NAVICO AXIS RT1200 MARINE VHF

TECHNICAL FILE TO SUPPORT SUBMISSION OF TYPE APPROVAL

CONTENTS:-

DERA

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

CERTIFICATE OF TYPE APPROVAL

Telecommunications Act 1984 (c. 12): Section 84

This is to certify that :-

NAVICO LTD
Star Lane
Margate
Kent. CT9 4NP

Having submitted a specimen of a:-

MARITIME MOBILE RADIO EQUIPMENT

Of a system type known and designated as:-

NAVICO VHF Radio System - Type - AXIS RT 1200
(Comprising Component parts and having technical characteristics shown on sheet 2)

has been tested and is CERTIFIED as complying with the VHF relevant parts:
ETS 300 162:1993 "Transmitters and Receivers for Maritime Mobile VHF Bands"

(being specifications for Technical Characteristics and Methods of measurements), published by the European Telecommunications Standards Institute.

It is also RECOGNISED that the equipment conforms to performance standards not inferior to those adopted by the International Maritime Organisation, and which are contained in the relevant parts of Resolution A803(19) and Resolution A694(17).

The issue of this certificate grants approval for the time being under Section 84 of the Telecommunications Act 1984, the equipment described above, provided that it complies with the above specification at all times, for the purposes of licences granted under Section 1 of the Wireless Telegraphy Act 1949

The conditions of issue of this certificate are printed on the attached schedule which forms an integral part of this certificate

SIGNED

NAME *J S Harris*

DATE 5th May 1998

Approved Signatory

Certificate Number DERA-TAR/01/98-01

mca

Maritime and Coastguard Agency

The MCA is an Executive Agency of the Department of the Environment, Transport and the Regions

DERA Funtington
Marine Type Approvals
Common Road, Funtington
West Sussex. PO18 9PD

The Defence Evaluation and Research Agency is specified as a "person" under the terms of the Merchant Shipping (Delegation of Equipment Approval) Regulations 1996, and this certificate is issued under the authority given in Merchant Shipping Notice No M1645.

Certificate of Type Approval - Schedule of equipment

The applicant declared that the following units may be used with the radio equipment of the designation given on page 1. These units have been assessed & tested, and satisfactory details of these units were included in the technical file.

MAIN UNIT Comprising:-

VHF Receiver	RT 1200

OTHER UNITS:-

Fist Microphone	FTM 5.
Telephone Handset	THS 4

---------- End of List.

*NOTES:-

The unit is sold as the RT1200:F with the fist mic or as the RT1200:H with the handset.

This Unit is not approved for use with integral DSC (digital selective calling) facilities.

Technical Characteristics

FREQUENCY OF OPERATION	TRANSMIT:	155.025MHz TO 162.975MHz
	RECEIVE:	155.025MHz TO 162.975MHz
CHANNELS		55
EMISSION CODE		16K0G3EJN
DSC CLASS		None
POWER CHARACTERISTIC		1 or 25 WATT (Switched)

Conditions of Issue of this certificate are printed overleaf.

DERA Funtington
Marine Type Approvals
Common Road, Funtington
West Sussex. PO18 9PD

Certificate Number DERA-TAR/01/98-01

NAVICO LIMITED
STAR LANE MARGATE KENT CT9 4NP
UNITED KINGDOM
TEL: (01843) 290290 FAX: +44 1843 290471
NAVIGATION & COMMUNICATION SYSTEMS

NAVICO

DECLARATION OF CONFORMITY

The following product has been tested in accordance with the Electromagnetic Compatability Directive 89/336/EEC (as amended by 91/263/EEC and 92/31/EEC) and found to comply in all respects with these requirements.

Product:	**AXIS RT1200**
Applicable Standard(s): (including Title)	**EN300-828:1997 Electromagnetic Compatibility (EMC) for radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands**
Test Report No.:	**DERA/SSW1/R/EMC/TT - 39/97/1.0**

Type Examination Certificate No. : [1.]	**DERA-ETA/04/98-01**
Issued By Name:	**Defence Evaluation and Research Agency**
Address:	**Maritime Navigation Systems,** **Fort Cumberland Road,** **Portsmouth, PO4 9LJ,** **United Kingdom**

Signed on behalf of Navico Ltd -

Signed:	David C Sheekey
Name:	**David Sheekey**
Title:	**Senior Electronics Engineer**
Date:	**26th May 1997**

[1.] **Radio Transmitting Equipment Only**

DERA

NOTIFIED BODY
No 0191

CERTIFICATE OF TYPE EXAMINATION

This is to certify that :-

NAVICO LIMITED
Star Lane, Margate
Kent CT9 4NP
United Kingdom

Having submitted a specimen of a:-
25W VHF Maritime Mobile Radio Transceiver

being a Sample of Type of a Radio Transceiver operating in the maritime mobile VHF band, it is designated and identified as :-

NAVICO AXIS RT 1200

Comprising component parts as described in the attached schedule, has been subject to an examination process by the Maritime Navigation Systems group of the Defence Evaluation and Research Agency in accordance with the requirements of the United Kingdom Statutory Instrument No 2372 and the requirements of the European Union Council Directive 89/336/EEC for Electromagnetic Compatibility.

The Equipment is found to be acceptable with respect to the protection requirements of the above regulations as demonstrated by compliance with EN 300-828:1997, which details equivalent tests to the EMC criteria of EN 60945:1997 (being a product standard notified in the Official Journal of the European Union. EN 300-828 is published by the), and by the submission of a technical file, held by DERA, which contains details of specifications, drawings and technical descriptions to identify the build standard of the submitted equipment.

SIGNED P Goddard

NAME *P J Goddard*

DATE *8th May 1998*

Approved Signatory

Head of EMC Assessment

Certificate Number DERA-ETA/04/98-01

DEFENCE EVALUATION and RESEARCH AGENCY
Maritime Navigation Systems
Fort Cumberland Road
Portsmouth. PO4 9LJ
United Kingdom

Certificate of Type Examination - Schedule of ancillary equipment

The applicant declared that the following units comprise the transceiver system listed on sheet 1 to form an operational radio of the system name given. Satisfactory details of these units were included in the technical file.

MAIN UNIT

VHF Transceiver	RT-1200

OTHER UNITS:-

Fist Microphone	FTM5
Telephone Handset	THS4

---------- End of List.

NOTES:-

The system is sold as the RT1200:F with the Fist Microphone or as the RT1200:H with the Handset.

Conditions of Issue of this certificate are printed overleaf.

DEFENCE EVALUATION and RESEARCH AGENCY
Maritime Navigation Systems
Fort Cumberland Road
Portsmouth. PO4 9LJ

Certificate Number DERA-ETA/04/98-01

Test Report: RT120

Additional tests were carried out on a sample RT1200 to Code of Federa Regulations Book 47 part 2 paragraph 989(c)(1) and 995(a)(2) and (b)

The results are shown below.

Paragraph 2.989 Occupied Bandwidth.

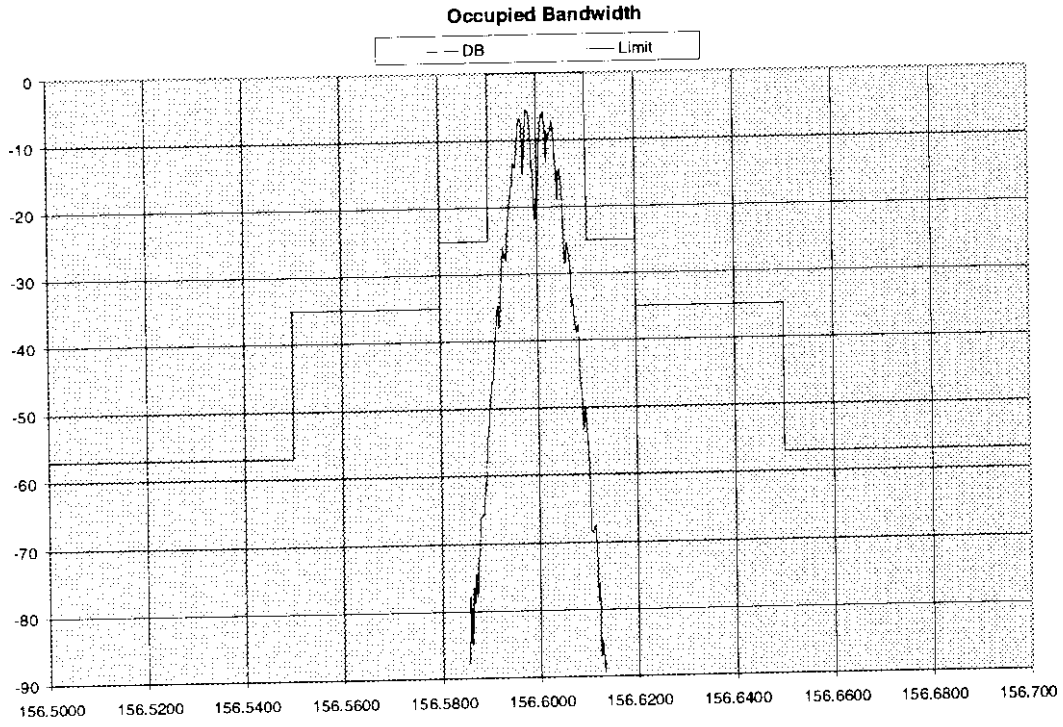
Method:

The sample radio was connected to an AF source and modulation meter. The AF frequency was set to 2500Hz and the modulation level set to 50% of th maximum level (2.5kHz). The level was increased by 16dB and the AF frequenc was varied to search for the maximum deviation. The Spectrum was then displayed on a spectrum analyser and the results plotted.

Test Equipment:

AF source	Rohde & Schwarz CMT	18/8/98
Modulation Meter	Rohde & Schwarz CMT	18/8/98
Spectrum Analyser	Rohde & Schwarz FSAS	6/10/98

Results:



The Occupied Bandwidth meets the requirements of Part 80.211(f).

Paragraph 2.995 Frequency Stability

Method:

The sample radio was placed in an environmental chamber and left over night at -20°C to stabilise the temperature.

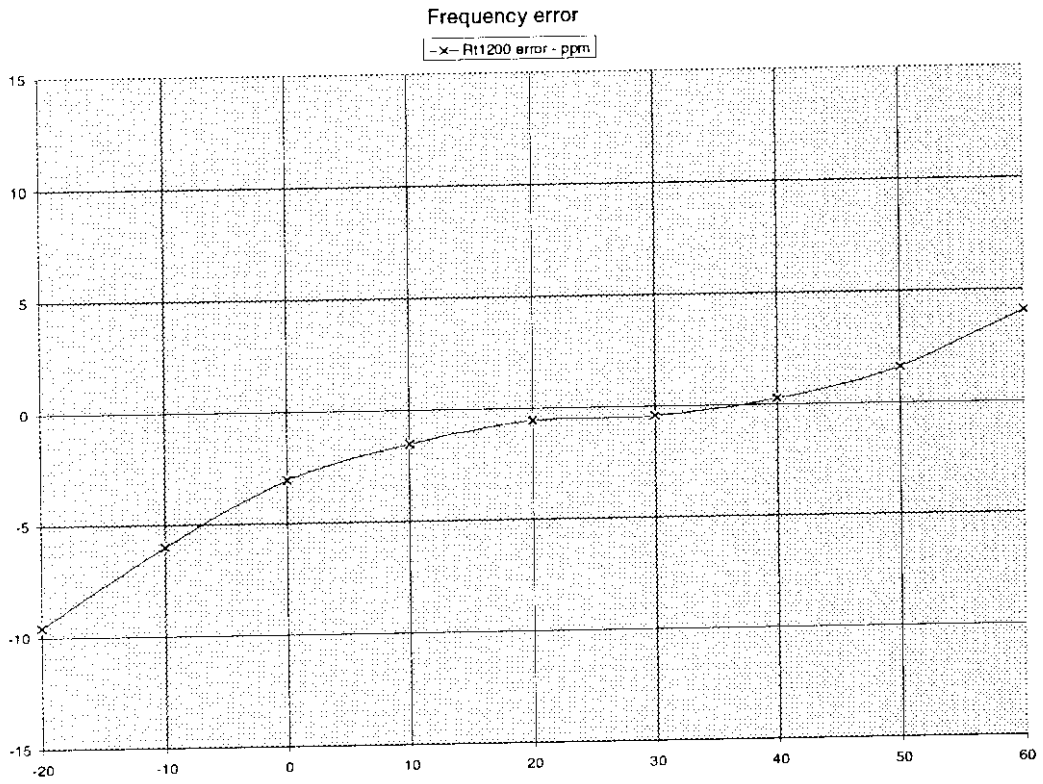
The frequency was measured at 10°C intervals, allowing 10 minutes to change temperature and 30 minutes for the unit under test to stabilise.

