




**TEST REPORT
FROM
RFI GLOBAL SERVICES LTD**

Test of: Raymarine UK Ltd
LT Base Station

Partial Testing To: FCC Part 15.247: 2004 (Subpart C)

Test Report Serial No:
RFI/MPTE2/RP48098JD04A

Supersedes Test Report Serial No:
RFI/MPTE1/RP48098JD04A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager:	
 pp	
Tested By: Raul Recio  pp	Checked By: Steven Wong 
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Test of: **Raymarine UK Ltd**

LT Base Station

To: **FCC Part 15.247: 2004 (Subpart C)**

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1. Client Information

Company Name:	Raymarine UK Ltd
Address:	Robinson Way Anchorage Park PO3 5TD
Contact Name:	Mr M Howes

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Raymarine
Model Name or Number:	LifeTag, E15026
Serial Number:	001
FCC ID Number:	PJ5-LTB
Hardware Revision:	3015-394 Issue C
Software Revision:	0.4
Country of Manufacture:	Hungry
Date of Receipt:	27 March 2006

Brand Name:	Raymarine
Model Name or Number:	Base Station, A18130
Serial Number:	002
FCC ID Number:	PJ5-LTT
Hardware Revision:	3015-395 Issue D
Software Revision:	0.4
Country of Manufacture:	Hungry
Date of Receipt:	27 March 2006

2.2. Description of EUT

The equipment under test is a wireless marine man over board alarm system. Its function is to detect a man over board condition which occurs when the RF link is broken.

2.3. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

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2.4. Additional Information Related to Testing

Power Supply Requirement:	DC Supply of 12 V		
Intended Operating Environment:	Commercial		
Equipment Category:	Short Range Device – Alarm (Marine)		
Type of Unit:	Mobile (Vehicular Use, powered via vehicle regulated supply)		
Transmit Frequency Range:	2.4 GHz to 2.4835 GHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	B	11	2405
	12	18	2440
	1A	26	2480
Receive Frequency Range:	2.4 GHz to 2.4835 GHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	B	11	2405
	12	18	2440
	1A	26	2480
Maximum Peak Power Output (EIRP)	5.7 dBm		

2.5. Port Identification

Port	Description	Type/Length	Applicable
1	RF Port	SMA	Y

2.6. Support Equipment

No support equipment was used to exercise the EUT during testing.

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3. Test Results

Reference:	FCC Part 15.247: 2004 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR22) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.2. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

None.

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5. Operation of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

Transmitting a constant stream of packets.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

A development board was used for programming the EUT into transmit mode. The development board was connected to a computer using a 5 m RS232 cable. All tests were performed using a SMA RF port for conducted emissions.

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6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Transmitter Minimum 6 dB Bandwidth	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(2)	Antenna Terminals	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 15: 2004 Section 2.1049	Antenna Terminals	Complied
Transmitter Peak Power Spectral Density	C.F.R. 47 FCC Part 15: 2004 Section 15.247(e)	Antenna Terminals	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2004 Section 15.247(b)(3)	Antenna Terminals	Complied
Transmitter Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247 (d)	Antenna Terminals	Complied
Transmitter Band Edge Conducted Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.247(d)	Antenna Terminals	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Pavilion A, Ashwood Park, Ashwood Way, Hampshire, RG23 8BG.

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7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to section 8 for details of measurement uncertainties.

No radiated spurious emissions tests to FCC Part 15.47. Only partial testing was performed at the request by the customer.

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7.2. Test Results

7.2.1. Transmitter Minimum 6 dB Bandwidth: Section 15.247(a)(2)

The EUT was configured for 6 dB bandwidth measurements as described in section 9 of this report.

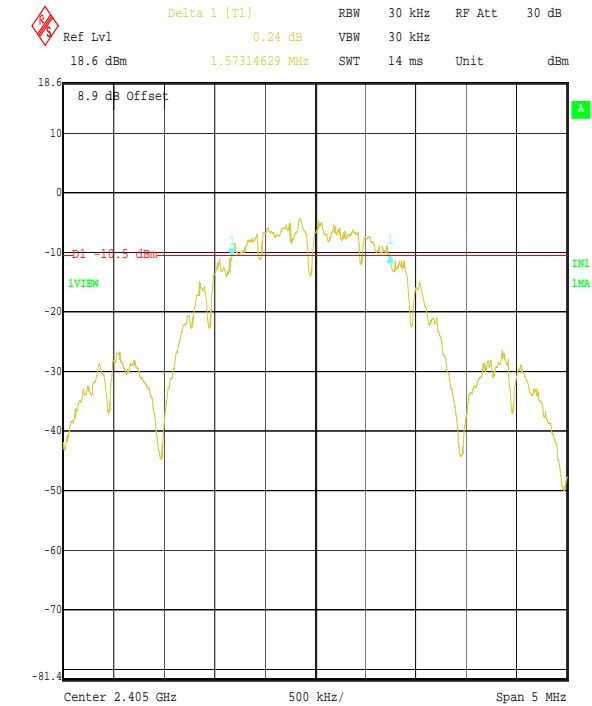
Tests were performed to identify the 6 dB bandwidth.

