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# Report On

Radio Approval Testing of the  
Raymarine Ltd. AIS500 Class B AIS Transponder  
In accordance with BS EN 62287-1: 2006

Document 75904957 Report 01 Issue 1

December 2008



Product Service

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**REPORT ON**

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Raymarine Ltd. AIS500 Class B AIS Transponder  
In accordance with BS EN 62287-1: 2006

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December 2008

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**DATED**

16 December 2008



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## **SECTION 1**

### **REPORT SUMMARY**

Radio Approval Testing of the  
Raymarine Ltd. AIS500 Class B AIS Transponder  
In accordance with BS EN 62287-1: 2006



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## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Radio Approval Testing of the Raymarine Ltd. AIS500 Class B AIS Transponder to limited requirements of BS EN 62287-1: 2006.

Objective	To perform Radio Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Software Radio Technology Ltd.
Model Number(s)	Raymarine Ltd. AIS500 Class B AIS Transponder
Serial Number(s)	EP2-001
Number of Samples Tested	One
Test Specification/Issue/Date	BS EN 62287-1: 2006
Disposal	Held Pending Disposal
Reference Number	Not Applicable
Date	Not Applicable
Order Number	PO 513
Date	20 November 2008
Start of Test	11 November 2008
Finish of Test	20 November 2008
Name of Engineer(s)	M P Hardy



## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with BS EN 62287-1: 2006 is shown below.

Section	Spec Clause	Test Description	Result	Comments
2.1	11.1.1	TDMA Transmitter – Frequency Error	Pass	
2.2	11.1.2	TDMA Transmitter – Carrier Power	Pass	
2.3	11.1.3	TDMA Transmitter – Transmission Spectrum	Pass	
2.4	11.1.4	TDMA Transmitter – Modulation Accuracy	Pass	
2.5	11.1.5	TDMA Transmitter – Transmitter Output Power vs Time Function	Pass	
2.6	11.2.1	TDMA Receiver – Receiver Sensitivity	Pass	
2.7	11.2.2	TDMA Receiver – Error Behaviour at high input levels	Pass	
2.8	11.2.3	TDMA Receiver – Co Channel rejection	Pass	
2.9	11.2.4	TDMA Receiver – Adjacent Channel Selectivity	Pass	
2.10	11.2.5	TDMA Receiver – Spurious Response Rejection	Pass	
2.11	11.2.6	TDMA Receiver – Intermodulation Response Rejection	Pass	
2.12	11.2.7	TDMA Receiver – Blocking or Desensitisation	Pass	
2.13	11.3.1	TDMA Receiver – Conducted Spurious Emissions From Receiver	Pass	
2.14	11.3.2	TDMA Transmitter – Conducted Spurious Emissions From Transmitter	Pass*	*Deviation from standard. Further details are mentioned in section 2.14 of test section.

### 1.3 PRODUCT INFORMATION

#### 1.3.1 Technical Description

The Equipment Under Test (EUT) was a Raymarine Ltd. AIS500 Class B AIS Transponder as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



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#### **1.4 DEVIATIONS FROM THE STANDARD**

Deviations from the applicable test standards were made during testing for clause 11.3.2, TDMA Transmitter – Conducted Spurious Emissions From Transmitter. The deviations are detailed in Section 2.14.

#### **1.5 MODIFICATION RECORD**

No modifications were made to the EUT during testing.

Modification State 0 – EUT as supplied.





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## **SECTION 2**

### **TEST DETAILS**

Radio Approval Testing of the  
Raymarine Ltd. AIS500 Class B AIS Transponder  
In accordance with BS EN 62287-1: 2006



**2.1 TDMA TRANSMITTER – FREQUENCY ERROR**

**2.1.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.1.1

**2.1.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.1.3 Date of Test and Modification State**

12 November 2008 - Modification State 0

**2.1.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.1.5 Environmental Conditions**

	12 November 2008
Ambient Temperature	23°C
Relative Humidity	31%

**2.1.6 Test Results**

Rated output power +33dBm

TEST CONDITIONS		Frequency Error (kHz)	
Frequency		156.025 MHz	162.025 MHz
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (12V DC)	0.017	0.049
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (24V DC)	0.033	0.033
T <sub>min</sub> (-15°C)	V <sub>min</sub> (10.8V DC)	0.104	0.096
T <sub>max</sub> (55°C)	V <sub>max</sub> (31.2V DC)	0.035	0.035
Measurement uncertainty (Hz)		±36	

**LIMIT CLAUSE 11.1.1.3**

The frequency error shall not exceed ±0.5 kHz under normal and ±1 kHz under extreme test conditions
---



**2.2 TDMA TRANSMITTER – CARRIER POWER**

**2.2.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.1.2

**2.2.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.2.3 Date of Test and Modification State**

12 November 2008 - Modification State 0

**2.2.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.2.5 Environmental Conditions**

	12 November 2008
Ambient Temperature	22°C
Relative Humidity	32%

**2.2.6 Test Results**

Rated radiated power +33dBm

Test Signal 4

TEST CONDITIONS		Carrier Power (dBm)	
Frequency		156.025 MHz	162.025 MHz
T <sub>nom</sub> (22°C)	V <sub>nom</sub> (12V DC)	32.06	31.81
T <sub>nom</sub> (22°C)	V <sub>nom</sub> (24V DC)	32.08	31.80
T <sub>min</sub> (-15°C)	V <sub>min</sub> (10.8V DC)	32.30	32.12
T <sub>max</sub> (55°C)	V <sub>max</sub> (31.2V DC)	31.88	31.71
Measurement uncertainty (dB)		±1.45	

**LIMIT CLAUSE 11.1.2.3**

At all test frequencies, the carrier shall be 33 dBm ±1.5 dBm under normal test conditions and 33 dBm ±3 dBm under extreme conditions.
--



**2.3 TDMA TRANSMITTER – TRANSMISSION SPECTRUM**

**2.3.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.1.3

**2.3.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.3.3 Date of Test and Modification State**

18 November 2008 - Modification State 0

**2.3.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.3.5 Environmental Conditions**

	18 November 2008
Ambient Temperature	24°C
Relative Humidity	48%

**2.3.6 Test Results**

Rated radiated power +33dBm

Test Signal 4

TEST CONDITIONS		Emission Mask	
Frequency		156.025 MHz	162.025 MHz
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (12V DC)	Pass	Pass
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (24V DC)	Pass	Pass
Measurement uncertainty (dB)		±1 kHz	

## LIMIT CLAUSE 11.1.3.3

The spectrum for slotted transmission shall be within the emission mask as follows:

- In the region between the carrier and  $\pm 10$  kHz removed from the carrier, the modulation and transmit side bands shall be below 0 dBc;
- At  $\pm 10$  kHz removed from the carrier, the modulation and transient sidebands shall be below -25dBc;
- At  $\pm 25$  kHz to  $\pm 62.5$  kHz removed from the carrier, the modulation and transient sidebands shall be below the lower value of -60 dBc or -30dBm;
- In the region between  $\pm 10$  kHz and  $\pm 25$  kHz removed from the carrier, the modulation and transient sidebands shall be below a line specified between these two points

The reference level for the measurement shall be carrier power (conducted) recorded for the appropriate test frequency in 11.1.2.

For information the emission mask specified above is shown in Figure 10.

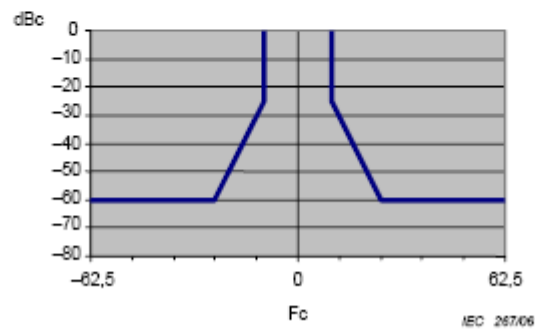
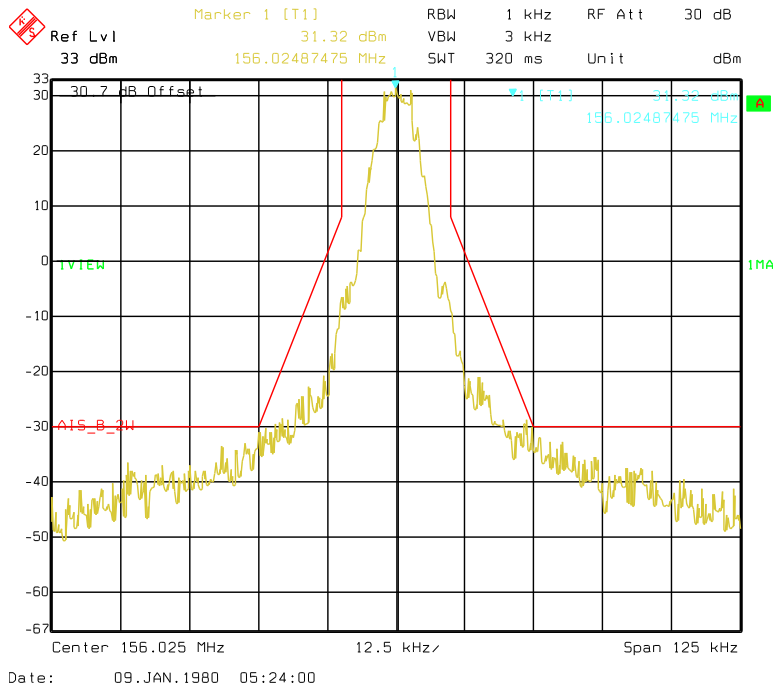