Test Equipment

Voltage	Iso Tech IDM68	
Temperature	Fluke 52 Digital Thermometer	28/7/98
Frequency	Rohde & Schwarz CMT	18/8/98

Test Results:

Temp °C	Frequency MHz	Offset Hz	Error ppm
-20	156.798500	-1500	-9.57
-10	156.799060	-940	-5.99
0	156.799520	-480	-3.06
10	156.799760	-240	-1.53
20	156.799910	-90	-0.57
30	156.799930	-70	-0.45
40	156.800040	40	0.26
50	156.800250	250	1.59
60	156.800640	640	4.08



The Transmitter frequency tolerance meets the requirements of Part 80.209(a)

Authorisation

	Name	Signature	Date
Report Originator	R. Thompson		19/05/98
Reviewer	D.Parr		21/05/98
Quality Officer	R. Rogers		22/05/98.

Issued by

Maritime Navigation Systems
DERA Fraser
Fort Cumberland Road
Portsmouth
England
PO4 9LJ

Distribution List

Copy No	Recipient	Location
1-25	Mr. Alan Wrigley	Navico Ltd.
26	Mr. P Goddard	DERA, Portsmouth
Master	File TT - 39/97	DERA Fraser, Portsmouth

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Issue	Date	Details of Changes
1.0	April 1998	First Issue
1.1	May 1998	Changes to formatting and pagination

TYPE APPROVAL TESTING

Table of Contents

Section 1

Introduction

Introduction

This report has been compiled at the request of the Customer, Navico Ltd, as the conclusion to a successful program of Type Approval Testing.

1.1

The Navigation Equipment Test Laboratory at DERA Fraser, Portsmouth, operates as an independent test laboratory equipped to conduct Type Approval and Prototype Testing on a variety of equipment including Marine Navigational and Safety Equipment and Radiocommunications Equipment. DERA Fraser has been accredited by the United Kingdom Accreditation Service (UKAS) for testing against a wide range of Performance Specifications.

1.2

The testing and inspection of the Navico AXIS RT1200 VHF Radio Transceiver was conducted to the environmental and electrical requirements of the following Specifications:

ETS 300 162 Oct 1993 "Radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands...."

prETS 300 162 Dec 1997 Radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands...."

The Test Laboratory is UKAS accredited to carry out all environmental and electrical aspects of the above Specification.

1.3

UKAS accreditation does not apply to opinions and interpretations. Where any test is not UKAS accredited it will be indicated "NUA" (Not UKAS Accredited).

1.4

A single sample of the AXIS RT1200, Serial Number QA 12345SHB, with its associated ancillary equipment, was supplied by Navico Ltd. for Type Approval Testing.

1.5

Testing of the AXIS RT1200 to the requirements of Specification ETS 300 162, was carried out over the period from 9th March 1998 to 27th March 1998. Detailed particulars of the observations and measurements carried out are given in the CEPT Report Form for Testing which is included in this report.

Section 2

**APPLICATION FORM
FOR TESTING
TO ETS 300 162**

**Radio Equipment and Systems;
Radiotelephone transmitters and receivers
for the maritime mobile service
operating in VHF bands
Technical characteristics and methods of measurement**

APPLICANT'S DETAILS

CATEGORY OF APPLICANT (please tick relevant box opposite)

(a) [✓]MANUFACTURER

If box (b), (c) or (d) is ticked complete details in box below with respect to the manufacturer.

(b) [...] IMPORTER

(c) [...] DISTRIBUTOR

(d) [...] AGENT

COMPANY NAME: **Navico Ltd.**

ADDRESS: **Star Lane, Margate Kent, CT9 4NP.**

NAME FOR CONTACT PURPOSES: **Alan Wrigley**

TELEPHONE NUMBER: **01843 290 290**

FAX NUMBER: **01843 290 471**

TELEX NUMBER: **N/A**

MANUFACTURER'S DETAILS

COMPANY NAME: **AS ABOVE**

ADDRESS:

NAME FOR CONTACT PURPOSES

TELEPHONE NUMBER:

FAX NUMBER:

TELEX NUMBER:

TYPE DESIGNATION (1)

The type designation may be either a single alphanumeric code or an alphanumeric code divided into two parts

Please fill in

EITHER:

TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE: .....

OR: .....

TYPE DESIGNATION IN TWO PARTS: .....

	1. EQUIPMENT SERIES NO. (2) ("MODEL NUMBER")	**AXIS 1200** .....
AND	2. EQUIPMENT SPECIFIC NO. (3) ("IDENTIFICATION NO.")	**QA 12345SHB** .....

(1) This is the manufacturer's numeric or alphanumeric code or name that is specific to a particular equipment. It may contain information in coded form on the characteristics of the equipment e.g. frequency, power. The manufacturer is free to choose the form of the type designation.

(2) This is the number, code or trade name used by the manufacturer to describe a series or 'family' of equipment of substantially the same mechanical and electrical construction which will include a number of related equipments. This number is often referred to as the "model number".

(3) This is the manufacturer's identification number given to a specific equipment in the series or 'family' of equipments. It is often referred to as the "identification number".

TYPE APPROVAL TO OTHER ETS

Has the equipment been previously type approved to other ETS?

[...] Yes ETS N^{O}

[✓] No

Give details of previous type approvals to the equipment:

N/A

TYPE OF EQUIPMENT	
Transmitter	[...]
Transmitter/Receiver	[✓]
Receiver	[...]
Simplex on single-frequency channel	[...]
Simplex on two-frequency channel	[✓]
Duplex	[...]
Integrated DSC unit	[...]
Integrated analog selective calling decoder	[...]
INTERFACES	
DSC at Audio Level	[...]
DSC at DC Level	[...]
Printer	[...]
External Loudspeaker	[✓]
Remote Control	[...]
DSC Watchkeeping Receiver Antenna Output	[...]
DSC Watchkeeping Receiver Control	[...]

DUPLEX OPERATION

Is the equipment intended for Duplex Operation?;

[...] Yes

[✓] No

Is the equipment fitted with separate transmitter and receiver antenna sockets?

[...] Yes

[✓] No

Is the equipment fitted with a duplex filter as an integral part of the equipment with a single antenna connection socket?

[...] Yes

[✓] No

Is the duplex filter externally fitted and connected to the main equipment by co-axial cable(s)? N/A

[...] Yes

[...] No

Type and make of duplex filter:

N/A

TRANSMITTER AND RECEIVER CHARACTERISTICS

NUMBER OF CHANNELS:

[✓] ITU channels: **55**

[...] USA channels:

[...] PRIVATE channels:

[...] WEATHER channels:
(Rx only)

[...] MEMORY channels:

DSC CHANNEL(S) (if provided): **N/A**

[...] 70

[...] other:

CHANNEL SEPARATION: **25** kHz ..... kHz ..... kHz

ITU designation of class of emission(s):

1	**6**	**K**	**O**	**G**	**3**	**E**	**J**	**N**

ANTENNA IMPEDANCE **50 Ω** Unbalanced

TRANSMITTER TECHNICAL CHARACTERISTICS

TRANSMITTER FREQUENCY

Method of frequency generation:

[...] CRYSTAL

[✓] SYNTHESIZER

[...] OTHER:

Transmitter frequency bands:

155	to	**163**	MHz
.....	to	.....	MHz
.....	to	.....	MHz

TRANSMITTER MODULATION

Modulation Method:	**Variable**	**Reactance**
Occupied Bandwidth:	**16**	kHz
Maximum Frequency Deviation:	**5**	kHz

TRANSMITTER MODULATION INPUT CHARACTERISTICS

Microphone Impedance: **600 Ω** [...] Balanced

[✓] Unbalanced

TRANSMITTER RF POWER CHARACTERISTICS

RATED TRANSMITTER OUTPUT POWER (as stated by the manufacturer)

Maximum Output Power: 25 W

Reduced Output Power: 1 W

Output Power Switch: [✓] YES

[...] NO

TRANSMITTER POWER SOURCE (1)

[...]	AC Mains ..... (state voltage)	[...]	single phase
		[...]	three phase
.....	AC Mains Frequency (Hz)		
[✓]	DC Voltage: **12.0 Volts (nominal)**		
[✓]	DC Maximum Current: **6 A**		
[...]	Other:		

BATTERY

[...]	Nickel Cadmium	
[...]	Mercury	
[...]	Alkaline	
[...]	Lead Acid (Vehicle regulated)	
[...]	Leclanché	
[...]	Lithium	
[...]	other:	.....
.....	Volts	End point voltage as quoted by equipment manufacturer

(1) If a transmitter and receiver use the same power source, this should be declared. In such cases the box for the transmitter power source should be filled in.

RECEIVER TECHNICAL CHARACTERISTICS

RECEIVER FREQUENCY

Method of frequency generation:

[...] CRYSTAL

[✓] SYNTHESIZER

[...] Other: .....

Intermediate frequencies::

[✓]	1st	**21.4**	MHz
[✓]	2nd	**455**	kHz
[...]	3rd	.....	kHz

Receiver frequency bands:

155	to	**163**	MHz
.....	to	.....	MHz
.....	to	.....	MHz

Is local oscillator injection frequency higher or lower than the receiver nominal frequency?

[...] Higher (for channel .... to ....)

[✓] Lower (for **ALL** channel)

RECEIVER MODULATION OUTPUT CHARACTERISTICS

RATED AUDIO OUTPUT POWER (as stated by the manufacturer)

Loudspeaker:	6 W	4 Ω
Earphone:	2 mW	300 Ω

RECEIVER MULTIPLE WATCH FACILITIES

Dual watch facilities: [✓] YES

[...] NO

If YES then:

Selection of priority channel possible? [...] YES

[✓] NO (=ch 16)

Multiple watch facilities: [✓] YES

[...] NO

If YES then:

Selection of priority channel possible? [...] YES

[✓] NO (=ch 16)

Number of additional channels selectable: ALL

Scan time programmable?: [...] YES

[✓] NO

RECEIVER POWER SOURCE (1)			
[...]	AC Mains ..... (state voltage)	[...]	single phase
		[...]	three phase
.....	AC Mains Frequency (Hz)		
[✓]	DC Voltage: **12.0 Volts (nominal)**		
[✓]	DC Maximum Current: **6 A**		
[...]	Other		

BATTERY		
[...]	Nickel Cadmium	
[...]	Mercury	
[...]	Alkaline	
[...]	Lead Acid (Vehicle regulated)	
[...]	Leclanché	
[...]	Lithium	
[...]	other:	.....
.....	Volts	End point voltage as quoted by equipment manufacturer

(1) If a transmitter and receiver use the same power source, this should be declared. In such cases the box for the transmitter power source should be filled in.