Results:

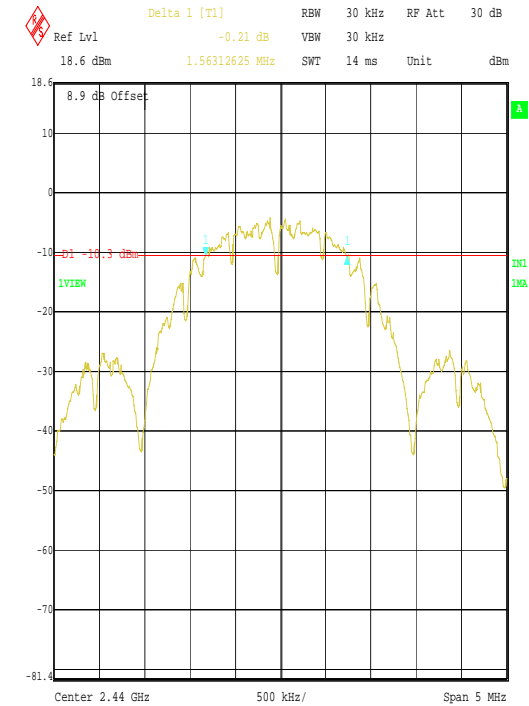
Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	1.573	≥ 0.5	1.103	Complied
Middle	1.563	≥ 0.5	1.063	Complied
Top	1.843	≥ 0.5	1.343	Complied

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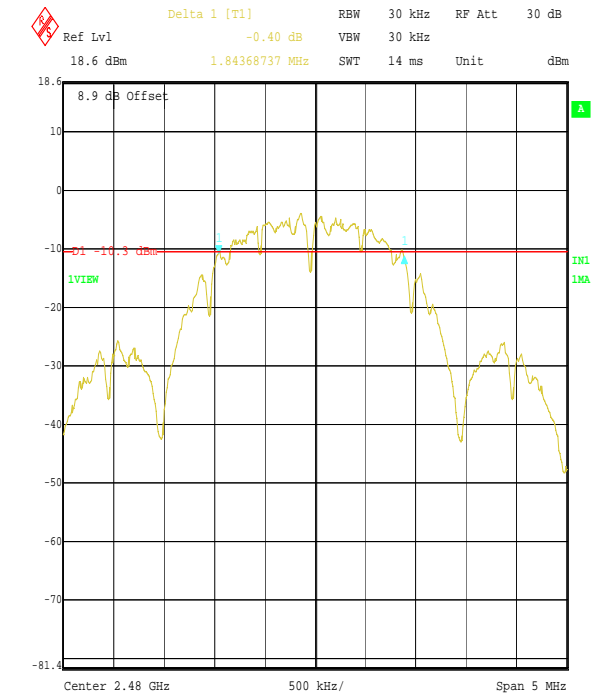
Transmitter Minimum 6 dB Bandwidth: Section 15.247(a)(2) (Continued)



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Minimum 6 dB Bandwidth (Bottom Channel)
Date: 11.APR.2006 15:33:33



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Minimum 6 dB Bandwidth (Middel Channel)
Date: 11.APR.2006 15:32:22



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Minimum 6 dB Bandwidth (Top Channel)
Date: 11.APR.2006 15:30:47

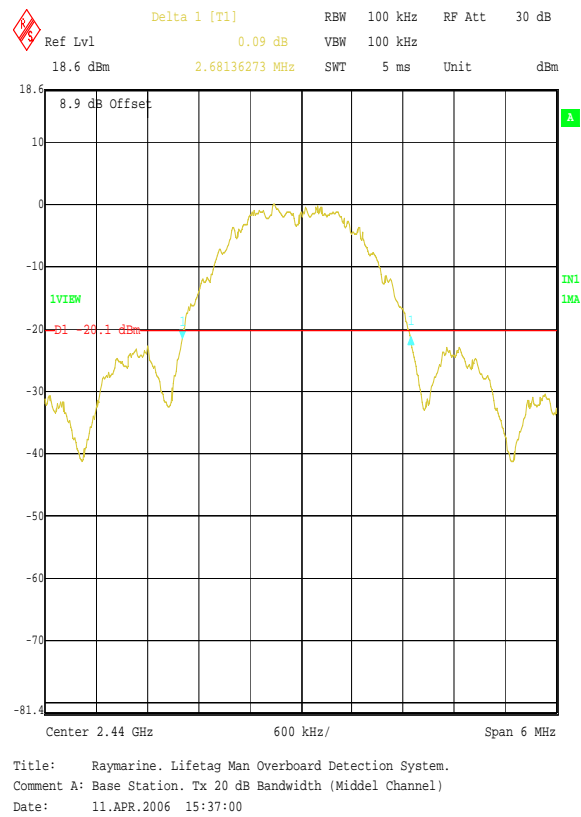
Test of: Raymarine UK Ltd
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7.2.2. Transmitter 20 dB Bandwidth: Section 2.1049

