SIMRAD
A KONGSBERG Company

NAVIGATION AND
COMMUNICATION
SYSTEMS

REPORT FORM FOR TESTING TO EN 301 025

RADIO EQUIPMENT AND SYSTEMS
RADIOTELEPHONE TRANSMITTERS AND RECEIVERS
FOR THE MARITIME MOBILE SERVICE OPERATING IN THE VHF BANDS
TECHNICAL CHARACTERISTICS AND METHODS OF MEASUREMENT

Test Report Number: TAR001

CONTENTS

SECTION 1 INTRODUCTION

This report contains the results of tests performed on the product RD68 VHF radio with DSC & ATIS, on this premises of :

Simrad Navico Ltd
Star Lane
Margate
Kent
CT9 4NP

Simrad Navico Ltd complies with the accreditation criteria requirements of the quality standards, BS EN ISO 9001:1994. The accreditation covers the quality system of the EMC test department as well as the, design,manufacture, distribution, aftersales, marketing and support of communications and marine electronics for the leisure, commercial and military markets, as described in the certificate of approval bearing the certificate number 21460 and granted on 3 december 1998 for a period of 3 years.

All testing was carried out within the EMC test department of Simrad Navico Ltd, to the requirements of ETSI EN 301 025 V1.1.1 (1998-08).

Testing carried out by: Kevin Heath

Report checked by: David Sheekey

Date: 15/06/00

Modification Record

Date	Mod Note	Description
19/09/00	1463	Change of decoupling. Re tested. See annex 1
26/10/00	N/A	Part number changed from RD68 to RD68W which is released part number

SECTION 2 PRODUCT

A sample of the following product was submitted for testing:

Maritime Integraded VHF/DSC Radiotelephone with ATIS

Manufacture: *Simrad Navico Ltd*

Parts of Product: *1 x RD68; Transceiver Unit with DSC controller & ATIS.*
1 x Handset / Fistmike.

Serial Number: *TA Unit 3*

Software Release: *Issue 1*

Particulars: *DSC Class D*

SECTION 3 TEST SCHEDULE

Tests were carried out in accordance with the specification detailed in clause 6 EN 301 025 document, "general conditions of measurement".

All tests were carried out at Simrad Navico Ltd.

The sample unit was tested between the following dates: 1st March 2000 - 14th April 2000.

The RD68 VHF radio with DSC & ATIS, is intended for use in the following application area:

MARINE COMMUNICATIONS EQUIPMENT

SECTION 4 TEST TECHNICAL DETAILS

Test Unit =	*RD68 VHF Radio with DSC & ATIS*	
Serial Number =	*TA UNIT 3*	
Additional Parts =	*Telephone handset / Fistmike*	
Nominal Voltage =	*12.0 Volts*	
Maximum Voltage =	*15.6 Volts*	
Minimum Voltage =	*10.8 Volts*	
Nominal Temperature =	*20°C*	
Maximum Temperature =	*55°C*	
Minimum Temperature =	*-15°C*	
Channel 16 =	*156.800MHz*	
Upper Frequency =	*162.975MHz*	
Lower Frequency =	*155.025MHz*	
Second Receiver Frequency =	*156.525MHz*	
Channel Spacing =	*25.0kHz*	
First IF Main Rx =	*21.4MHz*	
Second IF Main Rx =	*455.0kHz*	
First IF 2nd Rx =	*17.9MHz*	
Second IF 2nd Rx =	*455.0kHz*	
Rated Audio Power =	*6.0 Watts*	*(external speaker)*
	2 mW	*(handset earphone)*
Rated Audio Load =	*4 Ohms*	*(external speaker)*
	300 Ohms	*(handset earphone)*

SECTION 5 SUMMARY OF TEST RESULTS

Clause No	General and operational requirements	Complies?
4.1	*General*	Yes
4.2	*Composition*	Yes
4.3	*Construction*	Yes
4.4	*Controls and indicators*	Yes
4.5	*Facilities for coding and decoding of DSC*	Yes
4.5.1	*Call functions*	Yes
4.5.2	*Manual calls*	Yes
4.5.3	*Distress calls*	Yes
4.5.4	*All ships calls*	Yes
4.5.5	*Incoming calls*	Yes
4.6	*DSC display*	Yes
4.7	*Handset and loudspeaker*	Yes
4.8	*Safety precautions*	Yes
4.9	*Labelling*	Yes
4.10	*Warm up*	Yes
	Technical Requirements	
5.1	*Switching time*	Yes
5.2	*Class of emission and modulation characteristics*	Yes
5.3	*Facilities for DSC transmission and reception*	Yes
5.3.1	*General*	Yes
5.3.2	*Decoding*	Yes
5.3.3	*Free channel transmission*	Yes
5.3.4	*Automatic acknowledgement*	Yes
5.3.5	*Automatic re-transmission of distress calls*	Yes
5.4	*Ships identity - MMSI and group MMSI*	Yes
5.5	*Entry of position information*	Yes
5.6	*Alarm circuits*	Yes
5.6.1	*Distress and urgency*	Yes
5.6.2	*Other categories*	Yes
5.6.3	*Acoustic alarms*	Yes
5.6.4	*Cancellation of alarms*	Yes
5.7	*Facilities for automatic identification*	Yes
5.8	*Multiple watch facilities*	Yes
5.8.1	*General*	Yes
5.8.2	*Scanning provisions*	Yes
5.8.3	*Scanning characteristics*	Yes
	Enviromental Tests	
7.4	*Vibration*	Yes
7.5	*Temperature Tests*	Yes
7.5.2	*Dry heat*	Yes
7.5.3	Damp Heat	Yes
7.5.4	Low temperature	Yes