CONSTRUCTION OF EQUIPMENT	
[✓]	Single unit (1)
[...]	Multiple units
If multiple units, describe each one clearly:	

EXTREME TEMPERATURE RANGE OVER WHICH EQUIPMENT IS TO BE TESTED	
[✓]	-15 °C to +55 °C
[...]	+15 °C to +35 °C
[...]	Other: .....

(1) Unit means a physically separate item of the equipment.

OTHER ITEMS SUPPLIED

Spare batteries	[...] Yes
	[✓] No
Battery charging device	[...] Yes
	[✓] No
Special tools for dismantling equipment	[...] Yes
	[✓] No
Test interface box (if applicable)	[✓] Yes
	[...] No
Full documentation on equipment (Handbook and circuit diagrams)	[✓] Yes
	[...] No
Others	[...] Yes
	[✓] No
	If YES, please specify :

DECLARATION

Are the equipments submitted representative production models?	[...] Yes
	[✓] No
If not are the equipments pre-production models?	[✓] Yes
	[...] No
If pre-production equipments are submitted will the final production equipments be identical in all respects with the equipment tested?	[✓] Yes
	[...]No

If no supply full details:

I hereby declare that I am entitled to sign on behalf of the applicant and that the information is correct and complete.

Signature:

Name: **Richard Thompson**

Position held: **Test Engineer**

Date: **28/04/98**

Section 3

General Requirements

CONSTRUCTION

CLAUSE 4.1

	Satisfactory: Yes	No
■ Design	Yes	
■ Design and number of controls	Yes	
■ Accessibility	Yes	
■ Easy Identification of components	Yes	
■ Documentation	Yes	
■ Capable of operating on:		
→ Single-frequency channels with manual control (Simplex)	Yes	
→ Two-frequency channels with manual control (Simplex)	Yes	
→ Two-frequency channels without manual control (Duplex)		No
■ Operation on all channels of Appendix 18 of the R.R.	Yes	
■ Blocking of channels 75 and 76	Yes	
■ Blocking of additional channels (if provided)	Yes	
■ Unblocking of additional channels (if provided) not possible for the user	Yes	
■ Use of channel 70 only possible for DSC	Yes	
■ Transmission inhibited while any frequency synthesizer is out of lock	Yes	
■ Transmission inhibited during channel switching operations	Yes	

CONTROLS AND INDICATORS

CLAUSE 4.2

	Satisfactory: Yes	No
■ Channel Selector		
→ Channel designator as in Appendix 18 of the R.R.	Yes	
→ Channel designator legible irrespective of the external lighting conditions	Yes	
■ Marking of channel 16	Yes	
→ Marking of channel 70	N/A	N/A
■ Selection of channel 16	Yes	
→ Selection of channel 70	N/A	N/A
■ Input panel (if provided) conforms with CCITT REC. E161	N/A	N/A
■ Mandatory controls and indicators		
→ On/off switch for the entire installation with a visual indication	Yes	
→ A manual non-locking push-to -talk switch	Yes	
→ On/off switch for the loudspeaker	Yes*	
→ A switch for reducing the transmitter output power to no more than 1 Watt	Yes	
→ A volume control to adjust the AF output power	Yes	
→ A squelch control	Yes	
→ Extinction of light output from equipment	Yes	
→ A transmit carrier indication	Yes	
■ Compliance with the following:		
→ Accessibility of non-operational controls	Yes	
→ Priority and indication of control units	Yes	

*The internal loudspeaker can be muted by use of the volume control, which does not affect the handset volume.

HANDSET AND LOUDSPEAKER

CLAUSE 4.3

	Satisfactory: Yes	No
■ Provision of:		
→ Telephone handset or	Yes	
→ Microphone	Yes	
→ Integral Loudspeaker	Yes	
→ Socket for an external loudspeaker	Yes	
■ Effect of switching on /off the loudspeaker on the Audio Frequency output of the handset (if supplied)	N/A	N/A
■ Muting in simplex operation	N/A	N/A
■ Automatic switch -off of the loudspeaker in duplex	N/A	N/A
■ Precautions to prevent harmful electrical/acoustic feedback in duplex operation	N/A	N/A

SAFETY PRECAUTIONS

CLAUSE 4.4

	Satisfactory: Yes	No
■ Protection against the effects of excessive current and voltage	Yes	
■ Protection against damage due to transient voltage	Yes	
■ Protection against damage due to reversal of power supply polarity	Yes	
■ Earthing	Yes	
■ Protection against accidental access of voltages greater than 50 Volts	Yes	
■ Protection against damage due to short-circuited antenna terminals	Yes	
■ DC path from the antenna terminals to the chassis • Limit	Yes ≤ 100	 KΩ
■ Memory not erased during power supply interruptions up to 60 seconds	Yes	

CLAUSE 4.5

LABELLING OF :

	Satisfactory: Yes	No
■ Controls, instruments, indicators and terminals	Yes	
■ Power supply	Yes	
■ All units of the equipment	Yes	
■ Compass safety distance	Yes	

WARM UP

CLAUSE 4.6

	Satisfactory: Yes	No
■ Operational within 5 seconds after switching on	Yes	
■ Meets the requirements within 1 minute	Yes	

SWITCHING TIMES

CLAUSE 5.1

■ Channel switching time - limit ≤ 5 seconds	Compliant
■ Time to change from:	
➔ Tx to Rx condition - limit ≤ 0.3 seconds	Compliant
➔ Rx to Tx condition - limit ≤ 0.3 seconds	Compliant

CLASS OF EMISSION AND MODULATION CHARACTERISTICS

CLAUSE 5.2

	Satisfactory: Yes	No
■ Class of emission G3E for speech	Yes	
■ Class of emission G2B for DSC (if provided)	N/A	N/A
■ 25 kHz channel spacing	Yes	
■ Frequency deviation ± 5 kHz for 100 % modulation	Yes	

MULTIPLE WATCH FACILITIES : ADDITIONAL PERFORMANCE STANDARDS

CLAUSE 5.3.1

	Satisfactory: Yes	No
■ Provision for automatic scanning of a priority channel and one additional channel	Yes	
■ Facilities for automatic sequential change of the additional channel (if provided)	N/A	N/A
■ Means not accessible to the user to block/unblock the automatic sequential change of the additional channel (if provided)	N/A	N/A
■ Priority channel sampled during reception on the additional channel	Yes	
■ Additional channel not sampled during reception of the priority channel	Yes	
■ Manually operated control to switch the scanning facility on and off	Yes	
■ Automatic switch off of the scanning facility during any communication	Yes	
■ Selection of the additional channel and selection of the priority channel (if provided) possible at the operating position of the Rx or Tx	N/A	N/A
■ The priority channel is channel 16 if there is no selection of priority provided (unless other decision of the administration)	Yes	
■ Indication of both channels during scanning	Yes	
■ Transmission in a transceiver inhibited during scanning	Yes	
■ Automatic return of Rx and Tx to the selected additional channel when the scanning is switched off	Yes	
■ Single manual control to switch the equipment for operation on the priority channel	Yes	
■ Indication of the selected additional channel at the operating position of the transceiver as the operational channel	Yes	

MULTIPLE WATCH FACILITIES : SCANNING CHARACTERISTICS CLAUSE 5.3.2

■ Sampling period of the priority channel

• Limit

< 1.4	sec
≤ 2	sec

Satisfactory:

Yes	No

■ The Rx remains on the priority channel if a signal is detected on this channel for the duration of that signal

Yes	

■ The scanning continues if a signal is detected on the additional channel

Yes	

■ Interruption of the reception on the additional channel

• Limit

< 149.2	msec
≤ 150	msec

■ Proper functioning of the Rx during scanning

Yes	

■ Listening period on the additional channel during the reception of a signal on the additional channel and in the absence of a signal on the priority channel

• Limit

< 77	msec
≤ 850	msec

■ Indication of the channel on which a signal is being received

Yes	

DSC CONTROLLER INTERFACES (FACILITIES FOR DSC TRANSMISSION AND RECEPTION)

CLAUSE 5.4

	Satisfactory: Yes	Satisfactory: No
■ DSC facility on channel 70	N/A	N/A
■ DSC facility on other channels	N/A	N/A
• channels:		
■ Audio input/output impedance for DSC: 600Ω free of earth	N/A	N/A
■ DC input/output for DSC complies with CCITT REC. V.10	N/A	N/A
■ Binary input/output for DSC complies with NMEA 0183 Version 2.00 standard	N/A	N/A
■ If the equipment is designed as an integral unit or fitted with digital interface to a DSC Controller, the equipment shall also comply with the relevant requirements of ETS 300 338, as an integral equipment	N/A	N/A

Section 4

CEPT Report form for Testing to ETS 300 162

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Report form for testing to ETS 300 162

Radio Equipment and Systems;
Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands
Technical characteristics and methods of measurement

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

LIST OF MEASUREMENTS

The list of measured or checked parameters called for in ETS 300 162 are given below:

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

For results in this Test Report which are not derived from objective measurements the Test Laboratory is expressing an opinion only.
This refers to all subjective judgement testing where a Yes or No answer is given to a specific feature or test.
Under no circumstances does the Test Laboratory accept any liability for consequent damages resulting from the expression of this opinion.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 17.5 °C (Z-Plane 16.2 °C) Relative Humidity: 44.8 % (43.8%)

ENVIRONMENTAL TESTS: VIBRATION

PERFORMANCE CHECKS: TRANSMITTER OUTPUT POWER **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Equipment suspended: [ ] YES

[✓] NO

If YES, state the precise test conditions:

Channel	Vibration Direction	Endurance Frequency (Hz)	Transmitter Output Power (W)	Transmitter Frequency Error (Hz)	Receiver Maximum Usable Sensitivity (dBμV emf)
16	X	70	23.15	- 230	- 5.78
			(23.25*)	(- 286*)	(- 5.68*)
	Y	79	23.15	- 250	- 5.88
			(23.36*)	(- 290*)	(- 5.98*)
	Z	70	21.76	- 229	- 5.9
			(21.76*)	(- 276*)	(- 5.3*)
Measurement Uncertainty			**0.75 dB**	**5 x 10^{-8}ppm**	**2.5 dB**
Limit			**Between 6 and 25 W**	**± 1500**	**+ 6**

(* = Post Vibration Performance Checks)

X, Y = Mutual perpendicular directions in the horizontal plane
Z = Vertical direction

TEST EQUIPMENT USED:

01, 04, 07, 25, 26, 32, 34 & 42.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 17.5 °C

Relative Humidity: 44.8 %

ENVIRONMENTAL TESTS: VIBRATION

CLAUSE 4.6

PERFORMANCE CHECK: VISUAL INSPECTION

MARINE VHF RADIO EQUIPMENT

Visible damage or deterioration: [ ] YES

[✓] NO

Observations: None.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 17.5 °C

Relative Humidity: 44.8 %

ENVIRONMENTAL TESTS: VIBRATION

RESONANCE FREQUENCIES

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Equipment suspended: [ ] YES

[✓] NO

If YES, state the precise test conditions:

Found during performance check: All resonance frequencies observed had a Q factor ≤ 5 except for one observed frequency during vibration in the Y direction.