Figure 10 – Emission mask

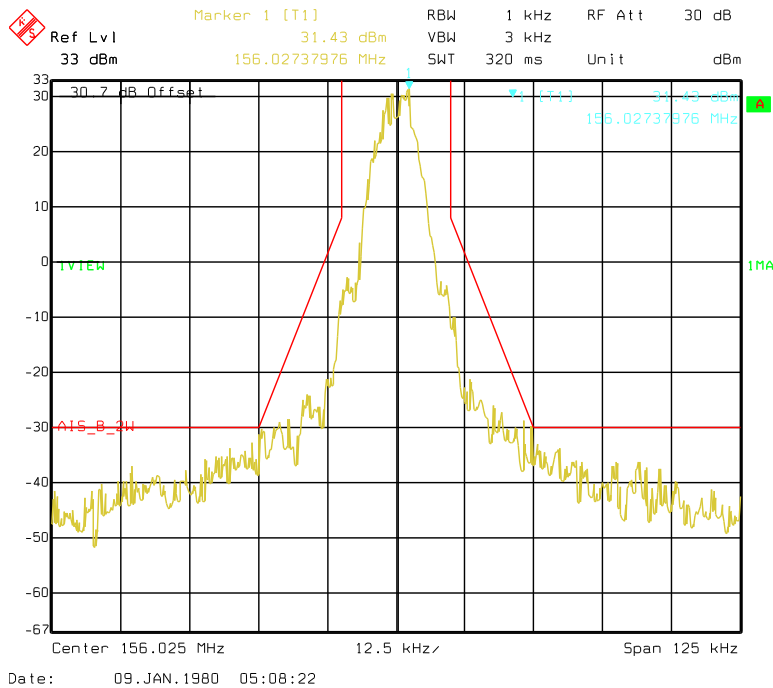


Product Service

### 156.025 MHz (12V)



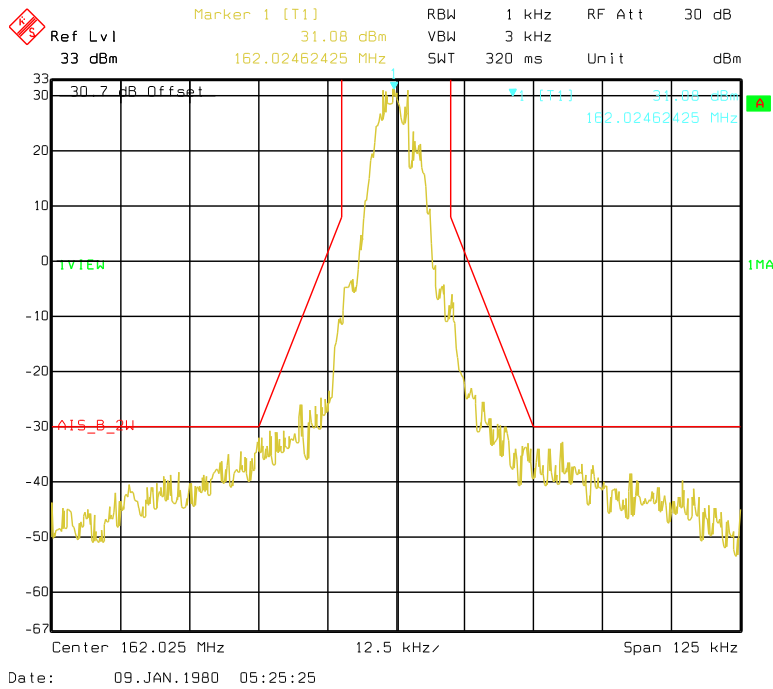
### 156.025MHz (24V)



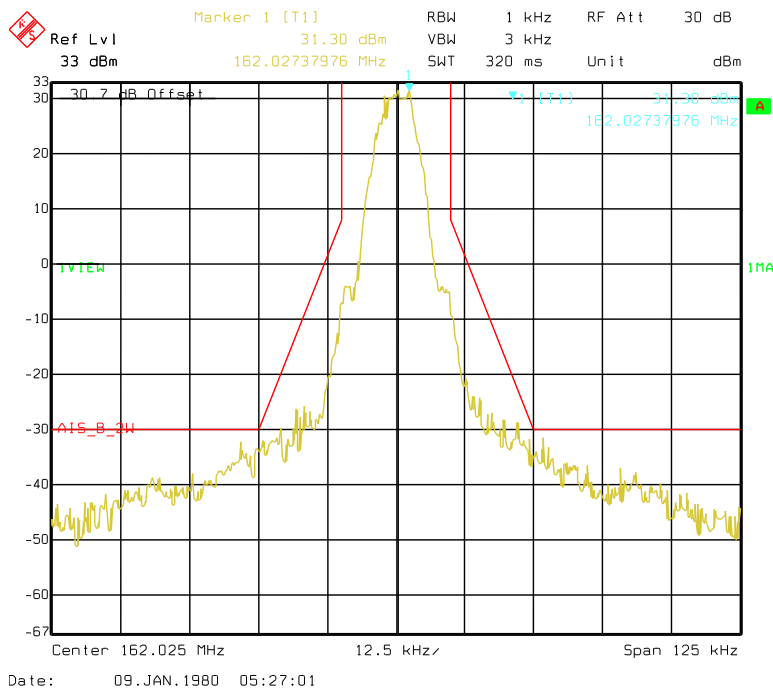


Product Service

### 162.025MHz (12V)



### 162.025MHz(24V)





Product Service

## **2.4 TDMA TRANSMITTER – MODULATION ACCURACY**

### **2.4.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.1.4

### **2.4.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

### **2.4.3 Date of Test and Modification State**

18 November 2008 - Modification State 0

### **2.4.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.4.5 Environmental Conditions**

	18 November 2008
Ambient Temperature	24°C
Relative Humidity	35%

### **2.4.6 Test Results**

Rated output power +33dBm

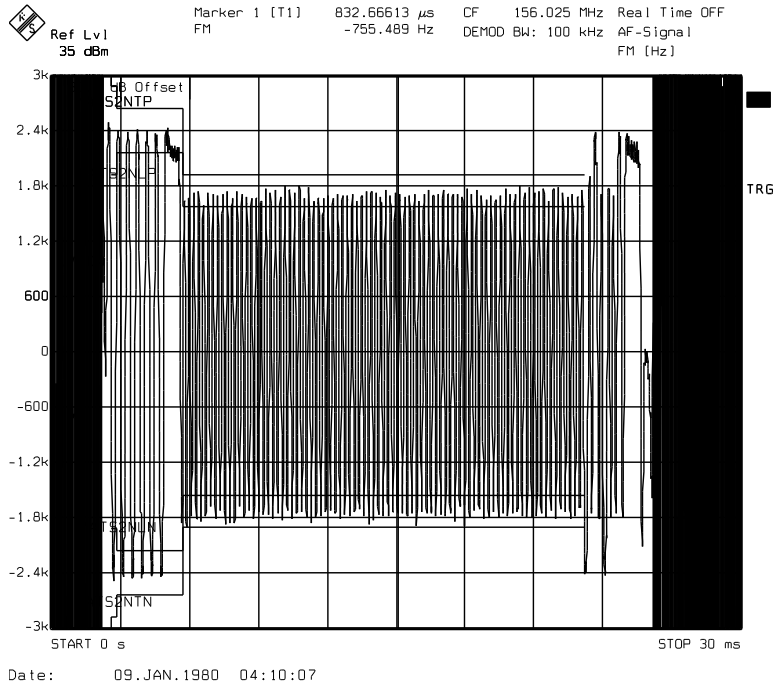
In plot headers: Ts2 – Test Signal 2  
Ts3 – Test Signal 3



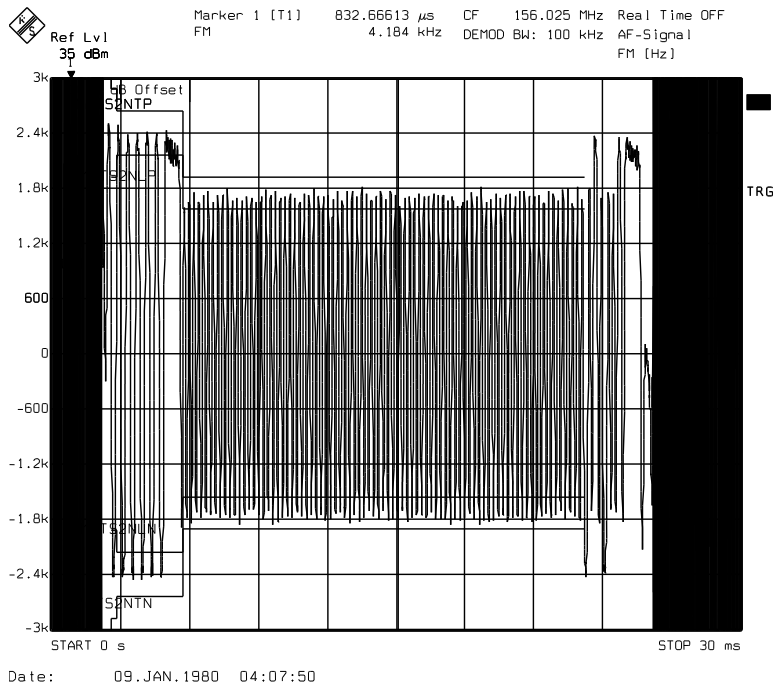


Product Service

### 156.025 MHz, Ts2, 12.0V/Ambient Temperature



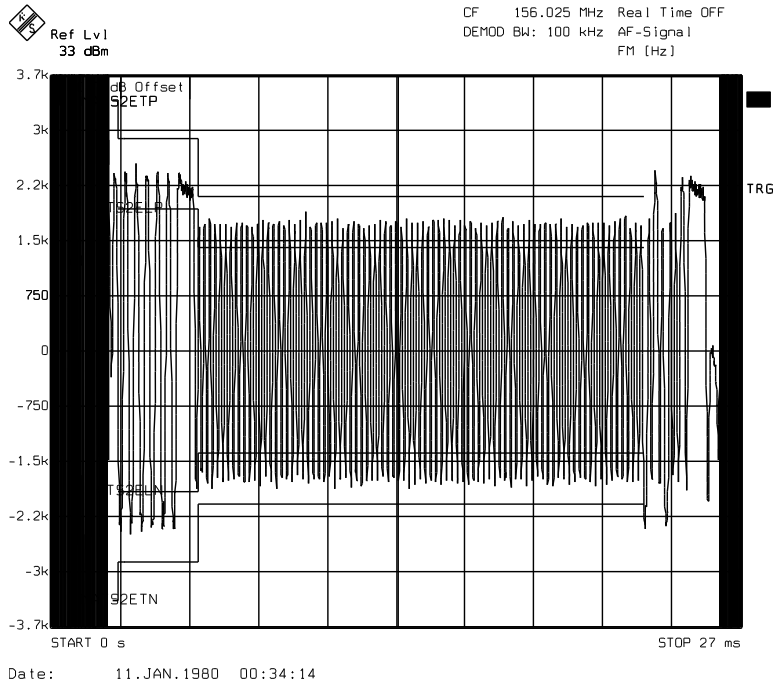
### 156.025 MHz, Ts2, 24.0V/Ambient Temperature