The EUT was configured for 20 dB bandwidth measurements as described in section 9 of this report. Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)
2681.363



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7.2.3. Transmitter Peak Power Spectral Density: Section 15.247(e)

The EUT was configured for transmitter peak power spectral density measurements as described in section 9 of this report.

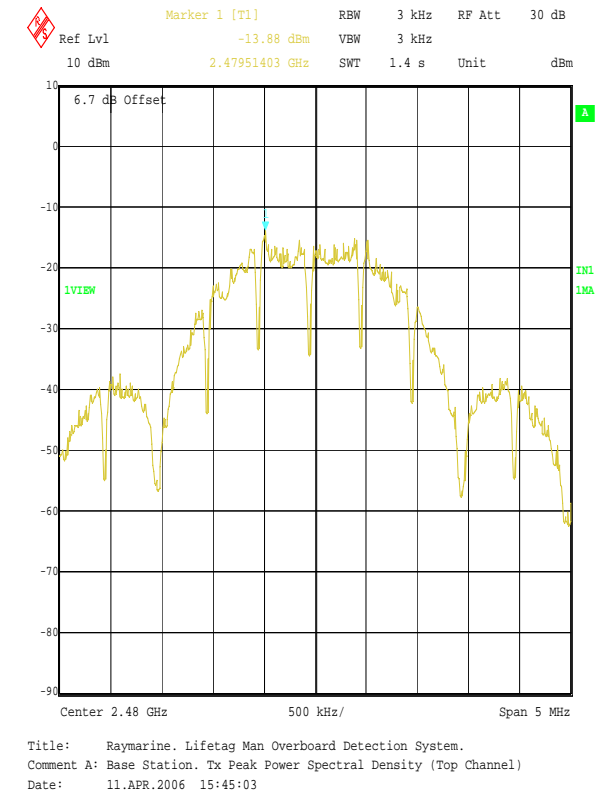
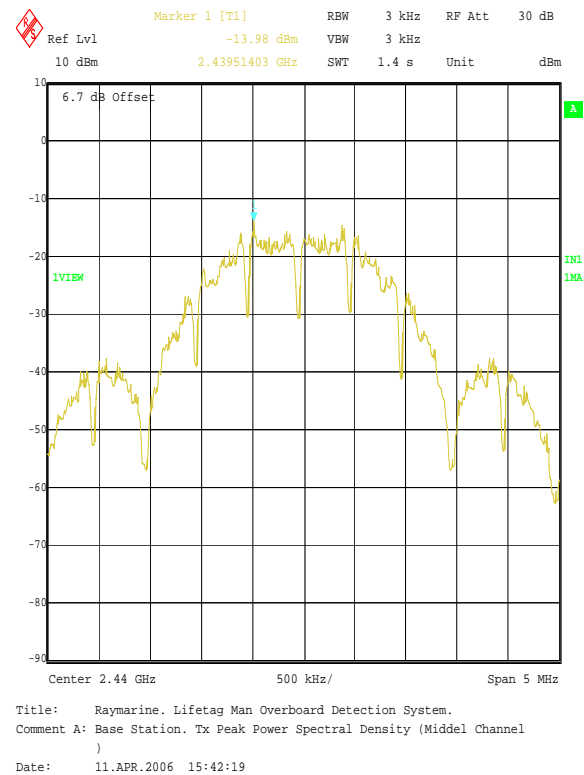
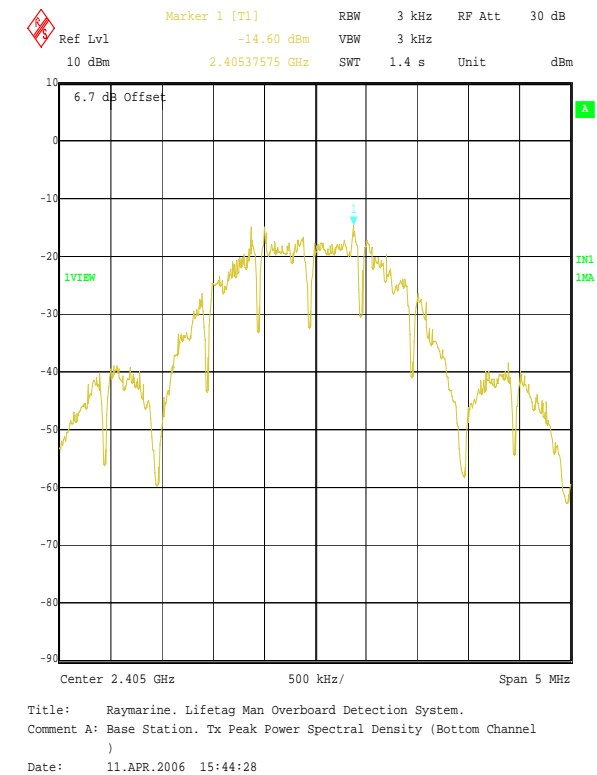
Tests were performed to identify the transmitter peak power spectral density.