The other endurance tests were performed at 70 Hz which was the most significant resonance frequency with a Q factor ≤ 5.

Vibration Direction	Resonance Frequencies (Hz)				
X	-	-	-	-	-
Y	79	-	-	-	-
Z	-	-	-	-	-

X, Y = Mutual perpendicular directions in the horizontal plane
Z = Vertical direction

TEST EQUIPMENT USED:

01, 04, 07, 25, 26, 32, 34 & 42.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 19.5 °C Relative Humidity: 27.3 %

ENVIRONMENTAL TESTS: DRY HEAT CYCLE

PERFORMANCE CHECKS: TRANSMITTER OUTPUT POWER **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Rated Output Power

High Power (HP): 25W

Channel	Transmitter Output Power (W)
	High Power (HP)
16	22.94
Measurement Uncertainty	0.75 dB
Limit	Between 6 and 25 W

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 19.5 °C

Relative Humidity: 27.3 %

ENVIRONMENTAL TESTS: DRY HEAT CYCLE

PERFORMANCE CHECKS: TRANSMITTER FREQUENCY ERROR **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Channel	Transmitter Frequency Error (Hz)
	High Power (HP)
16	- 631
Measurement Uncertainty	5×10^{-8} ppm
Limit	± 1500

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 19.5 °C

Relative Humidity: 27.3 %

ENVIRONMENTAL TESTS: DRY HEAT CYCLE

PERFORMANCE CHECKS: RECEIVER SENSITIVITY

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Rated AF Output Power: 6 W

Requirement ≥2W

Channel	Sensitivity (dBμV e.m.f.)
16	- 3.76
Measurement Uncertainty	2.5 dB
Limit	+ 6

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 19.5 °C

Relative Humidity: 27.3 %

ENVIRONMENTAL TESTS: DRY HEAT CYCLE

CLAUSE 4.6

PERFORMANCE CHECK: VISUAL INSPECTION

MARINE VHF RADIO EQUIPMENT

Visible damage or deterioration: [ ] YES

[✓] NO

Observations: None.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 21.2 °C

Relative Humidity: 31.0 %

ENVIRONMENTAL TESTS: DAMP HEAT CYCLE

PERFORMANCE CHECKS: TRANSMITTER OUTPUT POWER

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Rated Output Power

High Power (HP): 25 W

Channel	Transmitter Output Power (W)
	High Power (HP)
16	19.43
Measurement Uncertainty	0.75 dB
Limit	Between 6 and 25 W

HP = Output Power switch set at its maximum

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 21.2 °C Relative Humidity: 31.0 %

ENVIRONMENTAL TESTS: DAMP HEAT CYCLE

PERFORMANCE CHECKS: TRANSMITTER FREQUENCY ERROR **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Channel	Transmitter Frequency Error (Hz)
	High Power (HP)
16	-406
Measurement Uncertainty	5×10^{-8} ppm
Limit	± 1500

HP = Output Power switch set at its maximum

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 21.2 °C

Relative Humidity: 31.0 %

ENVIRONMENTAL TESTS: DAMP HEAT CYCLE

CLAUSE 4.6

PERFORMANCE CHECKS: RECEIVER SENSITIVITY

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Rated AF Output Power: 6W

Requirement ≥2W

Channel	Sensitivity (dBμV e.m.f.)
16	-4.4
Measurement Uncertainty	**2.5 dB**
Limit	**+ 6**

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 21.2 °C

Relative Humidity: 31.0 %

ENVIRONMENTAL TESTS: DAMP HEAT

PERFORMANCE CHECK: VISUAL INSPECTION

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Visible damage or deterioration: [ ] YES

[✓] NO

Observations: None.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 20.2 °C Relative Humidity: 25.8 %

ENVIRONMENTAL TESTS: LOW TEMPERATURE CYCLE

PERFORMANCE CHECKS: TRANSMITTER OUTPUT POWER **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Rated Output Power

High Power (HP): 25W

Channel	Transmitter Output Power (W)
	High Power (HP)
16	22.29
Measurement Uncertainty	0.75 dB
Limit	Between 6 and 25 W

HP = Output Power switch set at its maximum

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 20.2 °C

Relative Humidity: 25.8 %

ENVIRONMENTAL TESTS: LOW TEMPERATURE CYCLE

PERFORMANCE CHECKS: TRANSMITTER FREQUENCY ERROR

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Channel	Transmitter Frequency Error (Hz)
	High Power (HP)
16	-631
Measurement Uncertainty	5×10^{-8} ppm
Limit	± 1500

HP = Output Power switch set at its maximum

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 20.2 °C

Relative Humidity: 25.8 %

ENVIRONMENTAL TESTS: LOW TEMPERATURE CYCLE

PERFORMANCE CHECKS: RECEIVER SENSITIVITY

CLAUSE 4.6

MARINE VHF RADIO EQUIPMENT

Test Temperature: [✓] For internally mounted equipment

[ ] For externally mounted equipment

Rated AF Output Power: 6W

Requirement ≥2W

Channel	Sensitivity (dBμV e.m.f.)
16	-5.3
Measurement Uncertainty	**2.5 dB**
Limit	**+ 6**

TEST EQUIPMENT USED:

01, 04, 14, 24, 25, 26, 31, 32, & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient Temperature: 20.2 °C Relative Humidity: 25.8 %

ENVIRONMENTAL TESTS: LOW TEMPERATURE CYCLE

PERFORMANCE CHECK: VISUAL INSPECTION **CLAUSE 4.6**

MARINE VHF RADIO EQUIPMENT

Visible damage or deterioration: [ ] YES

[✓] NO

Observations: None.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 20.9 °C Relative humidity: 32.8 %

TRANSMITTER TESTING

FREQUENCY ERROR **CLAUSE 6.1**

TEST CONDITIONS		FREQUENCY ERROR (Hz)					
		155.025 MHz		channel 16		162.975 MHz	
Temperature	Voltage	HP	LP	HP	LP	HP	LP
T_{nom} (20.9 °C)	V_{nom} (12.0 V)	-278	-274	-264	-270	-302	-306
T_{min} (-15°C)	V_{min} (10.8V)	-475	-578	-615	-626	-518	-532
	V_{max} (15.6V)	-282	-260	-391	-264	-303	-311
T_{max} (+55°C)	V_{min} (10.8V)	-110	-98	-202	-203	-155	-165
	V_{max} (15.6V)	-175	-87	-90	-89	-195	-202
Measurement uncertainty		5×10^{-8} ppm					
Limits		± 1500 Hz					

HP = Output Power switch set at its maximum
LP = Output Power switch set at its minimum

TEST EQUIPMENT USED:

01, 07, 14, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 20.9 °C Relative humidity: 32.8 %

TRANSMITTER TESTING

CARRIER POWER **CLAUSE 6.2**

Rated output HP: 25 Watts
LP: 1 Watt

TEST CONDITIONS		CARRIER POWER (W)					
		155.025 MHz		channel 16		162.975 MHz	
Temperature	Voltage	HP	LP	HP	LP	HP	LP
T_{nom} (20.9 °C)	V_{nom} (12.0 V)	20.798	0.906	20.798	0.874	18.452	0.874
T_{min} (-15°C)	V_{min} (10.8V)	17.386	0.789	17.706	0.779	15.359	0.843
	V_{max} (15.6V)	22.079	0.789	22.079	0.779	23.145	0.832
T_{max} (+55°C)	V_{min} (10.8V)	16.106	0.928	15.999	0.928	14.292	0.917
	V_{max} (15.6V)	24.318	0.938	23.998	0.907	23.892	0.928
Measurement uncertainty		0.75 dB					
Limits		**Normal Test Conditions:** HP: Between 6 and 25 W - maximum of ± 1.5 dB from rated output power LP: Between 0.1 and 1 W **Extreme Test Conditions:** HP: Between 6 and 25 W - within +2 dB and -3 dB from rated output power LP: Between 0.1 and 1 W					

HP = Output Power switch set at its maximum
LP = Output Power switch set at its minimum

TEST EQUIPMENT USED:

01, 04, 07, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.5 °C Relative humidity: 32.0 %

TRANSMITTER TESTING

MAXIMUM PERMISSIBLE FREQUENCY DEVIATION **CLAUSE 6.3.2**

Channel	MODULATION FREQUENCY (Hz)	FREQUENCY DEVIATION IN Hz (δf)			
		High Power δf (kHz)		Low Power δf (kHz)	
		+	-	+	-
	100	1.84	2.05	1.37	1.36
	150	2.66	2.41	2.39	2.42
	200	3.93	3.88	3.60	3.69
	250	4.15	4.58	3.97	4.34
	300	4.65	4.36	4.17	4.15
	380	4.50	4.58	4.51	4.05
	480	4.69	4.65	4.55	4.07
16	600	4.78	4.33	4.53	4.12
	760	4.70	4.58	4.48	4.22
	960	4.73	4.35	4.49	4.27
	1000	4.45	4.49	4.48	4.32
	1200	4.50	4.41	4.48	4.33
	1510	4.59	4.75	4.48	4.35
	1900	4.49	4.47	4.37	4.31
	2400	4.32	4.29	4.31	4.32
	3000	4.23	3.94	3.83	3.94
Measurement uncertainty		4 %			
Limits		δf ≤ 5 kHz			

TEST EQUIPMENT USED:

01, 04, 07, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.4 °C Relative humidity: 32.3 %

TRANSMITTER TESTING

REDUCTION OF FREQUENCY DEVIATION AT MODULATION FREQUENCIES ABOVE 3 kHz

CLAUSE 6.3.3

MODULATION FREQUENCY (Hz)	FREQUENCY DEVIATION IN Hz (δf)			
	High Power δf (kHz)		Low Power δf (kHz)	
	+	-	+	-
3000	3.29	3.29	3.30	3.34
3780	2.42	2.48	2.53	2.56
4750	1.60	1.62	1.67	1.70
5990	0.954	0.961	1.01	1.01
7540	0.525	0.534	0.562	0.567
9490	0.281	0.287	0.306	0.306
11940	0.153	0.177	0.184	0.193
15040	0.101	0.131	0.105	0.123
18930	0.066	0.077	0.078	0.089
23830	0.094	0.082	0.080	0.081
25000	0.089	0.094	0.084	0.102
Measurement uncertainty	0.5 dB			

LIMIT **CLAUSE 6.3.3.2**

CHANNEL SPACING (KHz)	LIMITS (KHz)	
25	For modulation frequency between 3 kHz & 6 kHz:	±3 kHz
	For modulation frequency of 6 kHz:	±1.5 kHz
	For modulation frequency between 6 kHz & 25 kHz:	-14 dB/octave relative to limit at 6 kHz

(See Annex C for Plots of results)

TEST EQUIPMENT USED:

01, 04, 07, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.3 °C Relative humidity: 33.2 %

TRANSMITTER TESTING

LIMITATION CHARACTERISTICS OF THE MODULATOR **CLAUSE 6.4**

Rated output **HP: 25 Watts**
LP: 1 Watt

Test Conditions		FREQUENCY DEVIATION IN KHz (δf)			
		channel 16			
Temperature	Voltage	HP		LP	
		+	-	+	-
T_{nom} (21.3 °C)	V_{nom} (12.0 V)	4.12	4.20	4.14	3.99
T_{min} (-15 °C)	V_{min} (10.8 V)	4.43	4.74	4.62	4.28
	V_{max} (15.6 V)	4.37	4.22	4.32	4.20
T_{max} (+55 °C)	V_{min} (10.8 V)	4.12	3.93	4.25	4.15
	V_{max} (15.6 V)	4.08	3.99	4.06	4.04
Measurement uncertainty		**0.5 dB**			
Limits (subclause 6.4.3)		**The frequency deviation shall be contained between ± 3.5kHz & ± 5kHz**			