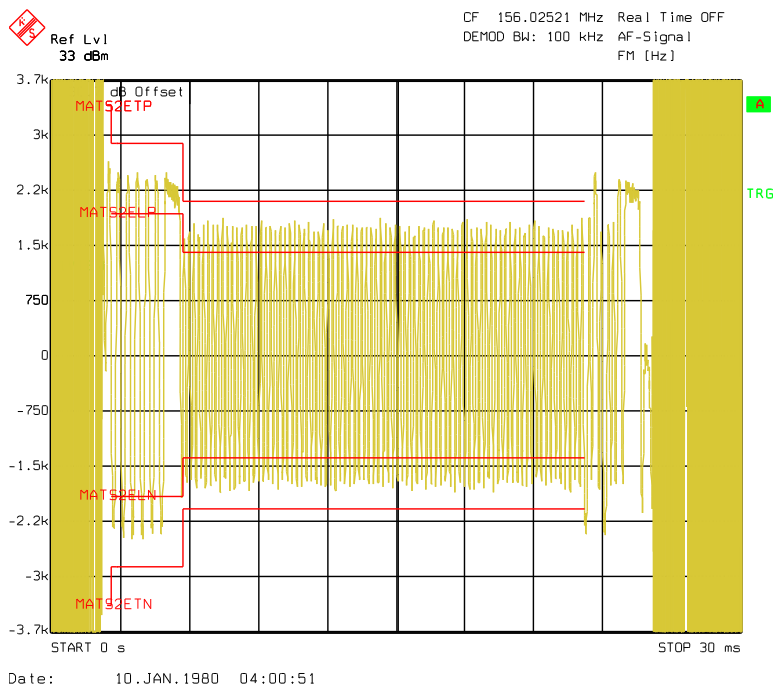


Product Service

### 156.025 MHz, Ts2, 10.8V/Low Temperature



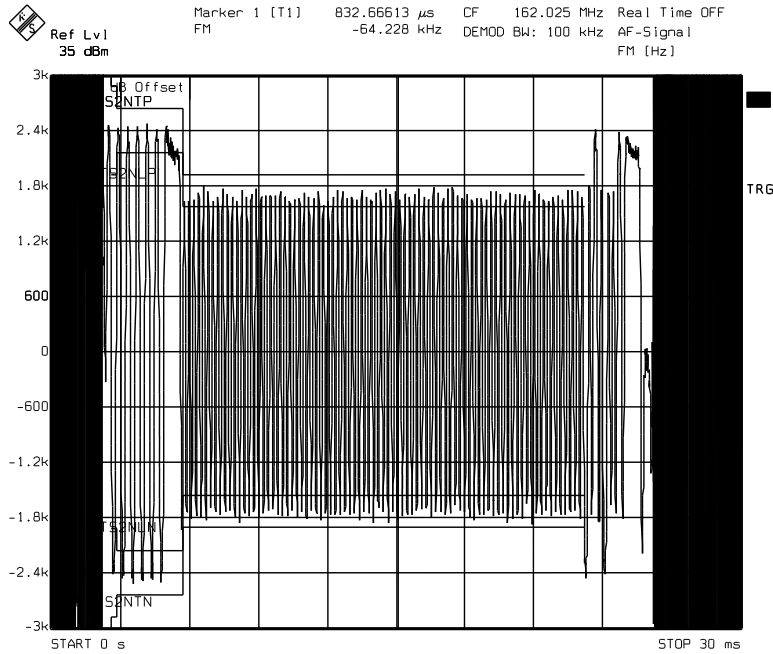
### 156.025 MHz, Ts2, 31.2V/High Temperature





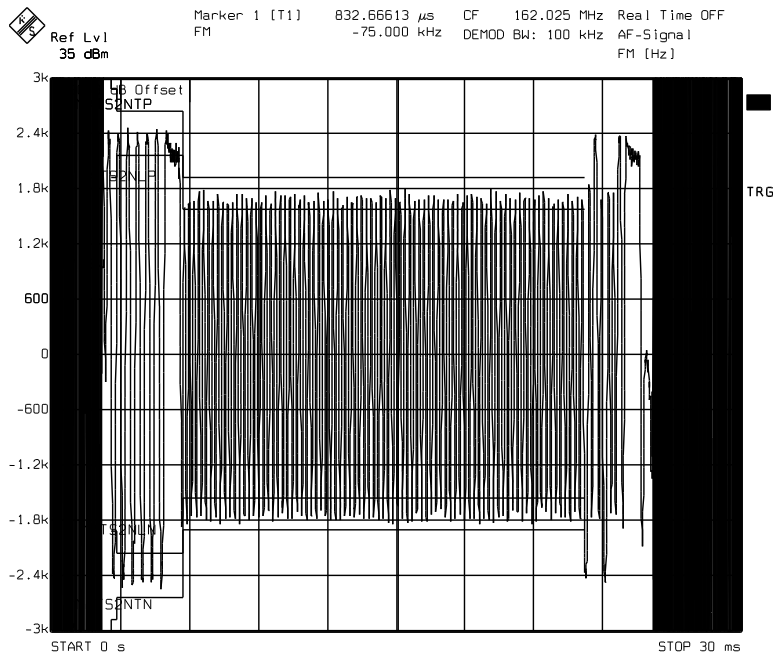
Product Service

### 162.025 MHz, Ts2, 12.0V/Ambient Temperature



Date: 09.JAN.1980 04:12:09

### 162.025 MHz, Ts2, 24.0V/Ambient Temperature

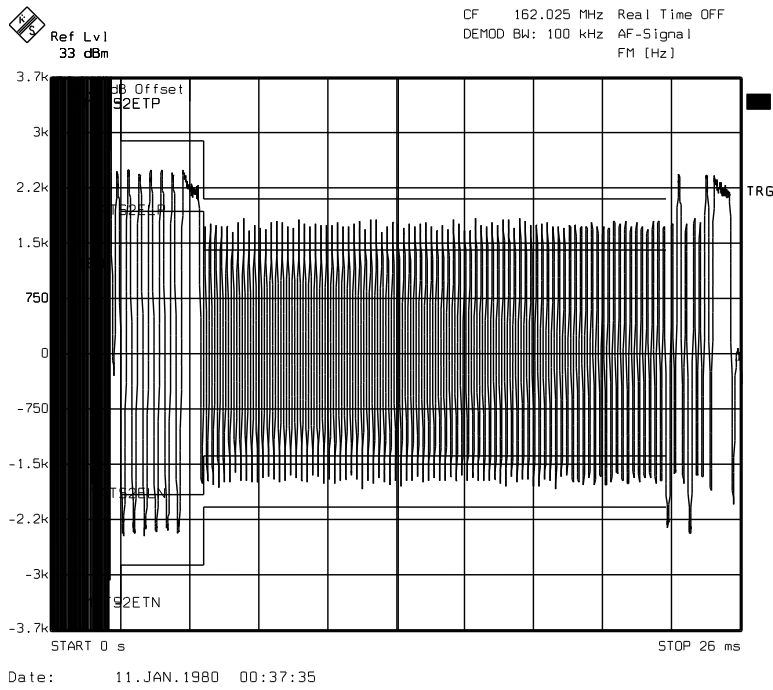


Date: 09.JAN.1980 04:14:57

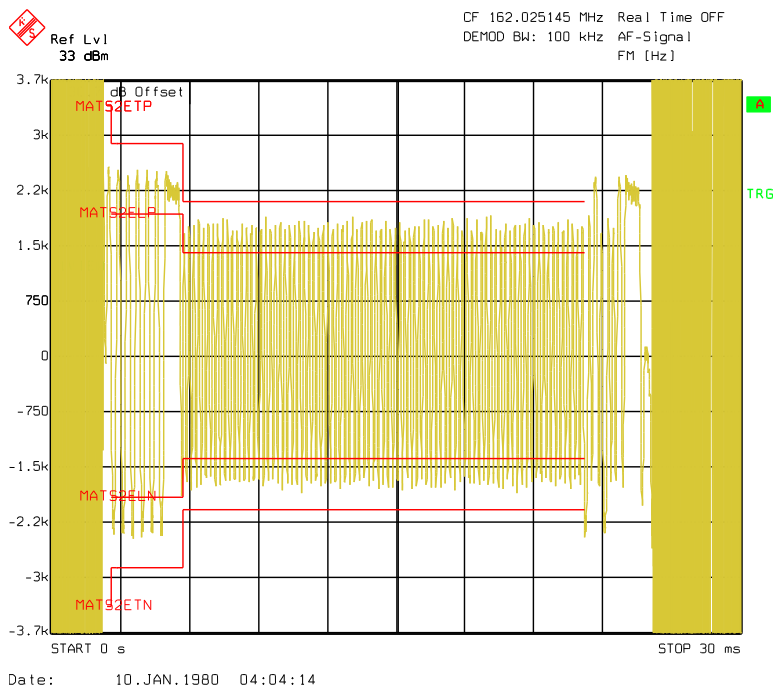


Product Service

### 162.025 MHz, Ts2, 10.8V/Low Temperature



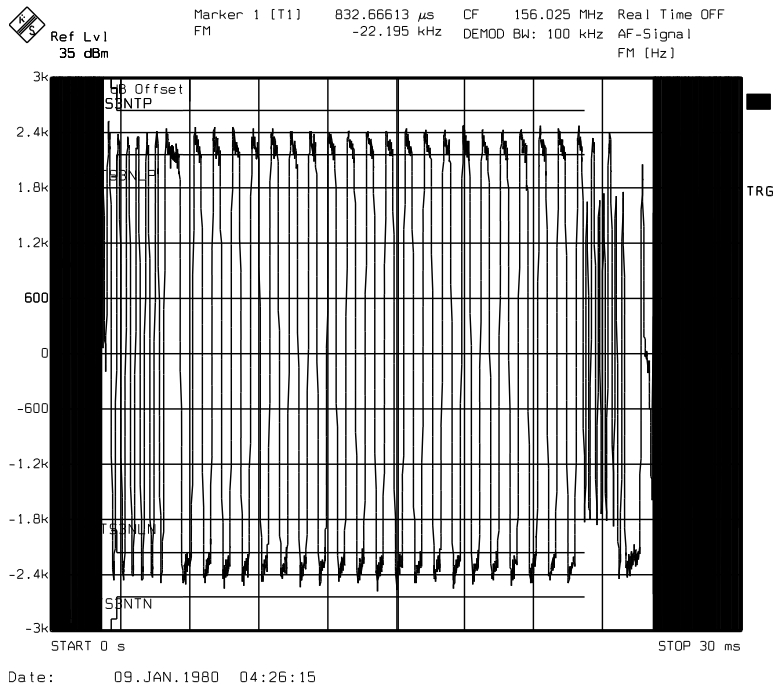
### 162.025 MHz, Ts2, 31.2V/High Temperature