Results:

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	-14.6	8	22.6	Complied
Middle	-14.0	8	22.0	Complied
Top	-13.9	8	21.9	Complied

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Transmitter Peak Power Spectral Density: Section 15.247(e) (Complied)



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7.2.4. Transmitter Maximum Peak Output Power: Section 15.247(b)(3)

The EUT was configured for transmitter peak output power measurements as described in section 9 of this report.

Results:**Battery Powered Devices**

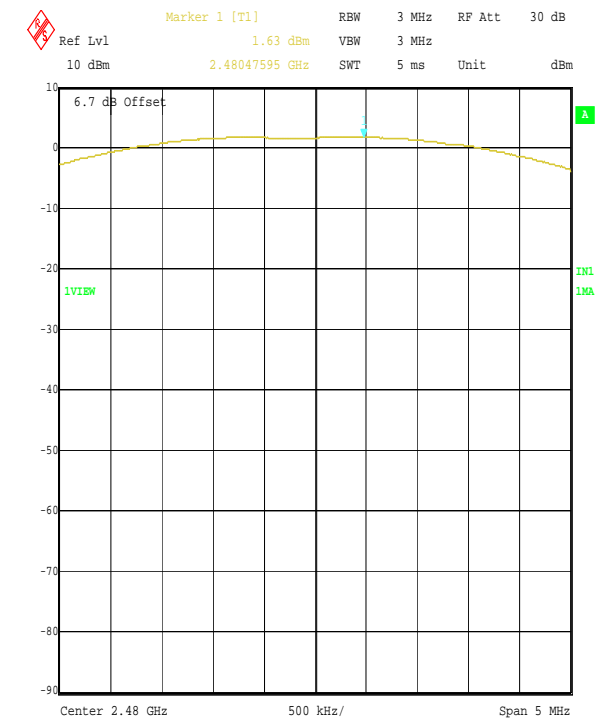
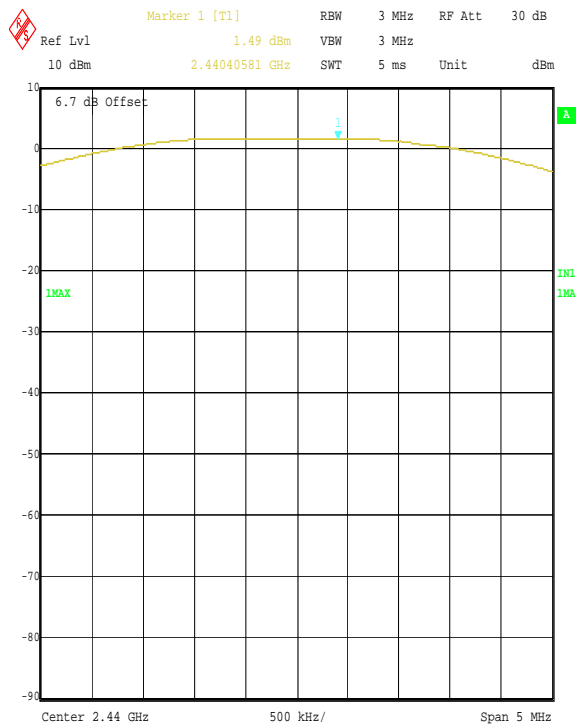
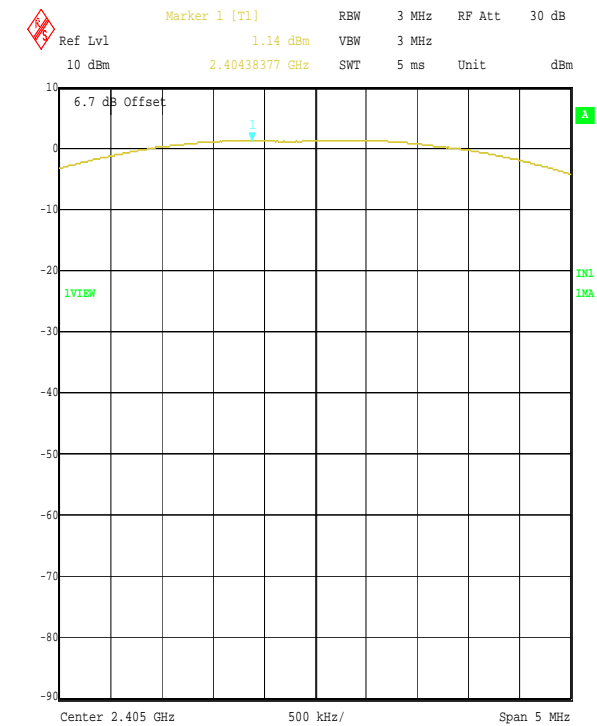
Channel	Conducted RF O/P Power (dBm)	Stated Antenna Gain (dB)	ERP or EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	1.1	4.1	5.2	30.0	24.8	Complied
Middle	1.5	4.1	5.6	30.0	24.4	Complied
Top	1.6	4.1	5.7	30.0	24.3	Complied