5 SUMMARY OF TEST RESULTS (continued)

Clause No.	Transmitter	Complies?
8.1	*Transmitter Frequency Error*	Yes
8.2	*Transmitter Carrier Power*	Yes
8.3	*Transmitter Frequency Deviation*	Yes
8.3.3	*Reduction of frequency deviation at mod freq above 3 kHz*	Yes
8.4	*Sensitivity of Modulator Including Microphone*	Yes
8.5	*Transmitter Audio Frequency Response*	Yes
8.6	*Transmitter Audio Frequency Distortion*	Yes
8.7	*Transmitter Adjacent Channel Power*	Yes
8.8	*Transmitter Conducted Spurious Emissions*	Yes
8.9	*Transmitter Radiated Spurious Emissions*	Yes
8.10	*Transmitter Transient Frequency Behaviour*	Yes
8.11	*Transmitter Residual Modulation*	Yes
8.12	*Frequency Error (demodulated DSC signal)*	Yes
8.13	*Modulation Index for DSC*	Yes
8.14	*Modulation Rate for DSC*	Yes
8.15	*Testing of generated call sequences*	Yes
	Receiver	
9.1	*Receiver AF Harmonic Distortion*	Yes
9.2	*Receiver Audio Frequency Response*	Yes
9.3	*Receiver Maximum Usable Sensitivity*	Yes
9.4	*Receiver Co-Channel Rejection*	Yes
9.5	*Receiver Adjacent Channel Selectivity*	Yes
9.6	*Receiver Spurious Response Rejection*	Yes
9.7	*Receiver Intermodulation Response*	Yes
9.8	*Receiver Blocking Response*	Yes
9.9	*Receiver Spurious Conducted Emissions*	Yes
9.10	*Receiver Spurious Radiated Emissions*	Yes
9.11	*Receiver Residual Noise Level*	Yes
9.12	*Receiver Squelch Operation*	Yes
9.13	*Receiver Squelch Hysteresis*	Yes
9.14	*Receiver Multiple Watch Characteristic*	Yes
10.1	*MUS for DSC receiver*	Yes
10.2	*Co-channel Rejection for DSC Receiver*	Yes
10.3	*Adjacent Channel Selectivity for DSC Receiver*	Yes
10.4	*Spurious Response/Blocking Immunity for DSC Receiver*	Yes
10.5	*Intermodulation Response for DSC Receiver*	Yes
10.6	*Dynamic Range for DSC Receiver*	Yes
10.7	*Conducted Spurious Emissions for DSC Receiver*	Yes
10.8	*Radiated Spurious emissions for DSC Receiver*	Yes
10.9	*Verification of Correct Decoding of DSC Calls*	Yes

SECTION 6 GENERAL & OPERATIONAL REQUIREMENTS

Clause:

		Complies:
4.1	**GENERAL**	
	Definition: Manufacture's declaration of complaince with clause 4.	
	- *Provision of relevant documentation to prove complaince*	**Yes**
4.2	**COMPOSITION**	
	Definition: Equipment consists of minimum composition	**Yes**
4.3	**CONSTRUCTION**	
	Definition: Good engineering practice in respect to mechanical and electrical construction	
	- *Equipment suitable for on-board vessels*	**Yes**
	- *Number of controls suitable for simple and satisfactory operation*	**Yes**
	- *Size of controls enable easy performance*	**Yes**
	- *Detailed operating instructions provided*	**Yes**
	- *Capable of operating on:*	**Yes**
	- *Single-frequency channels with manual control*	**Yes**
	- *Two-frequency channels with manual control*	**Yes**
	- *Operation on all channels of appendix 18 of the R.R*	**Yes**
	- *Blocking of channel 70 only possible for DSC*	**Yes**
	- *Unblocking of channels impossible*	**Yes**
	- *Additional channels (if granted)*	**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**
4.4	**CONTROLS & INDICATORS**	
	- *Controls impairing technical characteristics not accessible by user*	**Yes**
	- *Priority and indication of control units*	**Yes**
	- *Following mandatory controls or functions are provided*	**Yes**
	- *Distress button*	**Yes**
	- *Call*	**Yes**
	- *Cancel*	**Yes**
	- *Enter (accept) (ok)*	**Yes**
	- *Numeric keypad*	**Yes**
	- *Alpha -numeric display*	**Yes**
	- *On/off switch for the entire installation with a visual indication that installation is in operation*	**Yes**
	- *A manual non-locking push-to-talk switch*	**Yes**
	- *A transmit activation indication*	**Yes**
	- *A switch for reducing the transmitter output power to no more than 1 watt with visual indication of low power selection*	**Yes**
	- *A volume control to adjust the AF output power*	**Yes**

4.4 CONTROLS & INDICATORS (continued)

	Complies:
- *A squelch control*	**Yes**
- *Control for dimming equipment illumination to zero (except distress key)*	**Yes**
- *Controls for multiple watch facility (if provided)*	**Yes**
- *Channel designator legible irrespective of the external lighting conditions*	**Yes**
- *Selection of channel 16 by distinctively marked key*	**Yes**
- *Initial selection of channel 16 automatically selects high power*	**Yes**

4.5 FACILITIES FOR CODING AND DECODING OF DSC

4.5.1 CALL FUNCTIONS

- *Quick and precise entering of a call by operator*	**Yes**
- *Call function permits selection of:*	**Yes**
- *Individual call (call to specific MMSI)*	**Yes**
- *All ships call urgency*	**Yes**
- *All ships call safety*	**Yes**
- *Retrieving stored received calls*	**Yes**
- *Housekeeping functions of equipment*	**Yes**
- *Manual or directory individual call can be selected*	**Yes**
- *Directory has facility for 10 entries with programmable MMSI*	**Yes**

4.5.2 MANUAL CALLS

- *Manual call permits entry of MMSI*	**Yes**
- *If calling coast station, operator is requested no further information*	**Yes**
- *If calling ship, operator is requested to input channel number*	**Yes**
- *Equipment assists operator by suggesting suitable inter-ship channel*	**Yes**

4.5.3 DISTRESS CALLS

- *Transmisson of distress call only by dedicated distress button*	**Yes**
- *Distress button is clearly identified*	**Yes**
- *Distress button is protected with spring loaded cover*	**Yes**
- *Distress alert initiation requires 2 independent actions*	**Yes**
- *If distress alert is initiated, visual indication & acoustic alarm activated*	**Yes**
- *Time delay of >3 s between initiation and activation*	**Yes**
- *Possibility of selecting nature of distress prior to initiation*	**Yes**
- *Default of nature of distress is undesignated distress*	**Yes**
- *Initiation of distress call has priority over any other operation*	**Yes**
- *Equipment selects channel 70 with max power ouput*	**Yes**
- *Facility provided to discontinue transmission of distress*	**Yes**
- *Distress call is transmitted 5 times in succession with no time interval*	**Yes**
- *Each call of 5 successive calls includes dot pattern*	**Yes**
- *After distress call, equipment switches to channel 16 with max power output automatically*	**Yes**