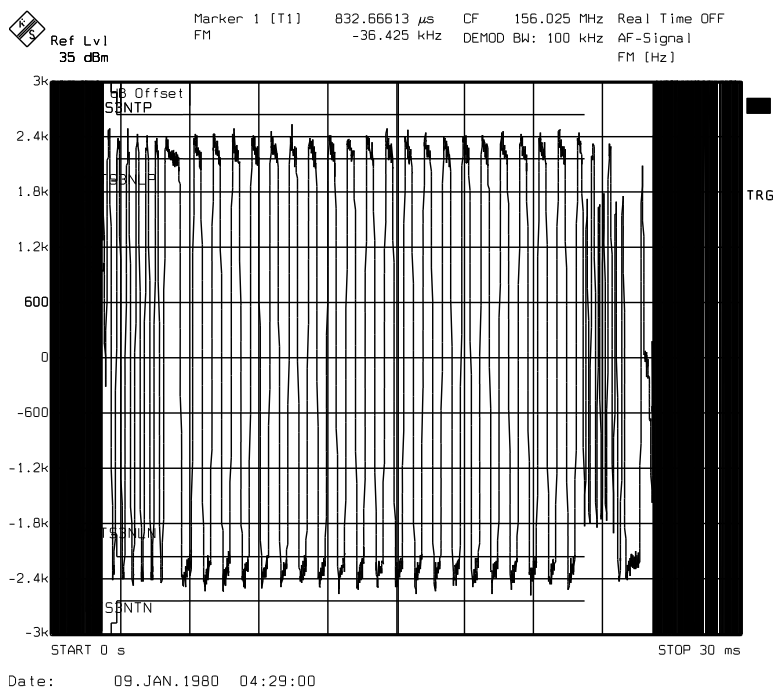


Product Service

### 156.025 MHz, Ts3, 12.0V/Ambient Temperature



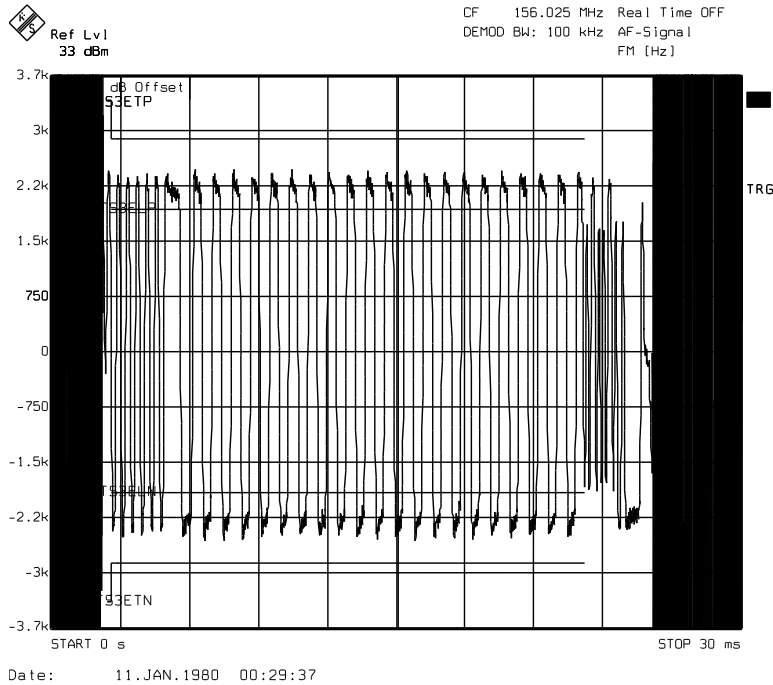
### 156.025 MHz, Ts3, 24.0V/Ambient Temperature



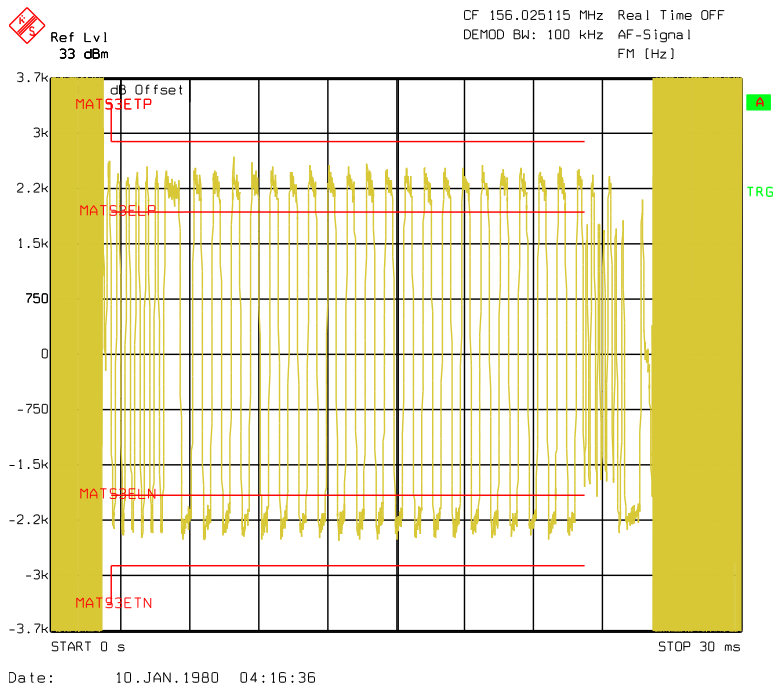


Product Service

### 156.025 MHz, Ts3, 10.8V/Low Temperature



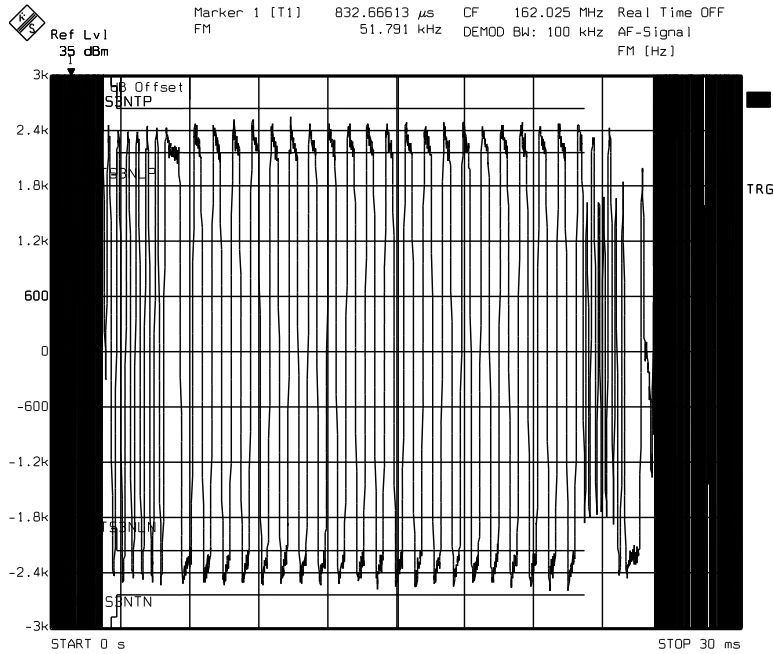
### 156.025 MHz, Ts3, 31.2V/High Temperature





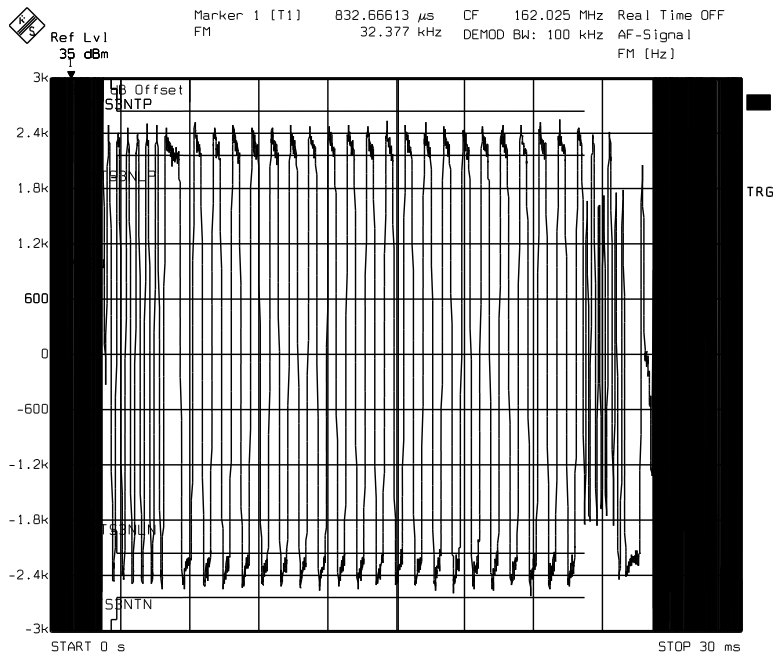
Product Service

### 162.025 MHz, Ts3, 12.0V/Ambient Temperature



Date: 09. JAN. 1980 04:24:14

### 162.025 MHz, Ts3, 24.0V/Ambient Temperature

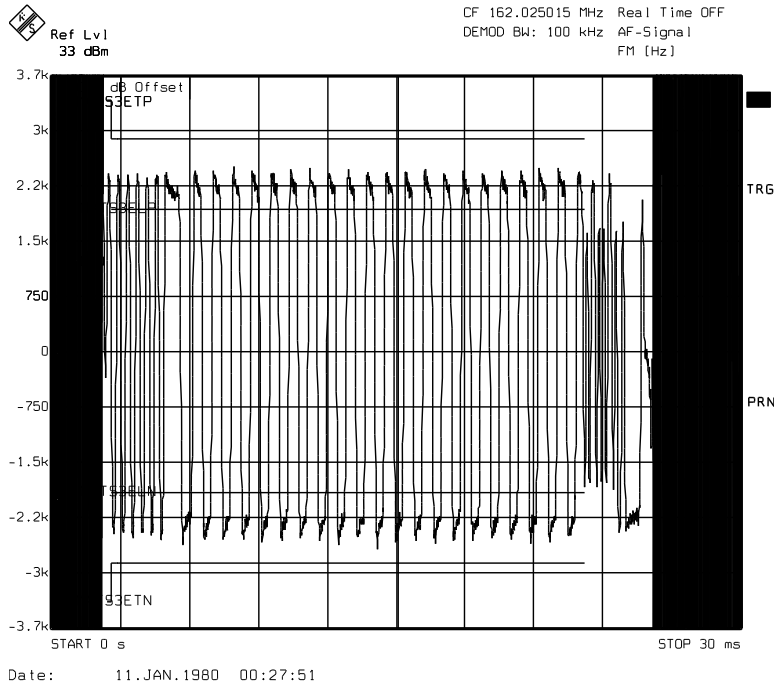


Date: 09. JAN. 1980 04:22:12

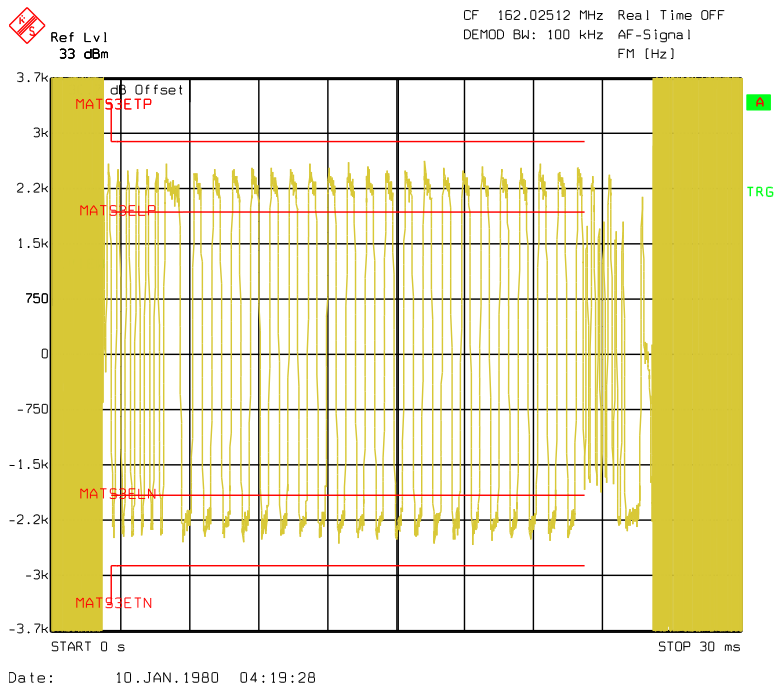


Product Service

### 162.025 MHz, Ts3, 10.8V/Low Temperature



### 162.025 MHz, Ts3, 31.2V/High Temperature







LIMIT CLAUSE 11.1.4.3

Peak frequency deviation at various points within the data frame shall comply with Table 22. (Applicable to both pos and neg modulation peaks).