HP = Output Power switch set at its maximum
LP = Output Power switch set at its minimum

TEST EQUIPMENT USED:

01, 07, 14, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.1 °C Relative humidity: 37.3 %

TRANSMITTER TESTING

SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE **CLAUSE 6.5**

Channel	Sound Level (dBA)
16	95
Measurement uncertainty	3.2 dB
Limits	94 dBA ± 3 dB (relative to 2.10^{-5} Pa)

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32, 34, 43, 44, 45, 50 & 51.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.3 °C Relative humidity: 33.2 %

TRANSMITTER TESTING

AUDIO-FREQUENCY RESPONSE **CLAUSE 6.6**

Modulation Frequency (Hz)	Modulation Index m (dB) channel 156.8 MHz	
	+	-
300	-1.31	-0.21
380	-1.10	0.16
480	0.35	-1.18
600	-0.33	-1.38
760	-0.96	-1.19
960	-0.49	-1.21
1000	0	0
1200	-1.24	0.59
1510	-1.10	-0.47
1900	-0.81	-0.87
2400	-0.80	-0.72
3000	-1.38	-1.14
Measurement uncertainty	0.4 dB	
Limits	$-3 \leq m \leq 1$ dB	

TEST EQUIPMENT USED:

01, 07, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.1 °C Relative humidity: 37.3 %

TRANSMITTER TESTING

AUDIO-FREQUENCY HARMONIC DISTORTION OF THE EMISSION **CLAUSE 6.7**

Test Conditions		Modulation Frequency (Hz)	Audio Frequency Harmonic Distortion (%)
			channel 16
Temperature	Voltage		HP
T_{nom} (21.1 °C)	V_{nom} (12.0 V)	300	3.44
		500	2.83
		1000	2.57
T_{min} (-15 °C)	V_{min} (10.8 V)	1000	6.05
	V_{max} (15.6 V)	1000	2.03
T_{max} (+55 °C)	V_{min} (10.8 V)	1000	4.18
	V_{max} (15.6 V)	1000	6.10
Measurement Uncertainty			0.1 dB (1 %)
Limit			≤ 10 %

HP = Output Power switch set at its maximum
LP = Output Power switch set at its minimum

TEST EQUIPMENT USED:

01, 07, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.4 °C Relative humidity: 30.7 %

TRANSMITTER TESTING

ADJACENT CHANNEL POWER **CLAUSE 6.8**

MEASUREMENT OFFSET	ADJACENT CHANNEL POWER (dBc)					
	155.025 MHz		156.8 MHz		162.975 MHz	
	HP	LP	HP	LP	HP	LP
+25 KHz	-77.9	-74.3	-75.2	-73.2	-74.7	-71.4
-25 KHz	-76.8	-73.6	-74.8	-73.9	-77.3	-73.9
Measurement uncertainty	5 dB					
Limits	≤ -70 dBc or ≤ 0.2 μW					

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.4 °C Relative humidity: 33.3 %

TRANSMITTER TESTING

SPURIOUS EMISSIONS (CONDUCTED) **CLAUSE 6.9**

FREQUENCY (MHz)	LEVEL OF SPURIOUS EMISSION (dBm)
	channel
	16
Tx - operating	
313.59942	-39.70
470.39920	-44.07
783.99860	-47.97
Measurement uncertainty	**3 dB**
Limit	**≤ 0.25 μW (-36 dBm)**

TEST EQUIPMENT USED:

03, 04, 05, 06, 07, 08, 10, 11, 17, 25, 26, 27, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 9.5 °C Relative humidity: 62.3 %

TRANSMITTER TESTING

SPURIOUS EMISSIONS (RADIATED) **CLAUSE 6.10**

FREQUENCY (MHz)	LEVEL OF SPURIOUS EMISSION (dBm) channel 16
Tx - operating	
313.59987	- 53.92
627.19967	- 39.21
Measurement uncertainty	**4 dB**
Limit	**≤ 0.25 μW (-36 dBm)**

TEST EQUIPMENT USED:

02, 03, 04, 05, 06, 07, 10, 17, 21, 22, 23, 25, 32, 46 & 47.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.4C Relative humidity: 30.4 %

TRANSMITTER TESTING

RESIDUAL MODULATION **CLAUSE 6.11**

Channel	Level of Residual Modulation (dB)
16	- 41.5
Measurement uncertainty	**0.7 dB**
Limit	**≤ -40 dB**

TEST EQUIPMENT USED:

01, 07, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.5 C Relative humidity: 29.5 %

TRANSMITTER TESTING

TRANSIENT FREQUENCY BEHAVIOUR **CLAUSE 6.12**

Channel	Maximum Frequency Difference (kHz)		
	TRANSIENT TIMES (ms)		
	t1 (5ms)	t2 (20ms)	t3 (5ms)
16	3.0	12	0
Measurement uncertainty	8 %		
Limits	≤ 25 kHz	≤ 12.5 kHz	≤ 25 kHz

Confirm that during the periods t1 and t3 the frequency difference does not exceed the value of one channel separation:

YES [✓] **NO [ ]**

(See Annex B)

Confirm that during the period t2 the frequency difference does not exceed the value of half a channel separation:

YES [✓] **NO [ ]**

(See Annex B)

TEST EQUIPMENT USED:

01, 02, 03, 04, 05, 06. 07, 08, 09, 10, 11, 12, 13, 14, 16, 17, 18, 25, 26, 27, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.6 °C Relative humidity: 29.7 %

RECEIVER TESTING

HARMONIC DISTORTION AND RATED AUDIO-FREQUENCY OUTPUT POWER **CLAUSE 7.1**

Rated AF output power: 6 W
Requirement: ≥ 2 W

Test Conditions		Modulation Frequency (Hz)	Test Signal Level (dBμV emf)	Audio Frequency Harmonic Distortion (%)		
				channel 16		
Temp.	Voltage			156.8 MHz	156.8015 MHz	156.7985 MHz
T_{nom} (22.6 °C)	V_{nom} (12.0 V)	300	60	4.46	N/A	N/A
			100	4.56	N/A	N/A
		500	60	1.83	N/A	N/A
			100	1.82	N/A	N/A
		1000	60	1.62	N/A	N/A
			100	1.72	N/A	N/A
T_{min} (-15°C)	V_{min} (10.8V)	1000	60	2.70	4.00	2.08
			100	2.80	4.27	2.09
	V_{max} (15.6V)	1000	60	2.77	4.14	2.10
			100	2.93	4.44	2.13
T_{max} (+55°C)	V_{min} (10.8V)	1000	60	6.05	6.86	4.03
			100	6.14	6.86	4.09
	V_{max} (15.6V)	1000	60	2.11	3.26	1.61
			100	2.27	3.35	1.71
Measurement Uncertainty				0.1 dB (1 %)		
Limit				≤ 10 %		

(N/A - See Subclause 7.1.2 of ETS 300 162 Feb 1993)

TEST EQUIPMENT USED:

01, 07, 14, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 23.3 °C Relative humidity: 32.7 %

RECEIVER TESTING

AUDIO-FREQUENCY RESPONSE **CLAUSE 7.2**

Modulation Frequency (Hz)	AF Output Power (dB) channel		
	156.7985 MHz	156.8 MHz	156.8015 MHz
300	8.07	8.05	8.31
380	6.98	6.94	7.18
480	5.69	5.60	5.87
600	4.26	4.19	4.38
760	2.50	2.40	2.57
960	0.49	0.37	0.51
1000	0	0	0
1200	-1.65	-1.74	-1.74
1510	-4.00	-4.07	-4.20
1900	-6.35	-6.53	-6.71
2400	-8.75	-9.14	-9.38
3000	-11.24	-11.72	-11.89
Measurement uncertainty	4 %		
Limits	Between +1 dB and -3 dB from a 6 dB/octave decreasing curve passing through the measured point at 1000Hz		

(See Annex D for Plot of results)

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.6 °C Relative humidity: 29.5 %

RECEIVER TESTING

MAXIMUM USABLE SENSITIVITY **CLAUSE 7.3**

TEST CONDITIONS		RECEIVER SENSITIVITY (dBμV emf) channel		
		155.025 MHz	156.8 MHz	162.975 MHz
T_{nom} (22.6 °C)	V_{nom} (12.0 V)	-4.5	-7.9	-6.6
T_{min} (-15.0 °C)	V_{min} (10.8 V)	-1.4	-5.8	-5.5
	V_{max} (15.6 V)	-1.7	-5.6	-5.9
T_{max} (+55.0 °C)	V_{min} (10.8 V)	-1.5	-4.0	-2.2
	V_{max} (15.6 V)	-1.1	-3.8	-1.8
Measurement uncertainty		2.5 dB		
Limits		**Normal Test Conditions:** RF Level ≤ + 6 dBμV AF Output Power 50 % of Rated AF Output Power **Extreme Test Conditions:** RF Level ≤ + 12 dBμV AF Output Power 50 % of Rated AF Output Power		

TEST EQUIPMENT USED:

01, 07, 14, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.5 °C Relative humidity: 26.2 %

RECEIVER TESTING

CO-CHANNEL REJECTION **CLAUSE 7.4**

FREQUENCY OF UNWANTED SIGNAL	REJECTION RATIO (dB) CARRIER FREQUENCY 156.8 MHz
f +3000 Hz	-7.7
f +2500 Hz	-7.9
f +2000 Hz	-7.9
f +1500 Hz	-8.0
f +1000 Hz	-7.8
f +500 Hz	-7.9
f	-8.0
f -500 Hz	-8.0
f -1000 Hz	-7.9
f -1500 Hz	-8.0
f -2000 Hz	-8.0
f -2500 Hz	-8.0
f -3000 Hz	-8.0
Measurement uncertainty	3.0
Limits	Between -8 and 0

The lowest value of the thirteen measurement results noted shall be recorded as the Co-channel rejection.