Note(s):

1. As per the method stated in section 15.247(b)(3), the standard antenna gain of the EUT is 4.1 dBi which, then added to the highest (worst case) measured conducted output power of 1.6 dBm (from the table above) gives a de facto EIRP of 5.7 dBm. This is in compliance with the requirements of section 15.247(b)(3) for de facto EIRP limitation i.e. 1 Watt (30 dBm).

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Transmitter Maximum Peak Output Power: Section 15.247(b)(3) (Continued)



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7.2.5. Transmitter Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emissions measurements as described in section 9 of this report.

Tests were performed to identify the maximum transmitter conducted emission levels.

The limit lines shown in the plots below are set to a level 20 dB below the measured highest fundamental peak power.

Results:

Bottom Channel

Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4810.887	-32.2	-33.9	-20.0	13.9	Complied

Middle Channel

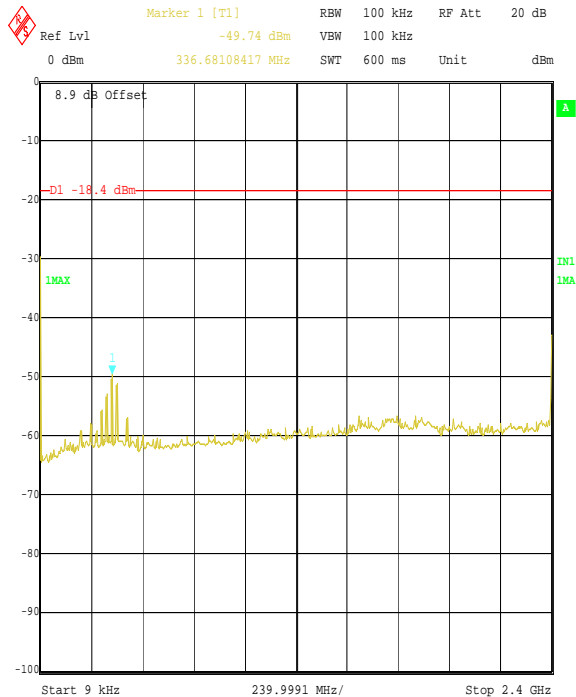
Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4878.893	-36.8	-38.4	-20.0	18.4	Complied

Top Channel

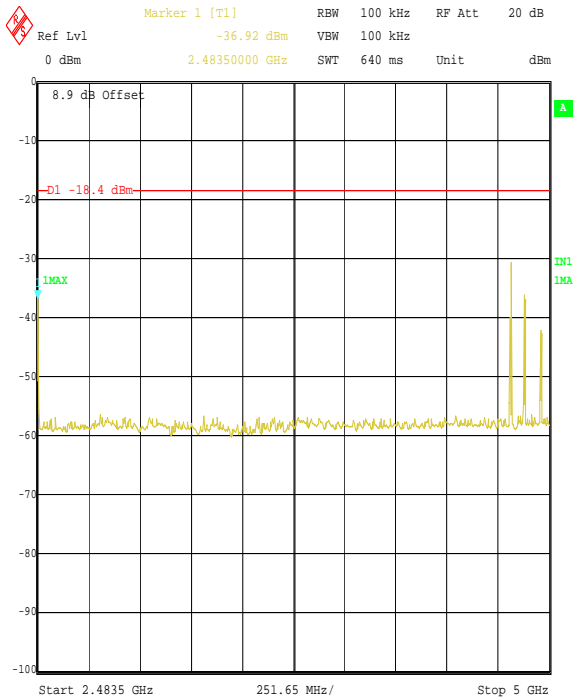
Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
4960.887	-43.8	-45.4	-20.0	25.4	Complied