Table 22 – Peak frequency deviation versus time

Measurement period from centre to centre of each bit	Test signal 2		Test signal 3	
	Normal	Extreme	Normal	Extreme
Bit 0 to bit 1	<3 400 Hz			
Bit 2 to bit 3	2 400 ±480 Hz			
Bit 4 to bit 31	2 400 ±240 Hz	2 400 ±480 Hz	2 400 ±240 Hz	2 400 ±480 Hz
Bit 32 to bit 199	1 740 ±175 Hz	1 740 ±350 Hz	2 400 ±240 Hz	2 400 ±480 Hz



Product Service

## **2.5 TDMA TRANSMITTER – TRANSMITTER OUTPUT POWER VS TIME FUNCTION**

### **2.5.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.1.5

### **2.5.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

### **2.5.3 Date of Test and Modification State**

18 November 2008 - Modification State 0

### **2.5.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

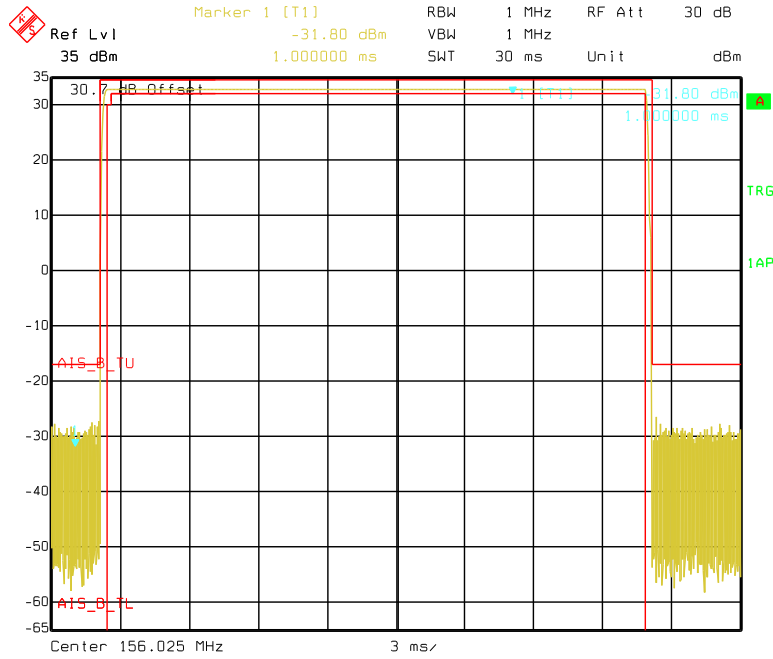
### **2.5.5 Environmental Conditions**

	18 November 2008
Ambient Temperature	24°C
Relative Humidity	35%



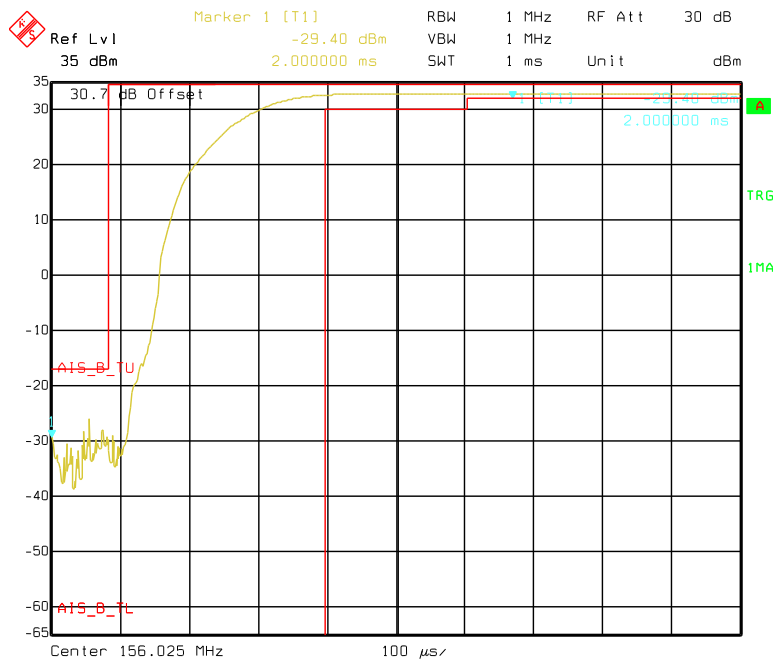
### 2.5.6 Test Results

#### 156.025 MHz (12V)- All



Date: 09.JAN.1980 04:50:39

#### 156.025 MHz (12V) - Start

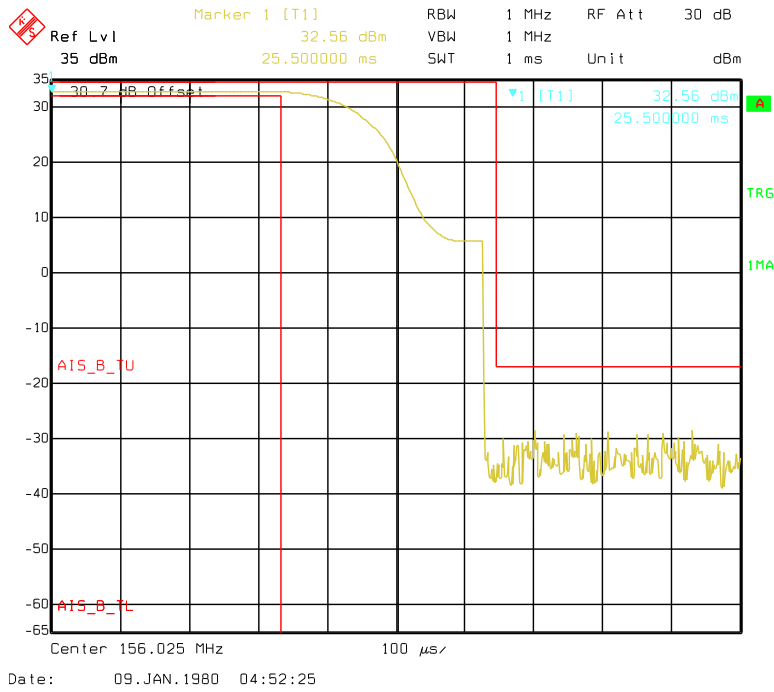


Date: 09.JAN.1980 04:51:28

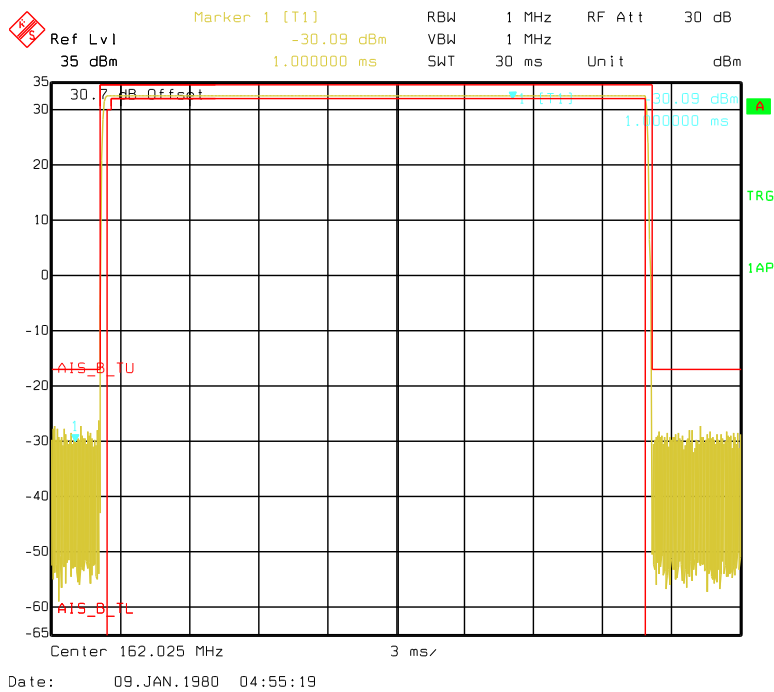


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### 156.025 MHz (12V)- End



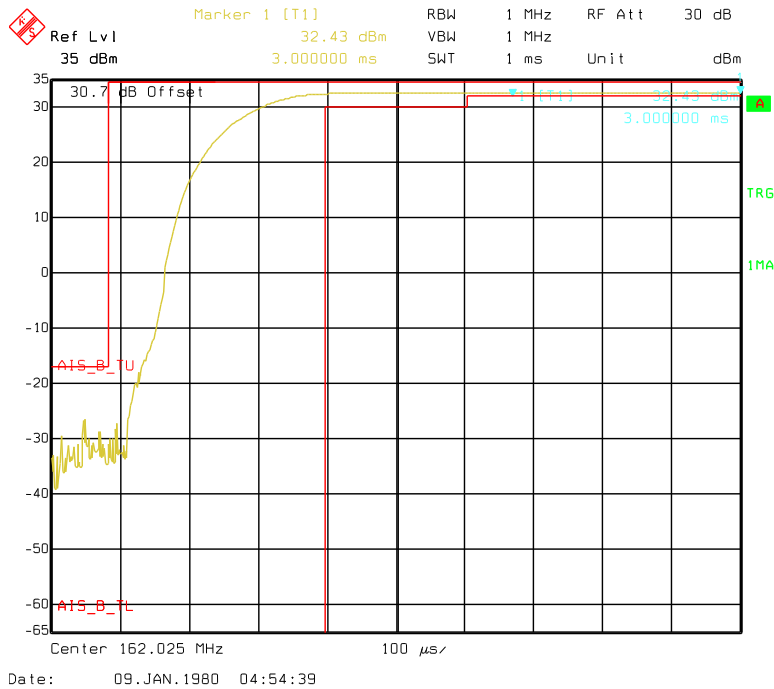
### 162.025 MHz (12V)- All



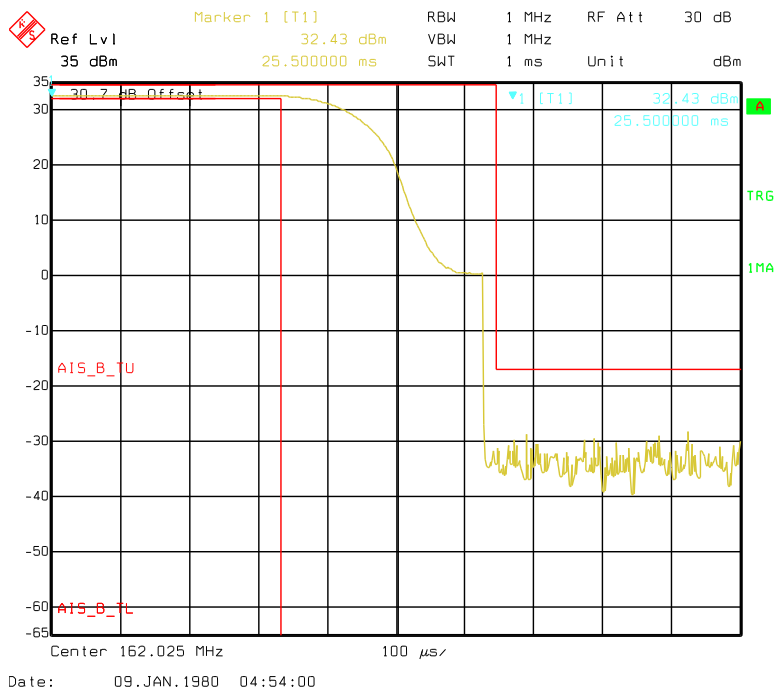


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### 162.025 MHz (12V)- Start