4.5.4 ALL SHIPS CALLS

- *Transmission of all ships urgency/safety calls only by deliberate action*	**Yes**

4.5.5 INCOMING CALLS

- *Facility to convert incoming calls to visual form in plain language*	**Yes**
- *Facility to store at least 10 DSC calls until read manually*	**Yes**
- *Radiotelephone automatically switches to channel identified in incoming call*	**Yes**
- *In case of distress call, radiotelephone switches to channel 16 and selects maximum power automatically*	**Yes**

4.6 DSC DISPLAY

- *Display shows functions currently available*	**Yes**
- *Operator is prompted if incorrect operation is attempted*	**Yes**
- *If equipment not in use for normal communication, display shows last entered position*	**Yes**
- *Visual indication of user programmable information of content of call*	**Yes**
- *Indication of unread incoming messages in memory*	**Yes**
- *Indication that distress alert is in automatic re-transmit mode*	**Yes**

4.7 HANDSET & MICROPHONE

Provision of a:

- *Telephone handset or microphone*	**Yes**
- *Integral loudspeaker and/or socket for external loudspeaker*	**Yes**
- *Acoustic alarm is also relayed to external loudspeaker*	**Yes**
- *Muting in simplex operation*	**Yes**

4.8 SAFETY PRECAUTIONS

- *Protection against the effects of excessive current and over-voltage protection (fuse & voltage regulator)*	**Yes**
- *Protection against damage due to transient voltage*	**Yes**
- *Protection against damage due to reversal of power supply polarity (fuse & diode)*	**Yes**
- *Earthing*	**Yes**
- *Protection against accidental access of voltages greater than 50v*	**Yes**
- *Protection against damage due to open-circuited antenna terminals*	**Yes**
- *Protection against damage due to short-circuit antenna terminals*	**Yes**
- *DC path from the antenna terminals to the chassis <100kohms (measured 47k Ohms)*	**Yes**
- *Memory not erased during power supply interruptions up to 60 seconds*	**Yes**

4.9 LABELLING

- *Controls, instruments, indicators and terminals*	**Yes**
- *Details of power supply*	**Yes**
- *Identification of manufacture, type designation, serial number*	**Yes**
- *Compass safety distance (in manual)*	**Yes**

4.10 WARM UP

- *After switched on, equipment is operational within 5 seconds*	**Yes**

SECTION 7 TECHNICAL REQUIREMENTS

Clause:

5.1 SWITCHING TIME

- *Switching time: 2 sec*	**Yes**
(Limit < 5 sec)	
- *Time to change from:* Tx to Rx condition *(limit <0.3 sec)*	**Yes**
- *Time to change from:* Rx to Tx condition *(limit <0.3 sec)*	**Yes**

5.2 CLASS OF EMISSION AND MODULATION CHARACTERISTICS

- *Class of emission G3E for speech*	**Yes**
- *Class of emission G2B for DSC*	**Yes**
- *25 kHz channel spacing*	**Yes**

5.3 FACILITY FOR DSC TRANSMISSION AND RECEPTION

5.3.1 GENERAL

- *Facility to code and transmit DSC on channel 70*	**Yes**
- *Facility to decode & converse received calls to visual form in plain form*	**Yes**
- *Configuration of equipment:*	
Independent DSC unit for connection to associated radiotelephone	**n/a**
Mechanically and electrically integrated with radio equipment	**Yes**
- *With either configuration automatic channel swiching bt DSC is possible*	**Yes**
- *Channel 70 watchkeeping receiver of DSC part continously in operation*	**Yes**
- *During transmitter usage, watchkeeping receiver may be muted*	**Yes**

5.3.2 DECODING

- *Decoding utilizes parity, diversity and error check as rec*	**Yes**

5.3.3 FREE CHANNEL TRANSMISSION

- *Automatic delay of transmission unitl channel 70 is free*	**Yes**
- *No delay of transmission of distress call if channel 70 is not free*	**Yes**

5.3.4 AUTOMATIC ACKNOWLEDGEMENT

- *Provision of sending automatic acknowledgements*	**Yes**

5.3.5 AUTOMATIC RETRANSMISSION OF DISTRESS CALLS

- *Re-transmission of distress call after random delay 3.5 - 4.5 min* **Yes**
- *Automatic continuation until acknowledgement received or discontinued* **Yes**
- *Distress call re-attempt by manual intervention at any time* **Yes**

5.4 SHIPS IDENTITY - MMSI AND GROUP MMSI

- *Permanent storage of MMSI-number and automatic insertion in call* **Yes**
- *Impossible to change MMSI-number with operator controls* **Yes**
- *Impossible to transmit DSC call until MMSI-number has been stored* **Yes**
- *Storing of operator programmable group MMSI-numbers* **Yes**
- *Equipment recognizes call directed to group MMSI-numbers* **Yes**
- *Programming group MMSI with 8 digits only' leading 0 is inserted automatically* **Yes**

5.5 ENTRY OF POSITION INFORMATION

- *Provision of manual entry of position with valid time* **Yes**
- *Provision for automatic entry and encoding of position and time* **Yes**
- *Above facilities conform with IEC 1162-1* **Yes**
- *No connection of or failure within external circuits disables DSC equipment* **Yes**
- *Failure of datastream initiates error massage on display* **Yes**
- *If failure, operator is prompted to manually entry position & time every 4 Hrs* **Yes**
- *If position not updated for 23.5 Hrs, position and time is set to default* **Yes**

5.6 ALARM CIRCUITS

5.6.1 DISTRESS AND URGENCY

- *Provision of specific acoustic and visual alarm activated by format specifier distress or category distress and urgency* **Yes**
- *Alarm circuits cannot be disabled* **Yes**