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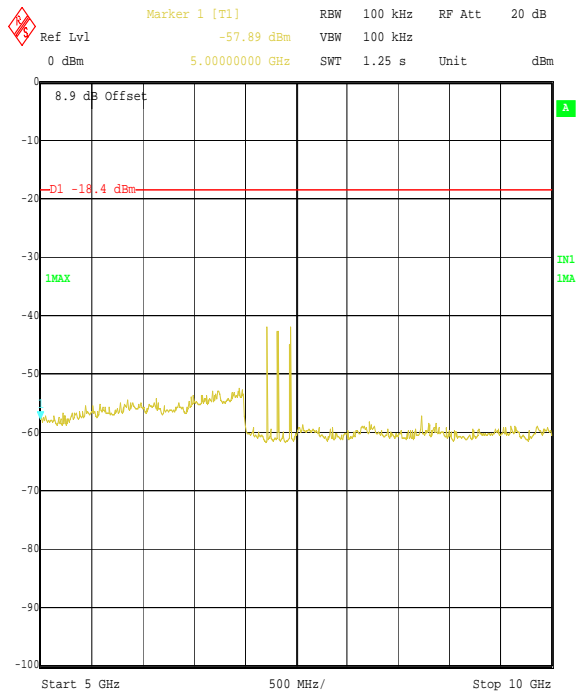
Transmitter Conducted Emissions: Section 15.247(d) (Continued)



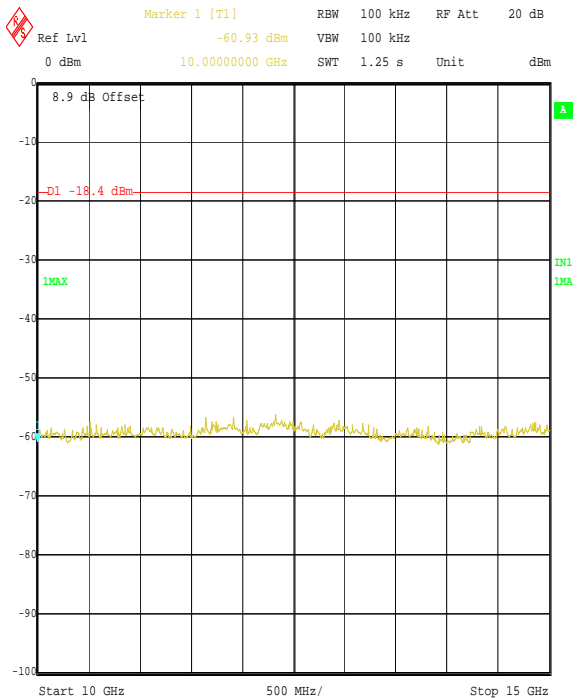
Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Conducted Emissions (Top, Middle and Bottom Channels)
Date: 11.APR.2006 16:06:42



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Conducted Emissions (Top, Middle and Bottom Channels)
Date: 11.APR.2006 16:07:20