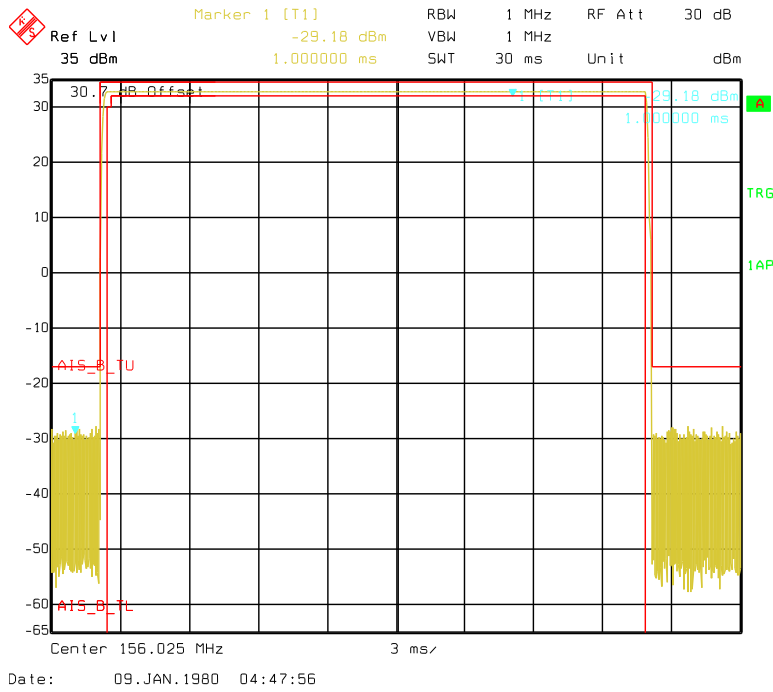
### 162.025 MHz (12V)- End



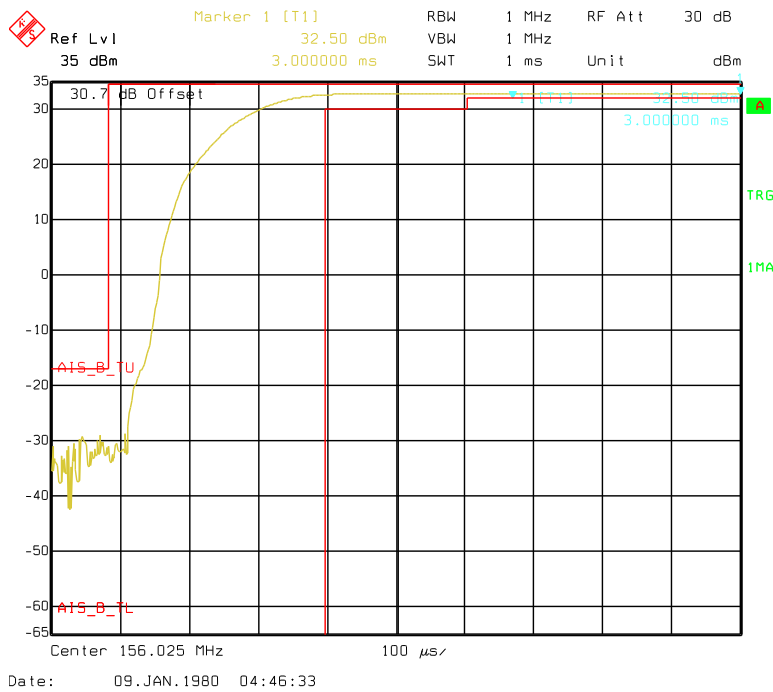


Product Service

### 156.025 MHz (24V)- All



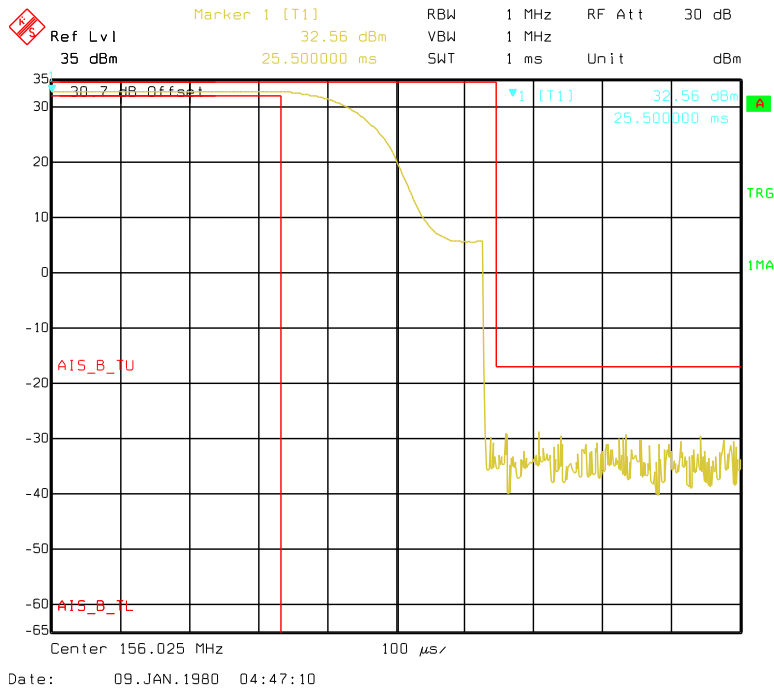
### 156.025 MHz (24V) - Start



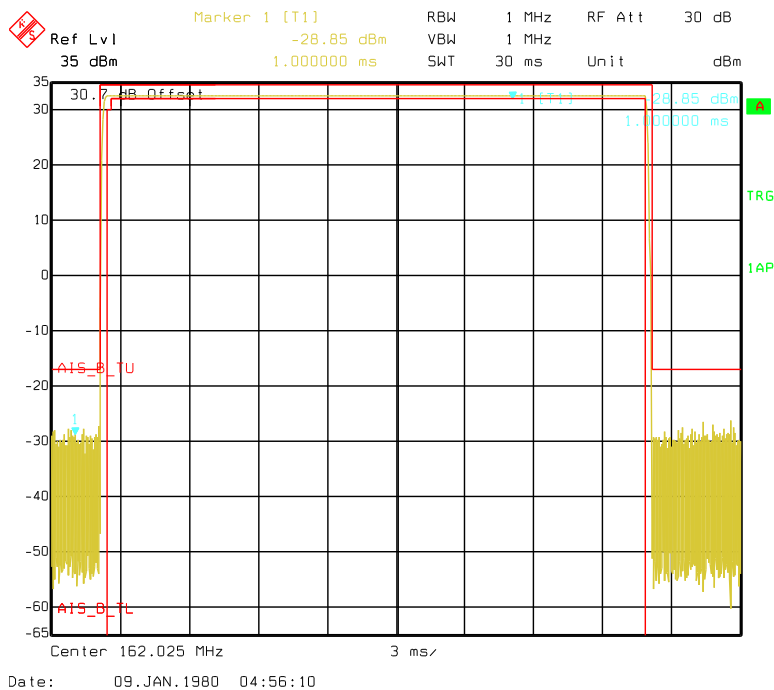


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### 156.025 MHz (24V)- End



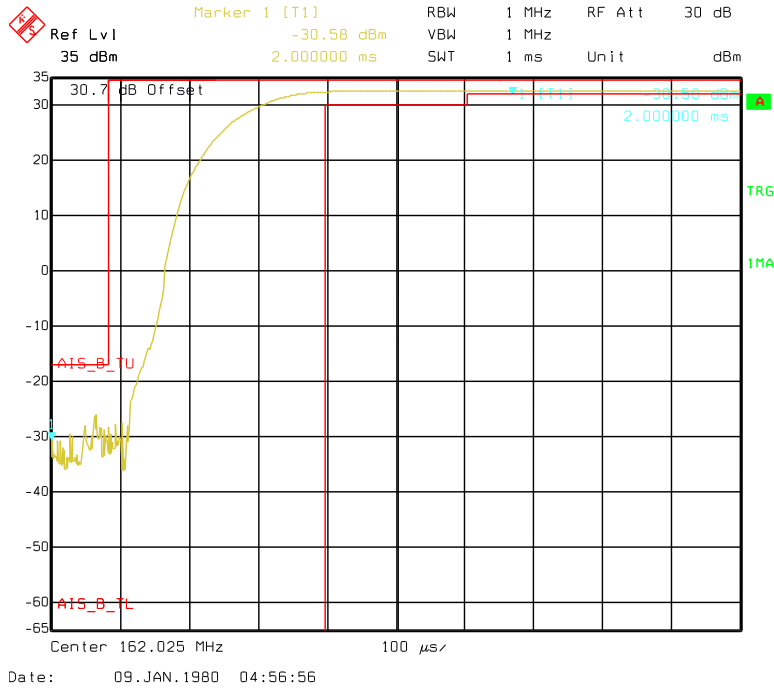
### 162.025 MHz (24V)- All



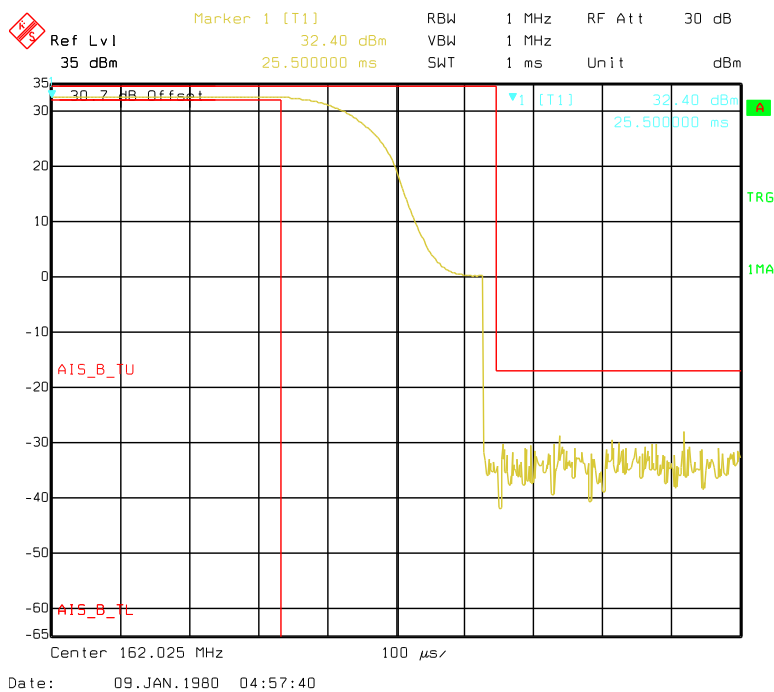


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### 162.025 MHz (24V)- Start



### 162.025 MHz (24V)- End





LIMIT CLAUSE 11.1.5.3

The transmitter power shall remain within the mask shown in fig 3 and associated timings given in Table 6.