5.6.2 OTHER CATEGORIES

- *Provision of acoustic and visual alarm activated on receipt of calls of categories other than distress and urgency* **Yes**
- *Acoustic alarm circuits cannot be disabled* **Yes**

5.6.3 ACOUSTIC ALARMS

- *Acoustic power of alarm is > 80dba at 1m distance (measured = 94dba)* **Yes**

5.6.4 CANCELLATION OF ALARMS

- *Provision of manual cancellation of alarms* **Yes**
- *Autonatic cancellation takes place after 2 minutes* **Yes**

5.7 FACILITIES FOR AUTOMATIC IDENTIFICATION

- *If facility for automatic identification to Rec. ITU-R M.825-1 is provided:*
  Operator not permitted to originate this type of call **n/a**
  Equipment capable of responding to request of identification **n/a**

5.8 MULTIPLE WATCH FACILITIES

5.8.1 GENERAL

- *Provision of multiple watch on traffic channels* **Yes**
- *DSC operation takes precedence* **Yes**
- *No scanning is possible on channel 70* **Yes**

5.8.2 SCANNING PROVISIONS

- *Provision for automatic scanning of a priority channel and one additional channel* **Yes**
- *Facilities for automatic sequential change of the additional channel* **Yes**
- *Means not accessible to the user to block/unblock the automatic sequential change of the additional channel (if provided)* **Yes**
- *Priority channel sampled during reception on the additional channel* **Yes**
- *Additional channel not sampled during reception on 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 Tx/Rx* **Yes**
- *The priority channel is channel 16 if there is no selection of the priority provide* **Yes**
- *Indication of both channels during scanning* **Yes**
- *Transmission in a transceiver inhibited during scanning* **Yes**
- *Automatic return of Rx/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 operating channel* **Yes**

5.8.3 SCANNING CHARACTERISTICS

- *Sampling period of the priority channel: 1.35 sec (limit < 2 sec)*	**Yes**
- *The Rx remains on the priority channel if a signal is detected on this*	**Yes**
- *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: 132ms (limit<150ms)*	**Yes**
- *Proper functioning of the Rx during scanning*	**Yes**
- *Listening period on the additional channel during the reception of a signal*	**Yes**
- *on the additional channel and in the absence of a signal on the priority*	**Yes**
- *channel: 1218 ms (limit>850ms)*	**Yes**
- *Indication of the channel on which a signal is being received*	**Yes**

SECTION 8 ENVIROMENTAL TEST RESULTS

VIBRATION TEST

Clause: 7.4

Definition: *This test determines the ability of the equipment to withstand vibration without resulting in mechanical weakness or degradation in performance.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301 025, clause 7.4.2.*

Results:

General conditions: *Equipment not suspended*
Date of test: *4th October 1998*
Temperature: *Tnom (20°C)*
Relative Humidity: *55%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel tested: *156.800MHz*

Note: *This test was previously carried out at KTL-Arnhem test laboratory on the Axis RT1400/DSC1400 transceiver unit. Due to the RD68 product of the same design specification e.g, chassis, Rx/Tx PCB and DSC circuitry, the test results shown below are provided from Test Report 97406432 Part 1 of 1 Axis RT1400/DSC1400.*

Vibration Direction	On 25w Setting		On 1w Setting		MUS	Resonance
	Output Power	Freq Error	Output Power	Freq Error	bit error rate	frequencies
X	*21.0*	*10Hz*	*0.7*	*15Hz*	*0 **	
Y	*21.0*	*18Hz*	*0.7*	*10Hz*	*0 **	*57Hz/Q=6.5*
Z	*21.0*	*18Hz*	*0.7*	*10Hz*	*0 **	
Measurement uncert	0.61db	9Hz	0.61db	9Hz	2.8db	

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

Complies: Yes

* = Performance check carried out at end of 2hr endurance test.

Limits:

Output power (25w) =	*between 6 - 25 watts*
Output power (1w) =	*between 0.1 - 1 watt*
Frequency error =	*< 1500 Hz*
MUS =	*1% bit error rate at 6dbuV*

Observations: No visable damage or deterioration.

Conclusion:

The EUT complies with the requirements of EN301 025 for vibration test. (Clause 7.4 EN 301-025)

DRY HEAT **Clause: 7.5.2**

Definition: *This test determines the ability of the equipment to be operated at high ambient temperatures and operate through temperature changes.*

Product: *RD68 VHF Radio with DSC & ATIS*
Method: *As per EN 301 025, clause 7.5.2.2.*
Results:
General conditions:
Date of test: *4th October 1998*
Temperature: *Tnom (20°C)*
(Maximum): *Tmax (55°C)*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel tested: *156.800MHz*

Note: *This test was previously carried out at KTL-Arnhem test laboratory on the Axis RT1400/DSC1400 transceiver unit. Due to the RD68 product of the same design specification e.g, chassis, Rx/Tx PCB and DSC circuitry, the test results shown below are provided from Test Report 97406432 Part 1 of 1 Axis RT1400/DSC1400.*

Performance Check	On 25w Setting		On 1w Setting		MUS
	Output Power	Freq Error	Output Power	Freq Error	bit error
	21.3	*348Hz*	*0.9*	*348Hz*	*0*

Limits: **Complies: Yes**

Output power (25w) =	*between 6 - 25 watts*
Output power (1w) =	*between 0.1 - 1 watt*
Frequency error =	*< 1500 Hz*
MUS =	*1% bit error rate at 6dbuV*

Observations: No visable damage or deterioration.