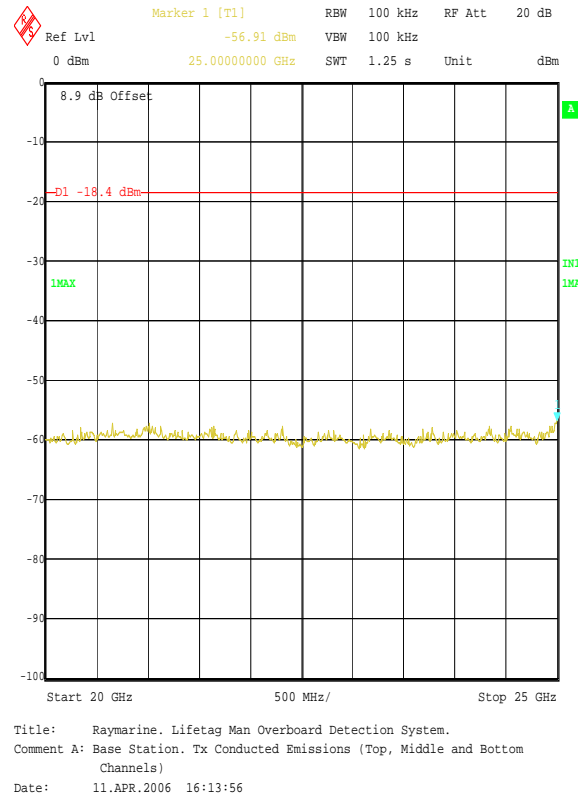
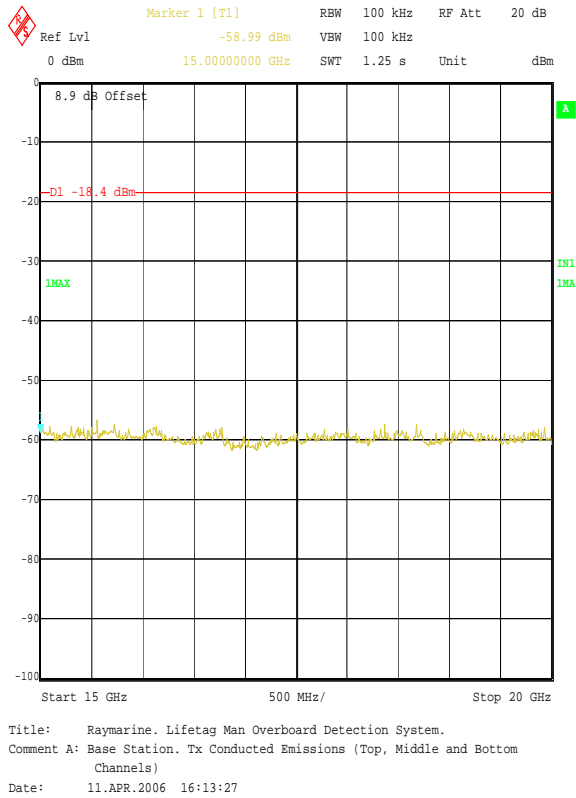
Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Conducted Emissions (Top, Middle and Bottom Channels)
Date: 11.APR.2006 16:12:18



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Conducted Emissions (Top, Middle and Bottom Channels)
Date: 11.APR.2006 16:12:56

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Transmitter Conducted Emissions: Section 15.247(d) (Continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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7.2.6. Transmitter Band Edge Conducted Emissions: Section 15.247(d)

The EUT was configured for transmitter conducted emissions measurements as described in section 9 of this report.

Tests were performed to identify the maximum conducted band edge emission levels.

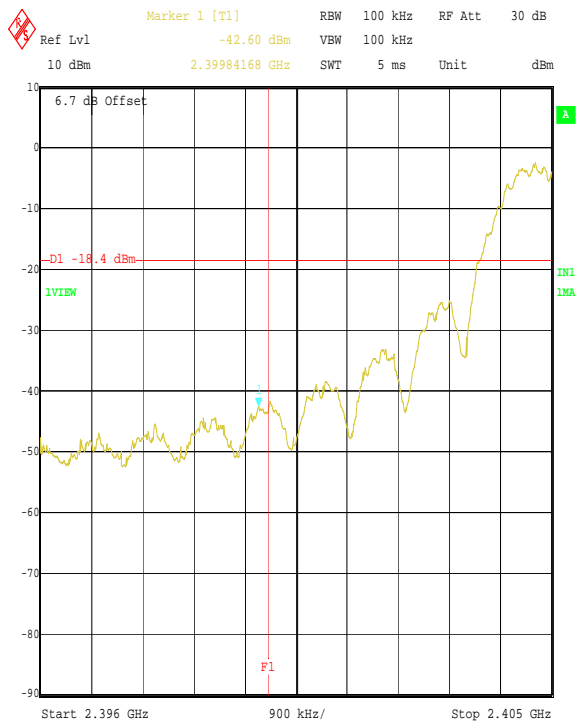
The limit lines shown in the plots below are set to a level 20 dB below the measured fundamental peak power of the channels closest to the lower and upper band edge.