TEST EQUIPMENT USED:

01, 07, 08, 09, 13, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.5 °C Relative humidity: 25.8 %

RECEIVER TESTING

ADJACENT CHANNEL SELECTIVITY **CLAUSE 7.5**

TEST CONDITIONS		UNWANTED SIGNAL + AND - RELATIVE TO WANTED RATIO (dB) channel	
		156.775 MHz -	156.825 MHz -
T_{nom} (21.5 °C)	V_{nom} (25.8 V)	74.4	72.9
T_{min} (-15.0 °C)	V_{min} (10.8 V)	76.2	79.1
	V_{max} (15.6 V)	76.1	79.2
T_{max} (+55.0 °C)	V_{min} (10.8 V)	72.8	74.8
	V_{max} (15.6 V)	71.3	74.4
Measurement uncertainty		3.0	

LIMITS CLAUSE 7.5.3

CHANNEL SPACING (KHz)	Under normal test conditions	Under extreme test conditions
25	70 dB	60 dB

TEST EQUIPMENT USED:

01, 07, 08, 09, 13, 14, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.3 °C Relative humidity: 46.2.%

RECEIVER TESTING

SPURIOUS RESPONSE REJECTION **CLAUSE 7.6**

SPURIOUS RESPONSES	REJECTION RATIO (dB)
	CHANNEL
	16
65.107350 MHz	87.6
146.100100 MHz	89.7
153.627500 MHz	91.5
156.775 MHz (Adjacent Channel)	71.4
156.825 MHz (Adjacent Channel)	76.5
157.713900 MHz	81.0
249.407200 MHz	81.9
698.3946 MHz	79.3
1061.798150	83.9
Measurement uncertainty	3.5

LIMIT **CLAUSE 7.6.3**

Limit	70 dB

TEST EQUIPMENT USED:

01, 07, 08, 09, 11, 13, 14, 24, 25, 26, 31, 32, 34, 35, 36, 37, 39 & 40.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.8 °C Relative humidity: 23.9 %

RECEIVER TESTING

INTERMODULATION RESPONSE REJECTION **CLAUSE 7.7**

FREQUENCY INCREMENTS OF UNWANTED SIGNALS	CHANNEL RATIO (dB)
	16
+50/+100 KHz	71.8
+47 KHz	71.9
-47 KHz	72.0
-50/-100 KHz	71.9
Measurement uncertainty	3.0
Limit	greater than 68.0 dB

TEST EQUIPMENT USED:

01, 07, 08, 09, 12, 13, 14, 15, 25, 26, 31, 32, 34,.48 & 49.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 23.5 °C Relative humidity: 30.1 %

RECEIVER TESTING

BLOCKING OR DESENSITISATION **CLAUSE 7.8**

FREQUENCY OF UNWANTED SIGNAL	BLOCKING RATIO (dB)
	CHANNEL
	16
f+10 MHz	98.6
f+9 MHz	98.6
f+8 MHz	98.0
f+7 MHz	98.0
f+6 MHz	98.0
f+5 MHz	98.0
f+4 MHz	97.7
f+3 MHz	95.1
f+2 MHz	95.9
f+1 MHz	95.6
f-1 MHz	95.2
f-2 MHz	95.2
f-3 MHz	94.6
f-4 MHz	97.7
f-5 MHz	99.6
f-6 MHz	100.0
f-7 MHz	100.1
f-8 MHz	99.6
f-9 MHz	99.6
f-10 MHz	99.6
Measurement uncertainty	3.5

LIMIT CLAUSE 7.8.3

The blocking ratio, for any frequency within the specified ranges shall not be less than 90 dBμV (emf), except at frequencies on which spurious responses are found, clause 7.6 refers.

TEST EQUIPMENT USED:

01, 07, 08, 09, 13, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 23.3 °C Relative humidity: 35.4 %

RECEIVER TESTING

SPURIOUS RADIATION **CLAUSE 7.9**

FREQUENCY OF SPURIOUS RADIATIONS	LEVEL (dBm)
	CHANNEL
	16
a) Conducted	
135.399767 MHz	-58.57
541.599192 MHz	-72.07
676.998975 MHz	-69.87
812.398817 MHz	-63.03
b) Radiated	
270.799984 MHz	-58.62
Measurement uncertainty	Conducted = 3.0 Radiated = 4.0

LIMITS **CLAUSE 7.9.3**

TEST	FREQUENCY RANGE	LIMITS
CONDUCTED	9 KHz to 2000 MHz	2.0 nW (-36 dBm)
RADIATED	30 MHz to 2000 MHz	2.0 nW (-36 dBm)

TEST EQUIPMENT USED:

02, 03, 04, 05, 06, 07, 08, 10, 11, 17, 21, 22, 23, 25, 26, 27, 31, 32, 34, 46 & 47.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.0 °C Relative humidity: 27.4 %

RECEIVER TESTING

AMPLITUDE CHARACTERISTICS **CLAUSE 7.10**

RF input to Receiver	AUDIO OUTPUT POWER (W) CARRIER FREQUENCY 156.8 MHz
6 dB μV	1.55
100 dB μV	1.58
Variation of AF output power level (dB)	0.08 dB
Measurement uncertainty	1.5 dB
Limit	≤ 3 dB

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.8 °C Relative humidity: 23.6 %

RECEIVER TESTING

NOISE AND HUM LEVEL **CLAUSE 7.11**

Channel	Noise and Hum Level (dB)
16	-55.98
Measurement Uncertainty	**1.5 dB**
Limit	**≤ -40**

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.8 °C Relative humidity: 23.6 %

RECEIVER TESTING

SQUELCH OPERATION **CLAUSE 7.12.2 (a)**

Channel	AF output power (dB)
16	-74.47
Measurement Uncertainty	1.5 dB
Limit	≤ -40

CLAUSE 7.12.2 (b)

Channel	Input Level (dBμV emf)
16	-2.7
Measurement Uncertainty	2.5 dB
Limit	≤ + 6 dBμV emf

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 21.0 °C Relative humidity: 33.5 %

RECEIVER TESTING

SQUELCH HYSTERESIS **CLAUSE 7.13**

Channel	Input Level (dBμV emf)		Input Level Difference (dB)
	Open Squelch	Close Squelch	
16	-3.9	-7.6	3.7
Measurement Uncertainty			1.5 dB
Limit			Between 3 and 6 dB

TEST EQUIPMENT USED:

01, 07, 14, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

Ambient temperature: 22.6 °C Relative humidity: 29.5 %

RECEIVER TESTING

MULTIPLE WATCH CHARACTERISTICS **CLAUSE 7.14**

Priority Channel (P.C.): 156.8 MHz

Additional Channel (A.C.): 155.025 MHz

TEST CONDITIONS		Scanning Period	Dwell Time (msec) on the:		Scanning stops on P.C. if signal on P.C.
Temperature	Voltage	(msec)	P.C.	A.C.	
T_{nom} (22.6 °C)	V_{nom} (12.0 V)	1324	149.3	1257	yes
T_{min} (-15.0 °C)	V_{min} (10.8 V)	1327	149	1260	yes
	V_{max} (15.6 V)	1328	149.2	1261	yes
T_{max} (+55.0 °C)	V_{min} (10.8 V)	1324	149.2	1257	yes
	V_{max} (15.6 V)	1321	148.7	1254	yes
Measurement uncertainty		8 %	8 %	8 %	N/A
Limits		≤ 2000	≤ 150	Between 850 and 2000	yes

TEST EQUIPMENT USED:

01, 07, 08, 09, 13, 14, 16, 18, 24, 25, 26, 31, 32 & 34.

TEST REPORT REFERENCE: DERA/SSWI/CR/TT-39/97-1.0

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory.

Number	Instrument/Ancillary	Type	Manufacturer	Serial Number
01	Test Analyzer	CMTA	RHODE & SCHWARZ	861093/001
02	Signal Generator	SMHU	RHODE & SCHWARZ	865950/005
03	Spectrum Analyzer	HP8563A	HP	3313A00878
04	Power Attenuator	765-10	NARDA	9501
05	Power Attenuator	765-20	NARDA	9504
06	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D3197
07	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D6039
08	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D3209
09	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D3210
10	Precision Attenuators	HP11581A	HP	CSC10592
11	Filter	BANDREJECT	K & L	40
12	Power Divider	4901.17.A	SUHNER	WHITE
13	Power Divider	4901.17.A	SUHNER	BLACK
14	DVM	79	FLUKE	60031113
15	Signal Generator	SMG	RHODE & SCHWARZ	863099/047
16	Oscilloscope	9450A	LeCROY	9450
17	Graphics Plotter	HP7550A	HP	2520A21789
18	Crystal Detector	HP423A	HP	12086
19	Signal Generator	HP8640B	HP	2849A30536
20	50 Ω Precision Termination	6500.17.A	SUHNER	NONE
21	Bi-conical Antenna	BBA9106	SCHWARZBECK	7189
22	Log-periodic Antenna	UHALP9107	SCHWARZBECK	9107994
23	Horn Antenna	96001	AILTECH	2389
24	Climatic Chamber	P/T-P/RH-RR10D	FISONS	4175B
25	Temperature probe	ms1	NOVASINA	NONE
26	Cables	BNC	RADIO SPARES	NONE
27	N-Type Male/Male Adaptor	32N-50-0-51	SUHNER	BLACK
28	Power Meter	436A	HP	1161A00582
29	Power Sensor	8481A	HP	1550A05694
30	Frequency Counter	1995	RACAL DANA	19307
31	GPS Frequency Reference	HP58503A	HP	3548A00454
32	Regulated Power Supply	AP60-150	FARNELL	000255
33	Stabilized Power Supply	LT30-1	FARNELL	000347
34	Cable	BNC to OPEN	RADIO SPARES	NONE
35	Spurious Response Detector	SRDU	RHODE & SCHWARZ	RSS/003
36	SMA Cable	065-9AA-0500-000	ITT SEALECTRO	A3338
37	SMA Cable	065-9AA-0750-000	ITT SEALECTRO	20121
38	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D3163
39	ACP Filter	21.4 MHz-6KHz	QUARTZTEK	9651-001
40	ACP Mixer	5/1350 MHz	OLEKTRON	0-CBD-9007
41	Screened Room	SHIELDED	BELLING LEE INTEC LTD.	00513
42	Vibration Table	ACTUATOR	SERVOTEST	2150
43	SOUND LEVEL METER	TYPE 2209	BRUEL & KJOER	698986
44	AMPLIFIER	KA-3750	TRIO	020197
45	SPEAKER	NONE	S.B. DAVENPORT LTD.	01E8B7
46	N-Type Cable 20m	NPS-1553-20000-NPS	RHOPHASE	L3634
47	N-Type Cable 25m	NPS-1553-25000-NPS	RHOPHASE	M2064
48	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D6040
49	N-Type Cable	SEALFLEX2	ITT SEALECTRO	D3211
50	1/3 Octave Filter Set	TYPE 1616	BRUEL & KJOER	794257
51	Condenser Microphone	TYPE 4165	BRUEL & KJOER	708259

TYPE-APPROVAL TESTING

ANNEX A

PHOTOGRAPHS

MARITIME MOBILE VHF TRANSCEIVER
Navico Model AXIS 1200

Serial Number QA 12345SHB

(consists of 7 photographs)