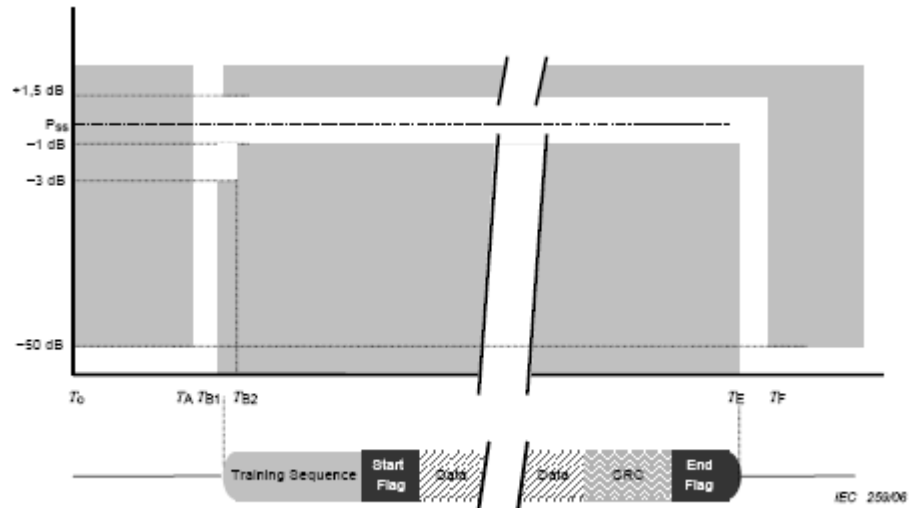


Figure 3 – Power versus time mask

Table 6 – Definition of timings for Figure 3

Reference	Bits	Time	Definition	
$T_0$	0	0 ms	Start of candidate transmission time period	
$T_A$	20	2,083 ms	Power shall not exceed $-50$ dB of $P_{ss}$	
$T_B$	$T_{B1}$	23	2,396 ms	Power shall reach within $+1,5$ dB or $-3$ dB of $P_{ss}$
	$T_{B2}$	25	2,604 ms	Power shall reach within $+1,5$ dB or $-1$ dB of $P_{ss}$
$T_E$ (plus 1 stuffing bit)	248	25,833 ms	Power shall still remain within $+1,5$ dB or $-1$ dB of $P_{ss}$	
$T_F$ (plus 1 stuffing bit)	251	26,146 ms	Power shall reach $-50$ dB of $P_{ss}$ and stay below this	



**2.6 TDMA RECEIVER – RECEIVER SENSITIVITY**

**2.6.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.1

**2.6.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.6.3 Date of Test and Modification State**

11 and 12 November 2008 - Modification State 0

**2.6.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.6.5 Environmental Conditions**

	11 November 2008	12 November 2008
Ambient Temperature	24°C	23°C
Relative Humidity	29%	32%

**2.6.6 Test Results**

Test Signal 5

TEST CONDITIONS		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
		RX1	RX2	RX1	RX2
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (12.0V)	1.5	4.5	1.5	3.0
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (24.0V)	0.5	1.0	3.0	1.0
T <sub>nom</sub> (-15°C)	V <sub>nom</sub> (10.8V)	0.00	0.50	0.00	2.00
T <sub>nom</sub> (+55°C)	V <sub>nom</sub> (31.2V)	2.00	1.50	3.00	2.00
Measurement Uncertainty (dB)		± 1.7			



Product Service

Nominal Frequency of Receiver +500 Hz  
Test Signal 5

TEST CONDITIONS Frequency		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
		RX1	RX2	RX1	RX2
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (12.0V)	2.50	4.00	0.00	0.00
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (24.0V)	1.00	0.00	0.00	1.00
Measurement Uncertainty (dB)		± 1.7			

Nominal Frequency of Receiver -500 Hz  
Test Signal 5

TEST CONDITIONS Frequency		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
		RX1	RX2	RX1	RX2
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (12.0V)	3.00	2.50	0.00	0.00
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (24.0V)	3.00	2.50	1.00	3.00
Measurement Uncertainty (dB)		± 1.7			

LIMIT CLAUSE 11.2.1.3

The PER shall not exceed 20%.
-------------------------------



**2.7 TDMA RECEIVER – ERROR BEHAVIOUR AT HIGH INPUT LEVELS**

**2.7.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.2

**2.7.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.7.3 Date of Test and Modification State**

11 November 2008 - Modification State 0

**2.7.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.7.5 Environmental Conditions**

11 November 2008  
 Ambient Temperature 23°C  
 Relative Humidity 32%

**2.7.6 Test Results**

Test Signal 5

RX1

TEST CONDITIONS		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
Frequency		-7 dBm	-77 dBm	-7 dBm	-77 dBm
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (12.0V)	0.00	0.00	0.00	0.00
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (24.0V)	0.00	0.00	0.50	0.00
Measurement Uncertainty (dB)		± 1.7			

RX2

TEST CONDITIONS		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
Frequency		-7 dBm	-77 dBm	-7 dBm	-77 dBm
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (12.0V)	0.00	0.00	0.00	0.00
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (24.0V)	0.00	0.00	0.50	0.00
Measurement Uncertainty (dB)		± 1.7			

**LIMIT CLAUSE 11.2.2.3**

The PER shall not exceed 2% with an input signal level of -77 dBm and 10% with an input signal level of -7 dBm..



**2.8 TDMA RECEIVER – CO CHANNEL REJECTION**

**2.8.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.3

**2.8.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.8.3 Date of Test and Modification State**

11 November 2008 - Modification State 0

**2.8.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.8.5 Environmental Conditions**

	11 November 2008
Ambient Temperature	24°C
Relative Humidity	29%

**2.8.6 Test Results**

Test Signal 5

TEST CONDITIONS			Packet Error Rate (%)			
			156.025 MHz		162.025 MHz	
Frequency		Frequency Offset	RX1	RX2	RX1	RX2
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (12V)	0	6.5	6.5	7.5	14.6
		+ 1 kHz	0.0	1.0	2.5	3.1
		- 1 kHz	4.0	6.0	5.0	4.0
T <sub>nom</sub> (24°C)	V <sub>nom</sub> (24V)	0	4.5	7.5	9.0	10.5
		+ 1 kHz	1.0	0.0	4.0	3.0
		- 1 kHz	3.5	9.5	7.0	6.0
Measurement Uncertainty (dB)			± 2.4			

**LIMIT CLAUSE 11.2.3.3**

The PER shall not exceed 20%
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**2.9 TDMA RECEIVER – ADJACENT CHANNEL SELECTIVITY**

**2.9.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.4

**2.9.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.9.3 Date of Test and Modification State**

13 November 2008 - Modification State 0

**2.9.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.9.5 Environmental Conditions**

	13 November 2008
Ambient Temperature	23°C
Relative Humidity	32%

**2.9.6 Test Results**

Test Signal 5

RX1

TEST CONDITIONS		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
		-25 kHz	+25 kHz	-25 kHz	+25 kHz
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (12V)	0.50	0.00	0.00	8.50
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (24V)	0.00	1.00	1.00	9.00
Measurement Uncertainty (Hz)		± 2.4			



Product Service

RX2

TEST CONDITIONS		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
		-25 kHz	+25 kHz	-25 kHz	+25 kHz
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (12V)	2.50	1.50	0.00	2.50
T <sub>nom</sub> (23°C)	V <sub>nom</sub> (24V)	0.50	2.50	1.00	4.50
Measurement Uncertainty (Hz)		± 2.4			

LIMIT CLAUSE 11.2.4.3

The PER shall not exceed 20%
------------------------------



**2.10 TDMA RECEIVER – SPURIOUS RESPONSE REJECTION**

**2.10.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.5

**2.10.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.10.3 Date of Test and Modification State**

20 November 2008 - Modification State 0

**2.10.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.10.5 Environmental Conditions**

	20 November 2008
Ambient Temperature	24°C
Relative Humidity	37%

**2.10.6 Test Results**

V<sub>nom</sub> (12 V & 24V DC Supply)

RX1

TEST CONDITIONS	Packet Error Rate (%)	
	161.975 MHz	162.025 MHz
Frequency		
80.985 MHz	PER of < 3%	PER of < 3%
81.015 MHz	PER of < 3%	PER of < 3%
Measurement Uncertainty (Hz)	± 2.6	





Product Service

RX2

TEST CONDITIONS	Packet Error Rate (%)	
	161.975 MHz	162.025 MHz
Frequency		
80.990 MHz	PER of < 3%	PER of < 3%
81.015 MHz	PER of < 3%	PER of < 3%
109.865 MHz	PER of < 3%	PER of < 3%
109.920 MHz	PER of < 3%	PER of < 3%
Measurement Uncertainty (Hz)	± 2.6	

LIMIT CLAUSE 11.2.4.3

At any frequency separated from the nominal frequency of the receiver by two channels or more, the spurious responses shall not result in a PER of greater than 20%.



Product Service

**2.11 TDMA RECEIVER – INTERMODULATION RESPONSE REJECTION**

**2.11.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.6

**2.11.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.11.3 Date of Test and Modification State**

20 November 2008 - Modification State 0

**2.11.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.11.5 Environmental Conditions**

20 November 2008  
 Ambient Temperature 19°C  
 Relative Humidity 59%

**2.11.6 Test Results**

12.0 V DC Supply

Test Signal 5

Frequency Increments of Unwanted Signals		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
Wanted	Interferer	RX1	RX2	RX1	RX2
162.025 MHz	+50/100 kHz Test # 1	-	-	0.00	4.00
162.025 MHz	-50/100 kHz Test # 2	-	-	3.00	2.00
156.025 MHz	+50/100 kHz Test # 3	1.50	0.50	-	-
156.025 MHz	-50/100 kHz Test # 4	3.00	3.00	-	-
Measurement Uncertainty (dB)		± 2.4			



Product Service

24.0 V DC Supply

Test Signal 5

Frequency Increments of Unwanted Signals		Packet Error Rate (%)			
		156.025 MHz		162.025 MHz	
Wanted	Interferer	RX1	RX2	RX1	RX2
162.025 MHz	+50/100 kHz Test # 1	-	-	3.00	2.00
162.025 MHz	-50/100 kHz Test # 2	-	-	2.00	1.00
156.025 MHz	+50/100 kHz Test # 3	1.00	3.00	-	-
156.025 MHz	-50/100 kHz Test # 4	2.50	4.00	-	-
Measurement Uncertainty (dB)		± 2.4			

LIMIT CLAUSE 11.2.6.3

The PER shall be < 20%.