Conclusion:

The EUT complies with the requirements of EN301 025 for dry heat. (Clause 7.5.2 EN 301-025)

DAMP HEAT **Clause: 7.5.3**

Definition: *This test determines the ability of the equipment to be operated under conditions of high humidity.*

Product: *RD68 VHF Radio with DSC & ATIS*
Method: *As per EN 301 025, clause 7.5.3.2.*
Results:
General conditions:
Date of test: *4th October 1998*
Temperature: *Tnom (20°C)*
(Maximum): *Tmax (40°C)*
Relative Humidity: *Ambient to 93%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel tested: *156.800MHz*

Note: *This test was previously carried out at KTL-Arnhem test laboratory on the Axis RT1400/DSC1400 transceiver unit. Due to the RD68 product of the same design specification e.g, chassis, Rx/Tx PCB and DSC circuitry, the test results shown below are provided from Test Report 97406432 Part 1 of 1 Axis RT1400/DSC1400.*

Performance Check	On 25w Setting		On 1w Setting		MUS
	Output Power	Freq Error	Output Power	Freq Error	bit error
	20.8	70Hz	0.8	70Hz	0%

Limits: **Complies: *Test***

Output power (25w) =	*between 6 - 25 watts*
Output power (1w) =	*between 0.1 - 1 watt*
Frequency error =	*< 1500 Hz*
MUS =	*1% bit error rate at 6dbuV*

Observations: No visable damage or deterioration.

Conclusion:

The EUT complies with the requirements of EN301 025 for damp heat. (Clause 7.5.3 EN 301-025)

LOW TEMPERATURE **Clause: 7.5.4**

Definition: *This test determines the ability of the equipment to be operated at low temperatures. It also allows equipment to demonstrate an ability to start up at low temperatures.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301 025, clause 7.5.4.2.*

Results:

General conditions:

Date of test: *4th October 1998*

Temperature: *Tnom (20°C)*

(Minimum): *Tmin (-15°C)*

Rated power: *1 Watt / 25 Watts*

Supply: *Vnom (12V)*

Channel tested: *156.800MHz*

Note: *This test was previously carried out at KTL-Arnhem test laboratory on the Axis RT1400/DSC1400 transceiver unit. Due to the RD68 product of the same design specification e.g, chassis, Rx/Tx PCB and DSC circuitry, the test results shown below are provided from Test Report 97406432 Part 1 of 1 Axis RT1400/DSC1400.*

Performance Check	On 25w Setting		On 1w Setting		MUS
	Output Power	Freq Error	Output Power	Freq Error	bit error
	19.3	286Hz	0.5	286Hz	0

Limits: **Complies:** ***Test***

Output power (25w) =	*between 6 - 25 watts*
Output power (1w) =	*between 0.1 - 1 watt*
Frequency error =	*< 1500 Hz*
MUS =	*1% bit error rate at 6dbuV*

Observations: No visable damage or deterioration.

Equipment Used :

Equipment used refers to item numbers, specified in section 12	

Conclusion:

The EUT complies with the requirements of EN301 025 for low temperature. (Clause 7.5.4 EN 301-025)

SECTION 9 TRANSMITTER TEST RESULTS

TRANSMITTER FREQUENCY ERROR — Clause: 8.1

Definition: *The frequency error is the difference between the measured carrier frequency and its nominal value.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301 025, clause 8.1.2*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

(Maximum): *Tmax (55°C)*

(Minimum): *Tmin (-15°C)*

Relative Humidity: *32%*

Rated power: *1 Watt / 25 Watts*

Supply: *Vnom (12V)*

(upper extreme): *Vmax(15.6V)*

(lower extreme): *Vmin (10.8V)*

Channel tested: *156.800MHz*

TEST CONDITIONS		Frequency Error (Hz)	
		156.800 Mhz	
		Hi power	Lo power
Tnom (20°C)	Vnom (12V)	156.80004	156.80004
Tmax (55°C)	Vmin (10.8V)	156.79953	156.79952
	Vmax(15.6V)	156.79952	156.79952
Tmin (-15°C)	Vmin (10.8V)	156.80004	156.80011
	Vmax(15.6V)	156.80007	156.80008
Maximum Frequency Error (Hz)		70	110
Minimum Frequency Error (Hz)		-480	-480

Limits:

Absolute frequency error (Hz)	*<1500 Hz*	*<1500 Hz*	**Complies: *Yes***

Equipment Used :

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 20, 21*

Conclusion:

The EUT complies with the requirements of EN301 025 for transmitter frequency error. (Clause 8.1 EN 301-025)

CARRIER POWER **Clause: 8.2**

Definition: *The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301-025, clause 8.2.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

(Maximum): *Tmax (55°C)*

(Minimum): *Tmin (-15°C)*

Relative Humidity: *32%*

Rated power: *1 Watt / 25 Watts*

Supply: *Vnom (12V)*

(upper extreme): *Vmax(15.6V)*

(lower extreme): *Vmin (10.8V)*

Channels tested: *156.525MHz*
156.800MHz
162.975MHz

TEST CONDITIONS		OUTPUT POWER (Watts) on 25W setting			Pass/Fail
		155.025MHz	156.800MHz	162.975MHz	
Tnom (20°C)	Vnom (12V)	24.1	23.7	23.4	*Pass*
Tmax (55°C)	Vmin (10.8V)	19.6	19.3	17.3	*Pass*
	Vmax(15.6V)	22.5	22.7	22.6	*Pass*
Tmin (-15°C)	Vmin (10.8V)	21.5	21.9	19.5	*Pass*
	Vmax(15.6V)	22.2	22.3	22.4	*Pass*

TEST CONDITIONS		OUTPUT POWER (Watts) on 1W setting			Pass/Fail
		155.025MHz	156.800MHz	162.975MHz	
Tnom (20°C)	Vnom (12V)	0.6460	0.6380	0.6100	*Pass*
Tmax (55°C)	Vmin (10.8V)	0.675	0.687	0.708	*Pass*
	Vmax(15.6V)	0.671	0.695	0.708	*Pass*
Tmin (-15°C)	Vmin (10.8V)	0.509	0.525	0.570	*Pass*
	Vmax(15.6V)	0.518	0.542	0.569	*Pass*

Limits:

	Upper Limit	Lower Limit	Lo Limit(Extreme)
On 25W setting	25.0 Watts	17.7 Watts	12.5 Watts
On 1W setting	1	0.1	0.1

Complies: ***Yes***

Equipment Used :

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 20, 21*

Conclusion:

The EUT complies with the requirements of EN 301-025 for transmitter carrier power. (Clause 8.2 EN 301-025)