TYPE-APPROVAL TESTING

ANNEX B

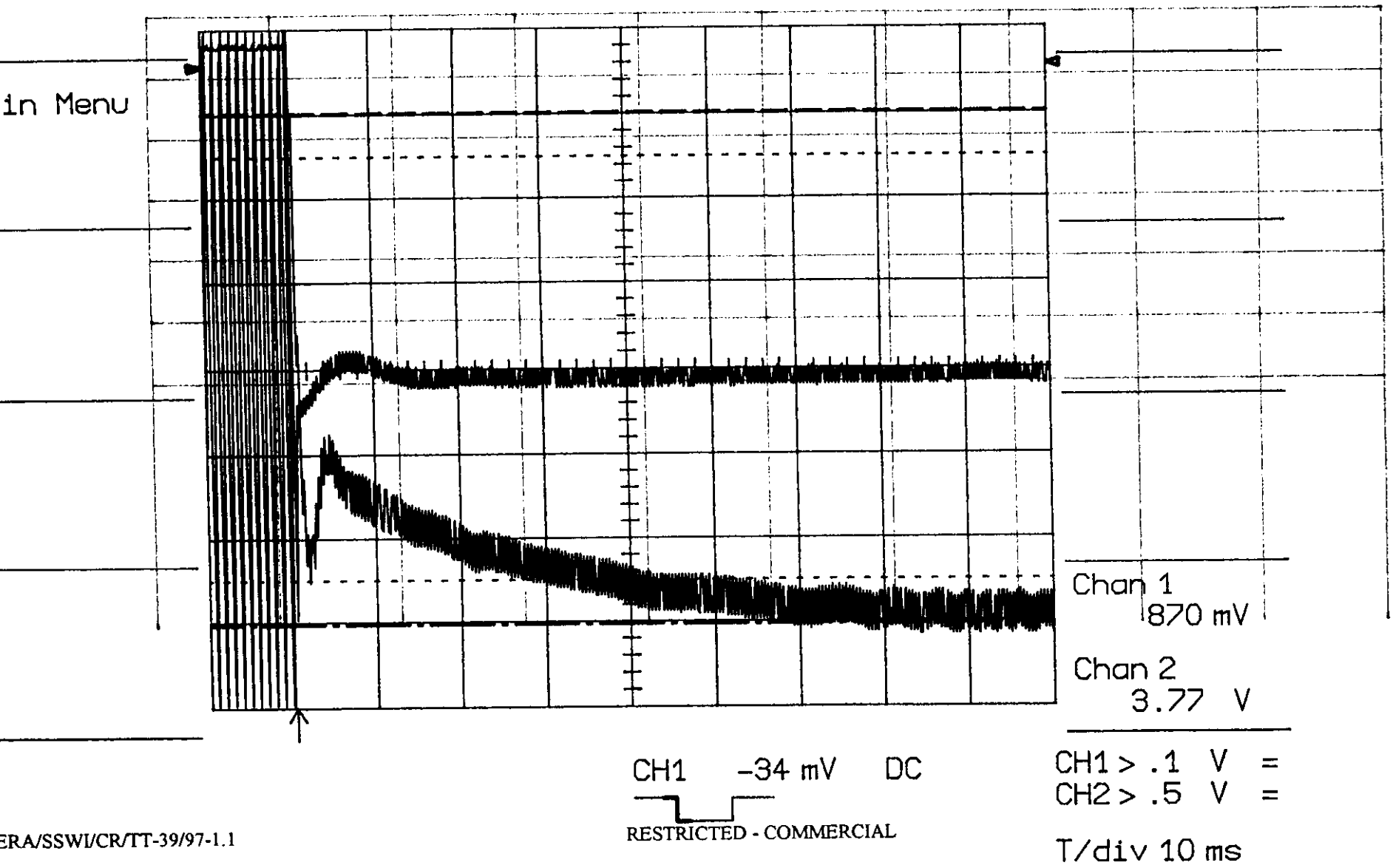
PLOTS OF TRANSMITTER TRANSIENT FREQUENCY BEHAVIOUR

MARITIME MOBILE VHF TRANSCEIVER
Navico Model AXIS 1200

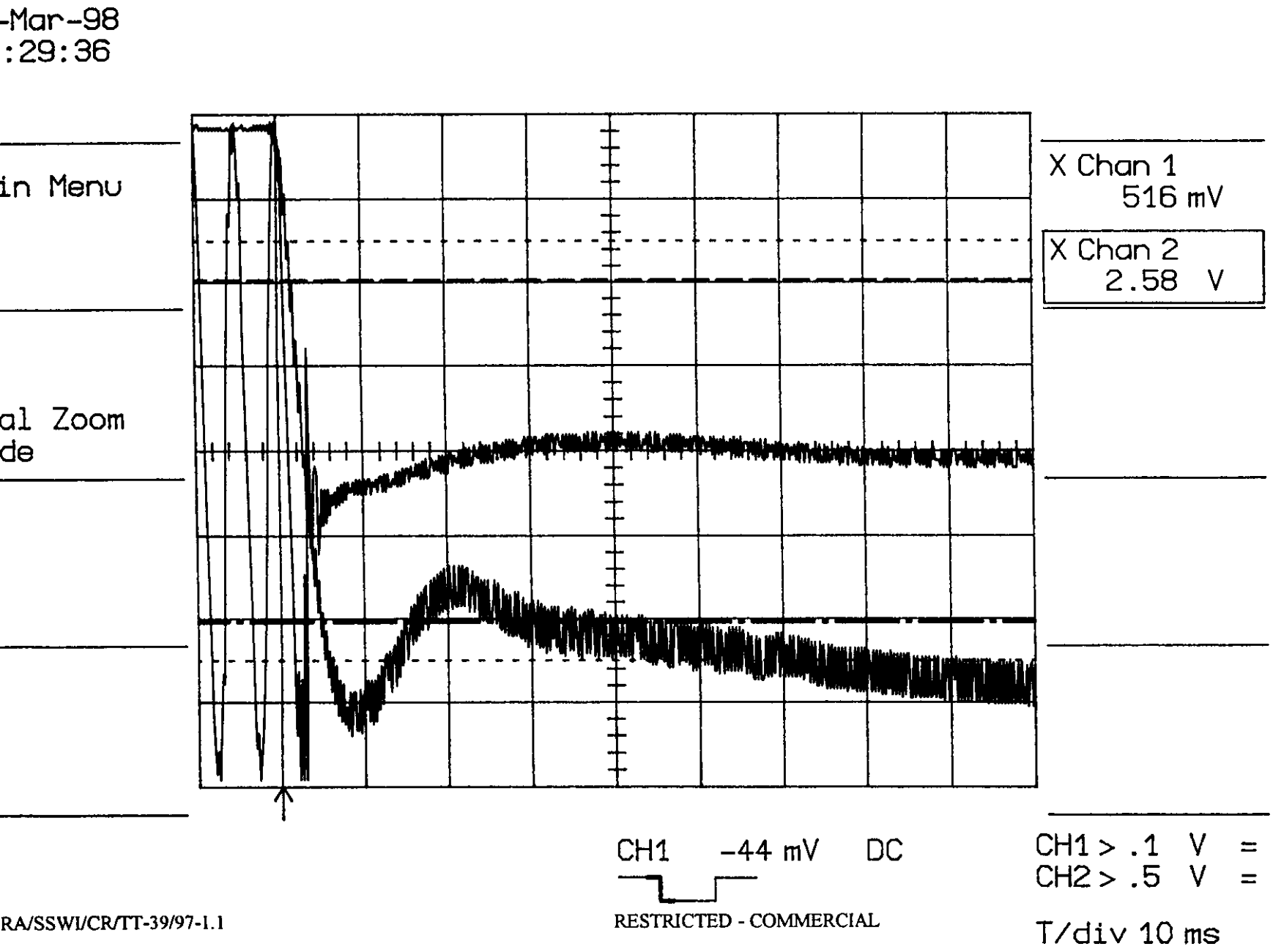
Serial Number QA 12345SHB

(consists of 4 plots)

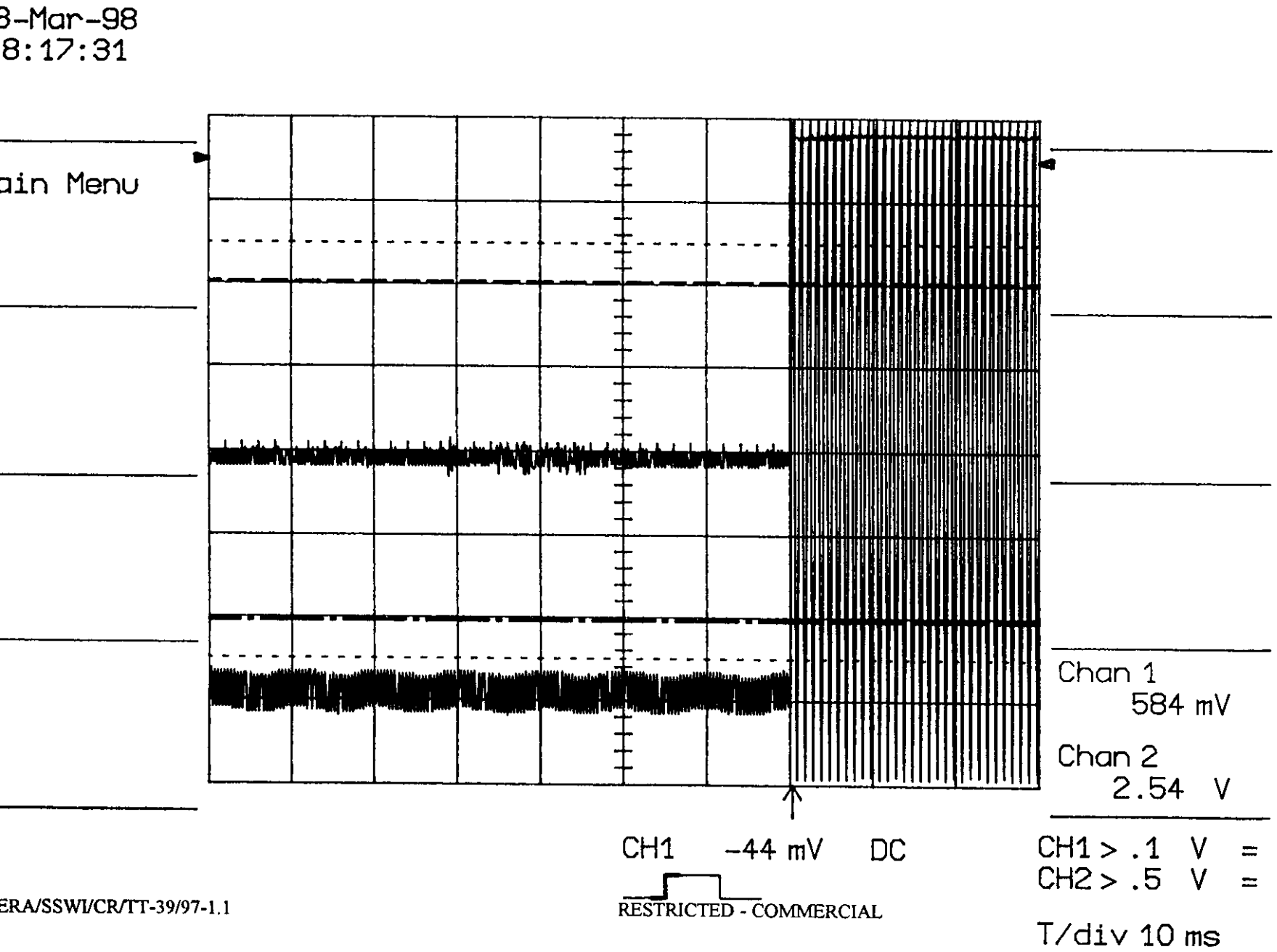
AXIS 1200 SWITCH ON TRANSIENT



AXIS 1200 SWITCH ON TRANSIENT (EXPANDED VIEW)