**2.12 TDMA RECEIVER – BLOCKING OR DESENSITISATION**

**2.12.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.2.7

**2.12.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.12.3 Date of Test and Modification State**

13 November 2008 - Modification State 0

**2.12.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.12.5 Environmental Conditions**

	13 November 2008
Ambient Temperature	24°C
Relative Humidity	34%

**2.12.6 Test Results**

12.0 V DC Supply

Test Signal 5

RX1

Frequency of Unwanted Signal	Packet Error Rate (%)	
	156.025 MHz	162.025 MHz
Nominal +10 MHz	1.50	1.00
+5 MHz	1.00	2.00
+2 MHz	2.00	1.00
+1 MHz	1.00	1.00
+500 kHz	1.00	0.00
-500 kHz	2.00	1.50
-1 MHz	0.00	0.00
-2 MHz	0.000	0.00
-5 MHz	0.00	1.00
-10 MHz	1.00	1.00
Measurement Uncertainty (dB)	± 2.4	



Product Service

RX2

Frequency of Unwanted Signal	Packet Error Rate (%)	
	156.025 MHz	162.025 MHz
Nominal +10 MHz	3.50	2.00
+5 MHz	0.00	2.00
+2 MHz	2.50	0.00
+1 MHz	1.50	2.00
+500 kHz	0.00	3.00
-500 kHz	350	0.50
-1 MHz	0.00	0.00
-2 MHz	3.00	0.00
-5 MHz	0.00	2.00
-10 MHz	0.00	0.00
Measurement Uncertainty (dB)	± 2.4	

24.0 V DC Supply

Test Signal 5

RX1

Frequency of Unwanted Signal	Packet Error Rate (%)	
	156.025 MHz	162.025 MHz
Nominal +10 MHz	0.00	0.00
+5 MHz	0.50	0.00
+2 MHz	1.00	1.00
+1 MHz	1.00	.000
+500 kHz	0.00	1.00
-500 kHz	0.00	1.00
-1 MHz	0.00	3.00
-2 MHz	0.00	1.00
-5 MHz	0.00	0.00
-10 MHz	3.00	0.00
Measurement Uncertainty (dB)	± 2.4	



Product Service

RX2

Frequency of Unwanted Signal	Packet Error Rate (%)	
	156.025 MHz	162.025 MHz
Nominal +10 MHz	0.00	1.00
+5 MHz	2.00	2.00
+2 MHz	2.00	2.00
+1 MHz	3.00	3.00
+500 kHz	1.00	1.00
-500 kHz	0.00	1.00
-1 MHz	2.00	0.00
-2 MHz	2.00	4.00
-5 MHz	0.00	2.00
-10 MHz	1.00	1.00
Measurement Uncertainty (dB)	± 2.4	

LIMIT CLAUSE 11.2.7.3

< 20%.
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**2.13 TDMA RECEIVER – CONDUCTED SPURIOUS EMISSIONS FROM RECEIVER**

**2.13.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.3.1

**2.13.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

**2.13.3 Date of Test and Modification State**

13 November 2008 - Modification State 0

**2.13.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.13.5 Environmental Conditions**

	13 November 2008
Ambient Temperature	16°C
Relative Humidity	44%

**2.13.6 Test Results**

12.0 V DC Supply

Frequency of Spurious Emissions (MHz)	Spurious Emission Level (dBm)	
	156.025 MHz	162.025 MHz
135.97	-	-64.80
Measurement Uncertainty (Hz)	± 1.5	

**LIMIT CLAUSE 11.3.1.3**

The power of any spurious emission in the specified range at the antenna terminal shall not exceed -57 dBm (2 nW) in the frequency range 9kHz to 1 GHz and -47 dBm (20 nW) in the frequency range 1 GHz to 4GHz.
--

Remarks

No other emissions were detected within 10dB of the limit.



Product Service

## **2.14 TDMA TRANSMITTER – CONDUCTED SPURIOUS EMISSIONS FROM TRANSMITTER**

### **2.14.1 Specification Reference**

BS EN 62287-1: 2006 Clause 11.3.2

### **2.14.2 Equipment Under Test**

Raymarine Ltd. AIS500 Class B AIS Transponder, S/N: EP2-001

### **2.14.3 Date of Test and Modification State**

14 and 17 November 2008 - Modification State 0

### **2.14.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

### **2.14.5 Environmental Conditions**

	14 November 2008	17 November 2008
Ambient Temperature	21°C	22°C
Relative Humidity	57%	34%

### **2.14.6 Test Results**

#### Deviation From Standard

Using the test method defined within the specification the EUT failed to meet the specification limits. Alternative bandwidths and analyser settings were used to obtain compliant results as described below.

Measurements were made close into the carrier both above and below with the following settings.

- RBW 1kHz and VBW 3kHz with peak detector and max hold trace.





Product Service

Power level at which the measurement was carried out +33dBm  
 Transmitter Unmodulated

Frequency of Spurious Emissions (MHz)	Spurious Emission Level (dBm)	
	162.025 MHz	
	+12V	+24V
161.98	-38.9	-40.3
162.06	-42.0	-42.5
162.33	-42.5	-42.1
161.73	-40.4	-39.4
123.08	-45.4	-
135.94	-45.7	-
162.78	-45.8	-42.9
Measurement Uncertainty (Hz)	± 2.0	

Frequency of Spurious Emissions (MHz)	Spurious Emission Level (dBm)	
	156.025 MHz	
	+12V	+24V
155.98	-36.9	-38.4
156.06	-38.8	-38.6
156.33	-40.2	-
155.74	-38.5	-38.9
140.02	-42.8	-42.8
156.71	-42.7	-44.1
Measurement Uncertainty (Hz)	± 2.0	

Remarks

No other emissions were detected at a level greater than 10 dB below the limit.

LIMIT CLAUSE 11.3.2.3

The power of any spurious emission on any discrete frequency shall not exceed 0.25 μW (-36 dBm) in the frequency range 9 kHz to 1 GHz and 1 μW (-30 dBm) in the frequency range 1 GHz to 4 GHz



Product Service

## **SECTION 3**

### **TEST EQUIPMENT USED**



### 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.9 Radio (Rx) - Adjacent Channel Selectivity</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Power Splitter	Weinschel	1506A	606	12	29-Nov-2008
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2436	12	19-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU
<b>Section 2.12 Radio (Rx) - Blocking</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Power Splitter	Weinschel	1506A	606	12	29-Nov-2008
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2436	12	19-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.8 Radio (Rx) - Co Channel Rejection</b>					
Signal Generator	Hewlett Packard	ESG4000A	61	12	2-May-2009
Attenuator (Software Driver)	Hewlett Packard	11713A	116	0	TU
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
Dual Power Supply Unit	Hewlett Packard	6253A	271	-	O/P Mon
Attenuator (Step, 11dB, 1W)	Hewlett Packard	8494H	425	12	TU
Multimeter	Fluke	75 Mk3	455	12	13-Dec-2008
Power Divider	Weinschel	1506A	603	12	19-Mar-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Power Supply Unit	Weir	460	2754	-	TU
Attenuator (11dB, 1W)	Hewlett Packard	8496H	2786	6	TU
Attenuator (20dB, 75W)	Bird	8308-200	3076	12	5-Jun-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon
<b>Section 2.13 Radio (Rx) - Conducted Emissions</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	12	14-Oct-2009
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.11 Radio (Rx) - Inter Modulation Response Rejection</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Signal Generator	Rohde & Schwarz	SMX	115	12	23-Jun-2009
Modulation Analyser	Rohde & Schwarz	FAM	119	-	TU
Power Splitter	Weinschel	1506A	606	12	29-Nov-2008
Power Splitter	Weinschel	1506A	607	12	Manual Calibration
1GHz Digital Oscilloscope	Lecroy	9370M	612	12	30-Sep-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2436	12	19-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU
<b>Section 2.6 and 2.7 Radio (Rx) - Sensitivity</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Signal Generator	Hewlett Packard	ESG4000A	61	12	2-May-2009
Multimeter	Fluke	75 Mk3	455	12	13-Dec-2008
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2436	12	19-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.6 and 2.7 Radio (Rx) - Sensitivity</b>					
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU
<b>Section 2.10 Radio (Rx) - Spurious Response Rejection</b>					
Signal Generator	Hewlett Packard	ESG4000A	38	12	2-May-2009
Signal Generator	Rohde & Schwarz	SMX	115	12	23-Jun-2009
Modulation Analyser	Rohde & Schwarz	FAM	119	-	TU
Power Splitter	Weinschel	1506A	606	12	29-Nov-2008
1GHz Digital Oscilloscope	Lecroy	9370M	612	12	30-Sep-2009
Audio Analyser	Hewlett Packard	8903B	1881	12	2-Oct-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2436	12	19-Sep-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	TU
Tunable Notch Filter	Wainwright	WRCD 130.0/170.0- 0.05/50-5EEK	3412	-	TU



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.14 Radio (Tx) - Conducted Spurious Emissions</b>					
Signal Generator	Rohde & Schwarz	SMX	115	12	23-Jun-2009
High Pass Filter	Mini-Circuits	NHP-300	1640	12	12-Aug-2009
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (20dB, 150W)	Narda	769-20	3367	12	9-May-2009
<b>Section 2.1 Radio (Tx) - Frequency Deviation</b>					
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	30-May-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (20dB, 150W)	Narda	769-20	3367	12	9-May-2009
<b>Section 2.2 Radio (Tx) - Maximum Peak Output Power</b>					
Signal Generator	Rohde & Schwarz	SMG	42	12	17-Jun-2009
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
<b>Section 2.3, 2.4 and 2.5 Radio (Tx) - Power Characteristics</b>					
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2419	12	2-Sep-2009
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	30-May-2009
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2009
Hygrometer	Rotronic	I-1000	3220	12	9-Apr-2009
Attenuator (20dB, 150W)	Narda	769-20	3367	12	9-May-2009

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment





Product Service

## **SECTION 4**

### **PHOTOGRAPHS**

#### 4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)





Product Service

## **SECTION 5**

### **DISCLAIMERS AND COPYRIGHT**



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## 5.1 DISCLAIMERS AND COPYRIGHT

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