Results:**Peak Power Level:**

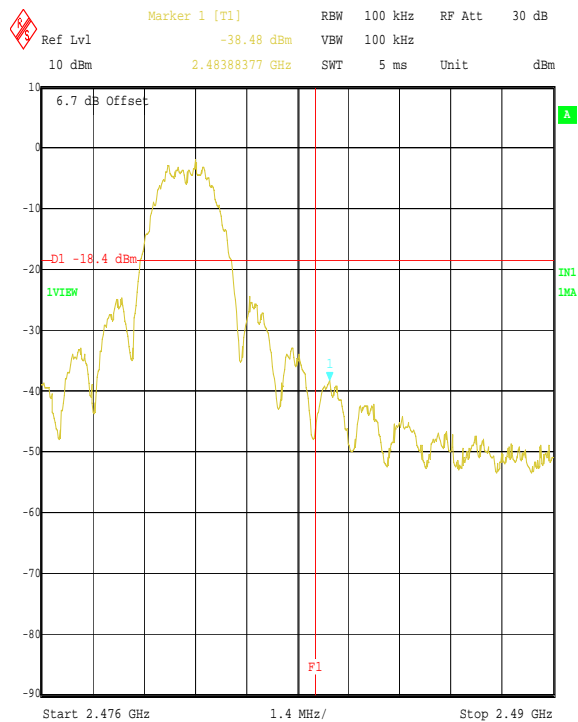
Frequency (MHz)	Peak Emission Level (dBm)	Peak Emission Level (dBc)	Limit (dBc)	Margin (dB)	Result
2400.000	-44.6	-46.2	-20.0	26.2	Complied
2483.500	-40.5	-42.1	-20.0	22.1	Complied

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Transmitter Band Edge Conducted Emissions: Section 15.247(d) (Continued)



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Band Edge Conducted Emissions (Lower Band Edge).
Date: 11.APR.2006 16:18:03



Title: Raymarine. Lifetag Man Overboard Detection System.
Comment A: Base Station. Tx Band Edge Conducted Emissions (Upper Band Edge).
Date: 11.APR.2006 16:19:49

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8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Transmitter Maximum Peak Output Power	Not applicable	95%	±0.28 dB
Conducted Emissions Antenna Port	30 MHz to 40 GHz	95%	±2.62 dB
Spectral Power Density	Not applicable	95%	±0.28 dB
6 dB/20 dB Bandwidth	Not applicable	95%	±0.12 %

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

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9. Measurement Methods

9.1. Conducted Antenna Port Emissions

Conducted antenna port emissions measurements were performed using a 100 kHz bandwidth in accordance with the standard against the appropriate limits.

Prior to testing being performed a suitable RF attenuator and cable, were calibrated for the required frequency range. For each measurement range the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which final measurements were necessary. To make the final measurements a peak detector was used in conjunction with the appropriate detector IF measuring bandwidth.

Repetitive scans were performed to allow for emissions with low repetition rates.

Scans were performed to the upper frequency limits as stated in 15.33(a)(1)

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Minimum 6 dB Bandwidth

The EUT and spectrum analyser were configured as for conducted antenna port emissions.

Prior to testing being performed a suitable RF attenuator and cables were calibrated for the required frequencies. For each frequency the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

To determine the 6 dB bandwidth, a resolution bandwidth of 30 kHz was used, which is approximates to 1% of the 6 dB bandwidth. A video bandwidth of 30 kHz was used. The analyser was set to a span of greater than twice the 6 dB bandwidth and for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference established 6 dB below the peak level. The bandwidth was determined at the points where the 6 dB reference crossed the profile of the emission.

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9.2. Transmitter 20 dB Bandwidth

The EUT and spectrum analyser was configured as for transmitter conducted antenna port emissions.

To determine the occupied bandwidth, a resolution bandwidth of 100 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of at least the same value was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20 dB below the peak level. The bandwidth was determined at the points where the 20 dB reference crossed the profile of the emission.

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9.3. Spectral Power Density

The EUT and spectrum analyser were configured as for conducted antenna port emissions measurements.

Prior to testing being performed a suitable RF attenuator and cables were calibrated for the required frequencies. For each frequency the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

Prior to the measurement being taken the spectrum analyser was tuned to the fundamental frequency of the EUT.

A resolution bandwidth of 3 kHz was selected and the analyser was set to a span greater than twice the 6 dB bandwidth. The trace was max held and a reading was taken at the peak point of the trace.

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9.4. Peak Output Power

The EUT and spectrum analyser were configured as for conducted antenna port emissions measurements.

Prior to testing being performed a suitable RF attenuator and cables were calibrated for the required frequencies. For each frequency to be measured, the calibrated level of the attenuator and cable were entered as an offset into a spectrum analyser to compensate for the measurement set up.

To determine the transmitter output power, the EUT was operated at maximum power and the result was obtained from the spectrum analyser as the peak measurement using the peak detector function and a resolution bandwidth of 3 MHz, which is greater than the 20 dB bandwidth of the emission being measured.

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Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
C1152	SMA cable	The Workhorse	WHU26-3636-036	None
L0796	Swept Signal Generator	Agilent	83630B	3844A00937
M1124	ESIB Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K
S240	Site 40	RFI	40	
S505	PSU	Weir	4000	964214/164

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule.

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Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\48098JD04\EMICON	Test configuration for measurement of conducted emissions.

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DRG48098JD04\EMICON