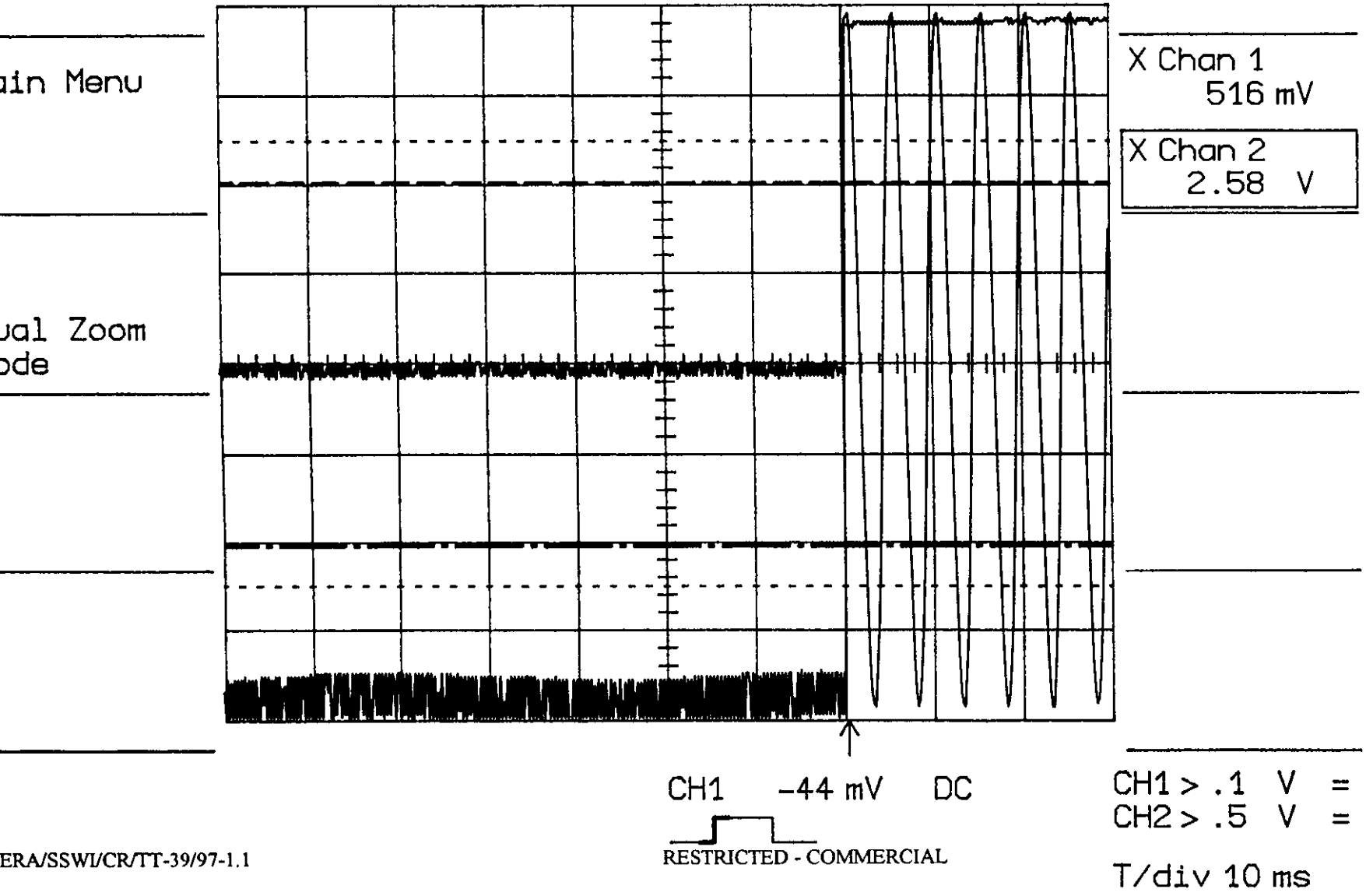


AXIS 1200 SWITCH OFF TRANSIENT



RESTRICTED - COMMERCIAL

AXIS 1200 SWITCH OFF TRANSIENT (EXPANDED VIEW)



TYPE-APPROVAL TESTING

ANNEX C

PLOTS OF RESULTS FOR REDUCTION OF FREQUENCY DEVIATION AT MODULATION FREQUENCIES ABOVE 3 kHz

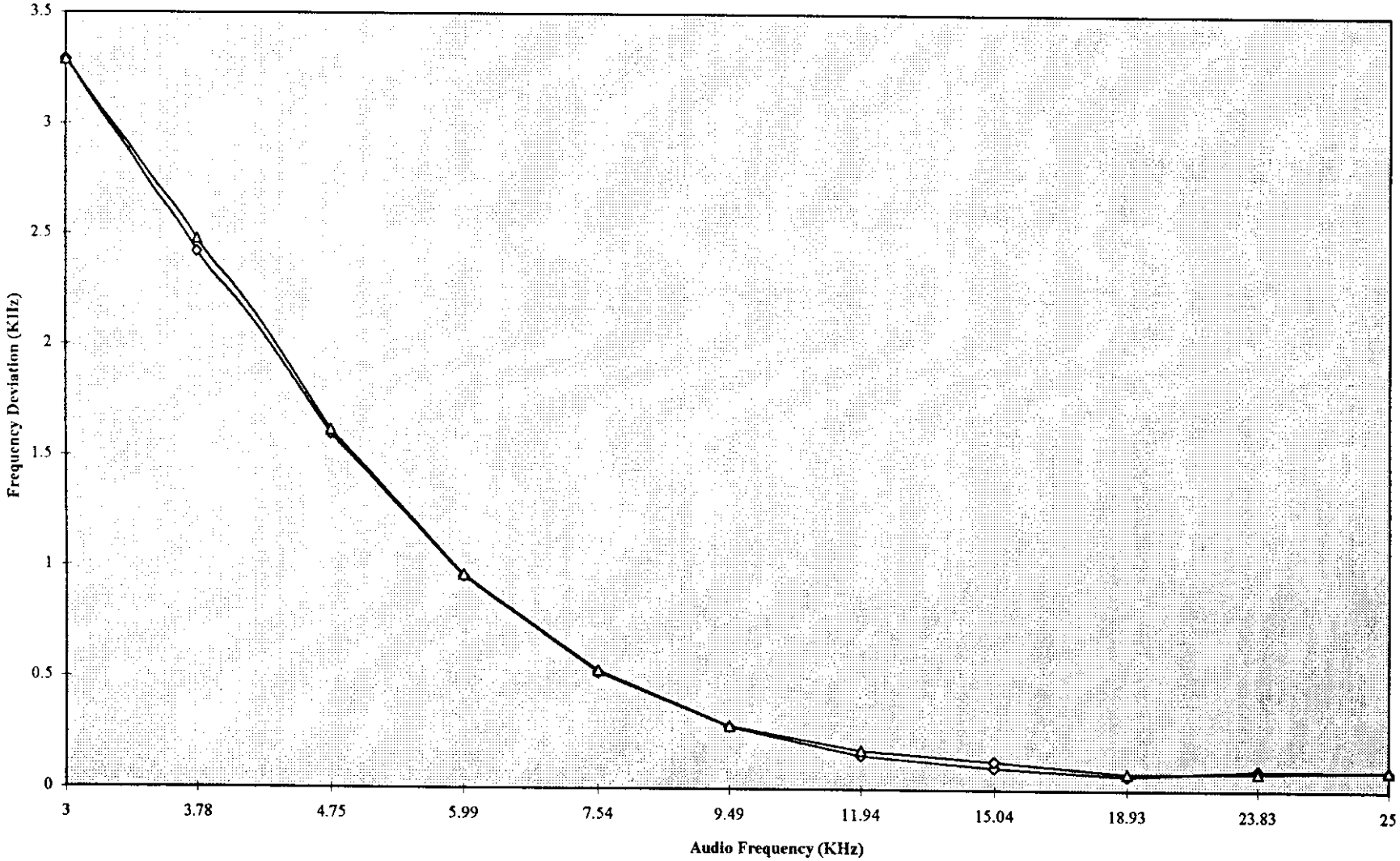
(See Section 4 page 24)

MARITIME MOBILE VHF TRANSCEIVER
Navico Model AXIS 1200

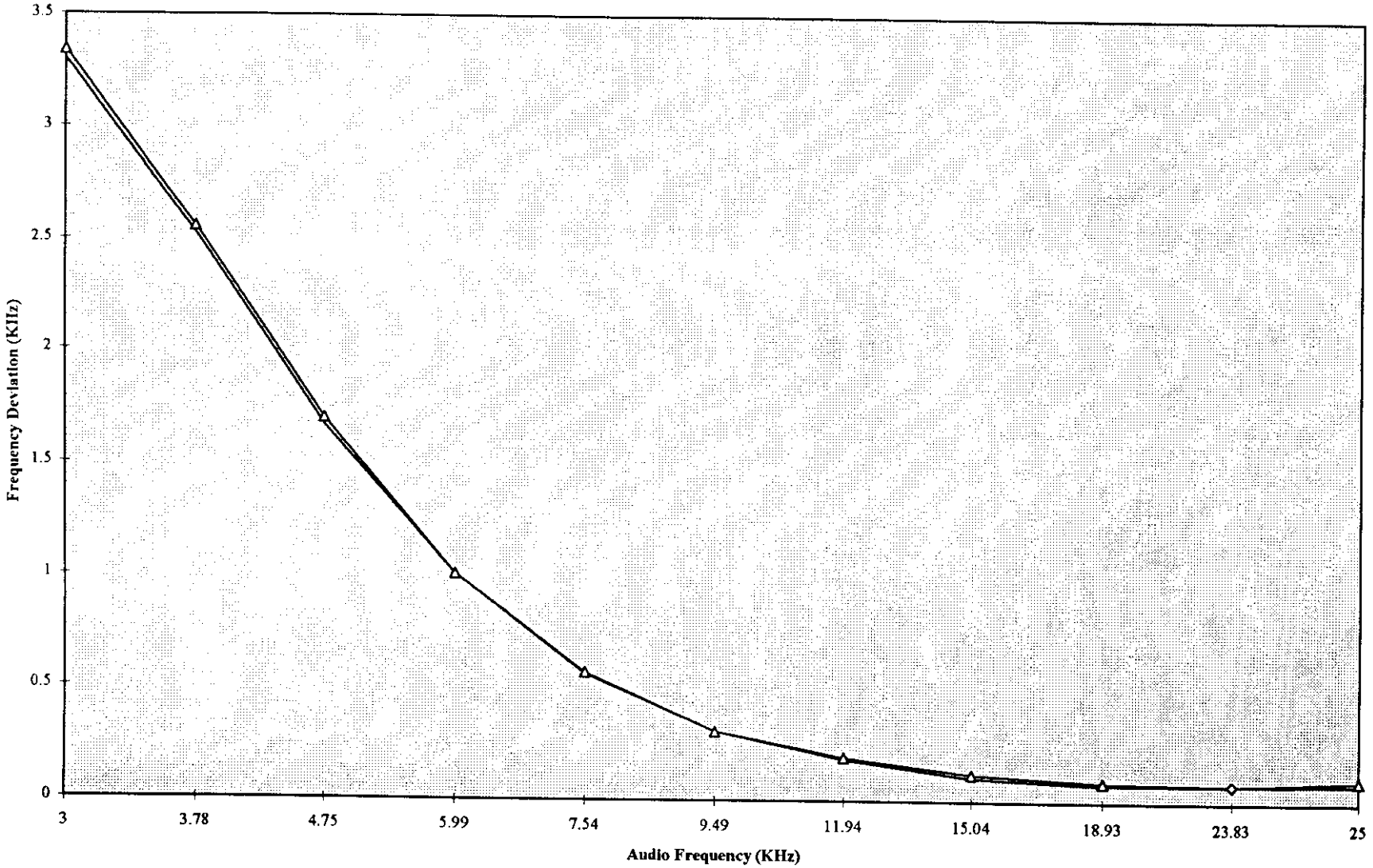
Serial Number QA 12345SHB

(consists of 2 plots)

Reduction of Frequency Deviation at Modulation Frequencies above 3 KHz (High Power)



Reduction of Frequency Deviation at Modulation Frequencies above 3 KHz (Low Power)



Receiver Audio Frequency Response