MAXIMUM PERMISSIBLE FREQUENCY DEVIATION **Clause: 8.3**

Definition: *Frequency deviation is the difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301-025, clause 8.3.2.1.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *1 Watt / 25 Watts*

Supply: *Vnom (12V)*

Channel tested: *156.800MHz*

Modulation Frequency (Hz)	Input Level	Limit	Maximum Deviation (kHz)		Pass/Fail
			25W Setting	1W Setting	
100	20db 3kHz	5.0kHz	1.300	1.280	*Pass*
200	20db 3kHz	5.0kHz	4.100	4.100	*Pass*
300	20db 3kHz	5.0kHz	4.600	4.600	*Pass*
400	20db 3kHz	5.0kHz	4.340	4.320	*Pass*
500	20db 3kHz	5.0kHz	4.460	4.430	*Pass*
1000	20db 3kHz	5.0kHz	4.610	4.600	*Pass*
1500	20db 3kHz	5.0kHz	4.560	4.570	*Pass*
2000	20db 3kHz	5.0kHz	4.630	4.620	*Pass*
2500	20db 3kHz	5.0kHz	4.300	4.290	*Pass*
3000	20db 3kHz	5.0kHz	3.600	3.600	*Pass*

Limits:

Maximum permissible frequency deviation less than <5 khz

Complies: ***Yes***

Equipment Used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22*

Conclusion:

The EUT complies with the requirements of EN 301-025 for maximum permissible frequency deviation. (Clause 8.3.2 EN 301-025)

REDUCTION OF FREQUENCY DEVIATION AT MODULATION FREQ ABOVE 3 kHz

Clause: 8.3.3

Definition: *As per clause 8.3.1.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301-025, clause 8.3.3.1.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *25.0 Watts*

Supply: *Vnom (12V)*

Channel tested: *156.800MHz*

Modulation Frequency	Input Level	Limit	Max Deviation	Pass/Fail
3000	3kHz	3.30	3.30	*Pass*
3100	3kHz	3.30	3.12	*Pass*
4000	3kHz	3.30	1.83	*Pass*
5000	3kHz	3.30	1.02	*Pass*
6000	3kHz	1.5kHz	0.60	*Pass*
8000	3kHz	.77kHz	0.25	*Pass*
10000	3kHz	.46kHz	0.14	*Pass*
12000	3kHz	.30kHz	0.04	*Pass*
15000	3kHz	.18kHz	0.02	*Pass*
20000	3kHz	.09kHz	0.02	*Pass*
25000	3kHz	.05kHz	0.01	*Pass*

Equipment Used:

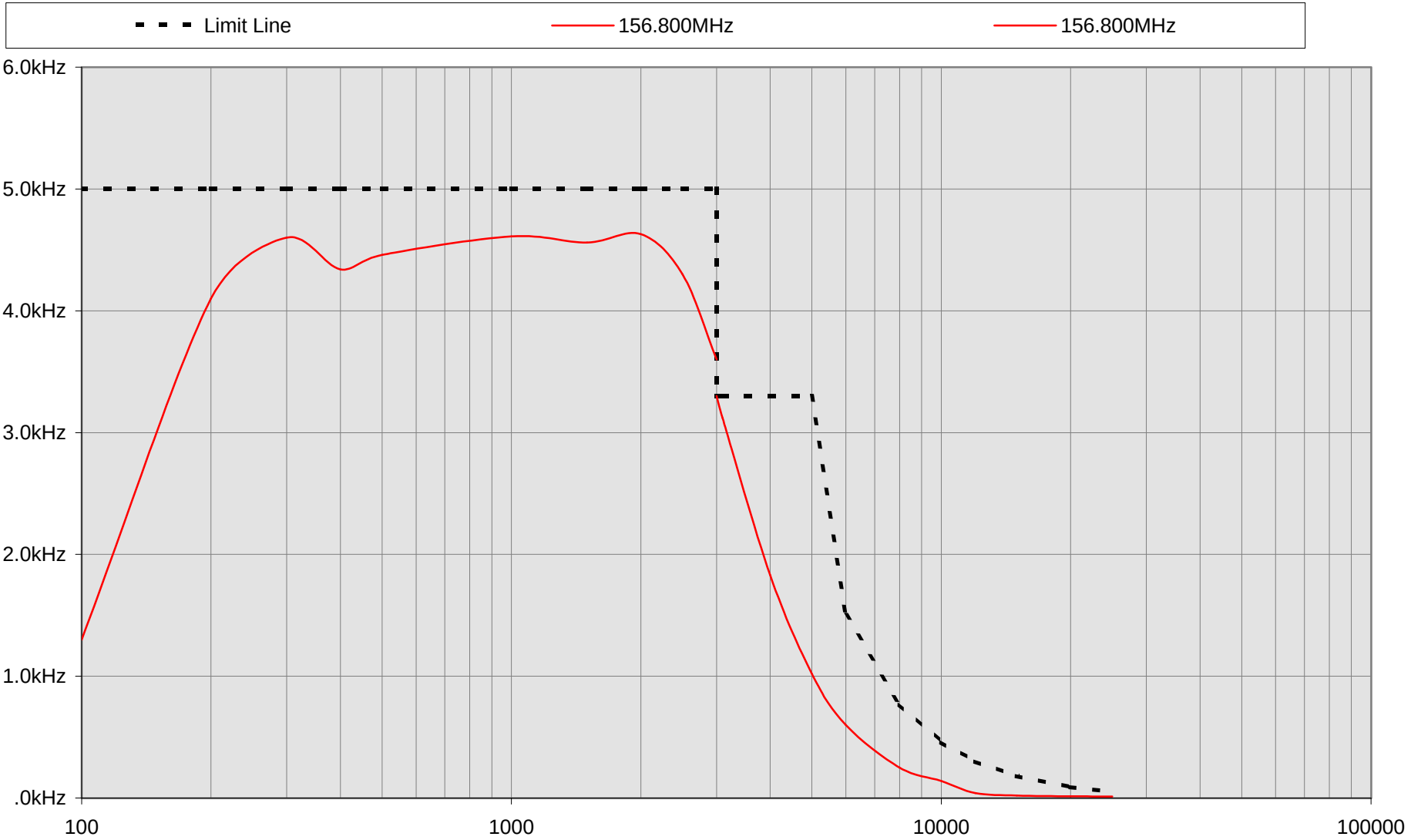
Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22*

Complies: ***Yes***

Conclusion:

The EUT complies with the requirements of EN 301-025 for reduction of frequency deviation. (Clause 8.3.3 EN 301-025)

Maximum Deviation - Transmit



SENSITIVITY OF THE MICROPHONE, INCLUDING MICROPHONE **CLAUSE: 8.4**

Definition: *This characteristic expresses the capability of the transmitter to produce sufficient modulation when an audio frequency signal corresponding to the normal speech level is applied to the microphone.*

Product: *RD68 VHF Radio with DSC & ATIS*

Method: *As per EN 301-025, clause 8.4.*

Results:

General conditions: *Sounfd source was applied to the RD68 fistmike.*
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel Tested: *156.800MHz*
Soundlevel: 94dba

Power	156.800MHz	Pass / Fail
High	2.28kHz	*Pass*
Low	2.27kHz	*Pass*

Limits:

Upper Limit:	*3.0kHz*
Lower Limit:	*1.5kHz*

Complies: *Yes*

Equipment Used:

Equipment used refers to item numbers, specified in section 12	*6, 21, 25*

Conclusion:

The EUT complies with the requirements of EN 301-025 for reduction of frequency deviation. (Clause 8.4 EN 301-025)

AUDIO FREQUENCY RESPONSE **CLAUSE: 8.5**

Definition: *The audio frequency response is the frequency deviation of the transmitter as a function of the modulating frequency.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.5.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *25.0 Watts*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Modulating Frequency	Upper Limit	Lower limit	Modulation Index (dB) relative. to 1 kHz	Pass / Fail
0.30	-9.5	-13.5	-10.9	*Pass*
0.50	-5.0	-9.0	-6.2	*Pass*
0.80	-0.9	-4.9	-2.1	*Pass*
1.00	0.0	0.0	0.0	*Pass*
1.50	4.5	0.5	4.1	*Pass*
1.80	6.1	2.1	5.8	*Pass*
2.00	7.0	3.0	6.8	*Pass*
2.50	9.0	5.0	8.6	*Pass*
3.00	10.5	6.5	9.0	*Pass*

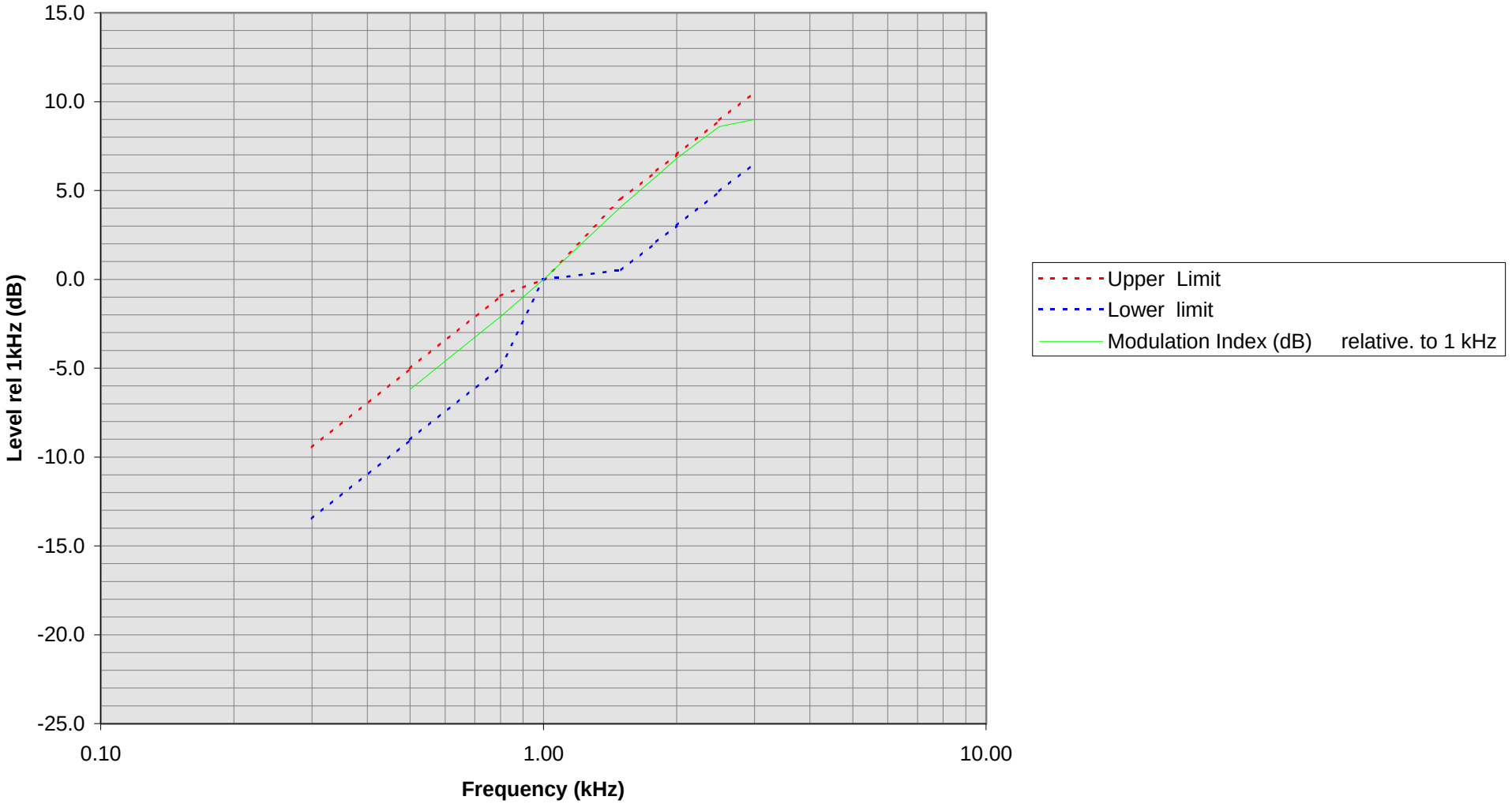
Equipment Used: **Complies: *Yes***

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22*

Conclusion:

The EUT complies with the requirements of EN 301-025 for audio frequency response. (Clause 8.5 EN 301-025)

Audio Frequency Response - Transmit



AUDIO FREQUENCY HARMONIC DISTORTION OF THE EMISSION

CLAUSE: 8.6

Definition: *The harmonic distortion of the emission modulated by any audio frequency signal is defined as the ratio, expressed as a percentage, of the root mean square (r.m.s) voltage of all the harmonic components of the fundamental frequency to the total r.m.s voltage of the signal after linear demodulation.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.5.2.*

Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
(Maximum): *Tmax (55°C)*
(Minimum): *Tmin (-15°C)*
Relative Humidity: *32%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
(upper extreme): *Vmax(15.6V)*
(lower extreme): *Vmin (10.8V)*
Channel Tested: *156.800MHz*

Test Conditions		Modulation Frequencies (Hz)	AF Distortion (%)	
Temperature	Voltage		1W Setting	25W Setting
Tnom (20°C)	Vnom (12V)	300	2.43	2.60
		500	2.10	2.17
		1000	2.90	2.94
Tmax (55°C)	Vmin (10.8V)	1000	2.81	2.82
	Vmax(15.6V)	1000	2.80	2.83
Tmin (-15°C)	Vmin (10.8V)	1000	3.14	3.64
	Vmax(15.6V)	1000	3.15	3.15
Pass/Fail			*Pass*	*Pass*

Limits:

	10%

Complies: ***Yes***

Equipment Used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 20, 21, 22*

Conclusion:

The EUT complies with the requirements of EN 301-025 audio frequency response. (Clause 8.5 EN 301-025)

TRANSMITTER ADJACENT CHANNEL POWER **CLAUSE: 8.7**

Definition: *The adjacent channel power is that part of the total power output of a transmitter under defined conditions of modulation, which falls within a specific passband, centred on the nominal frequency of either of the adjacent channels. This sum of the mean power produced by the modulation hum and noise of the transmitter.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.7.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *1 Watt / 25 Watts*

Supply: *Vnom (12V)*

Channel Tested: *155.025MHz*
156.800MHz
162.975MHz

Adjacent Channel	Adjacent Channel Power (dBc)						
	155.025MHz		156.800MHz		162.975MHz		Pass / Fail
	1W Setting	25W Setting	1W Setting	25W Setting	1W Setting	25W Setting	
Fn + 25kHz	-76.7	-79.3	-78.9	-74.3	-73	-78.3	*Pass*
Fn - 25kHz	-77.1	-79.5	-80.1	-77.2	-77.1	-78.6	*Pass*

Limits:

Adjacent Channel Power	*-70.0dB , but not less than : 0.2uW*	**Complies: *Yes***

Equipment Used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22*

Conclusion:

The EUT complies with the requirements of EN 301-025 for adjacent channel power. (Clause 8.7 EN 301-025)

CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA **CLAUSE: 8.8**

Definition: *Conducted spurious emissions are emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation and frequency conversion products, but exclude out of band emissions.*

Product: *RD68 VHF Radio with DSC.*
Method: *As per EN 301-025, clause 8.8.2.*
Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel Tested: *155.025MHz*
156.800MHz
162.975MHz

Frequency of Spurious Emissions (MHz)	155.025MHz		156.800MHz		162.975MHz		Pass / Fail
	1W Setting	25W Setting	1W Setting	25W Setting	1W Setting	25W Setting	
310.050	11.0nW	14.0nW					*Pass*
465.075	2.0nW	47.0nW					*Pass*
620.100	27.0nW	66.0nW					*Pass*
775.125	1.0nW	43.0nW					*Pass*
930.150	0.6nW	5.9nW					*Pass*
1085.175	0.1nW	0.9nW					*Pass*
1240.200	1.4nW	22.0nW					*Pass*
313.600			7.0nW	14.0nW			*Pass*
470.400			1.8nW	92.0nW			*Pass*
627.200			2.7nW	87.0nW			*Pass*
784.000			0.5nW	53.0nW			*Pass*
940.800			1.2nW	14.0nW			*Pass*
1097.600			0.5nW	2.4nW			*Pass*
1254.400			5.1nW	31.0nW			*Pass*
325.950					0.7nW	3.4nW	*Pass*
488.925					0.1nW	40.0nW	*Pass*
651.900					0.4nW	14.0nW	*Pass*
814.875					0.4nW	95.0nW	*Pass*
977.850					0.3nW	6.0nW	*Pass*
1140.825					0.2nW	2.1nW	*Pass*
1303.800					0.2nW	20.0nW	*Pass*

Limits:

	250.0nW

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*7, 9, 21, 22, 26, 27*

Conclusion:

The EUT complies with the requirements of EN 301-025 for spurious emissions conveyed to the antenna. (Clause 8.8 EN 301-025)

CABINET RADIATION AND CONDUCTED SPURIOUS EMISSIONS OTHER THAN THOSE CONVEYED TO THE ANTENNA **CLAUSE: 8.9**

Definition: *Cabinet radiation consists of emissions at frequencys, radiated by the equipment cabinet and structures. Conducted spurious emissions other than those conveyed to the antenna are emissions at frequencies , other than those of the carrier and the sideband components resulting from the wanted modulation process, which are produced by conduction in the wiring and accessories used with the equipment.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.9.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *1W / 25W Setting*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Results from this test can be found at section 13, Plot 1 - 4, showing all measured radiated transmitter spurious emissions in the required test frequency range.

Complies: ***Yes***

Limits:

Power of conducted spurious emissions in Tx standby:	< 2 nW
Power of conducted spurious emissions when Tx operational:	< 0.25uW

Equipment used:

Equipment used refers to item numbers, specified in section 12	*1, 3, 13, 16, 17,21, 27, 28, 29*

Conclusion:

The EUT complies with the requirements of EN 301-025 for Tx radiation and conduction emissions conveyed to the antenna. (Clause 8.9 EN 301-025)

TRANSMITTER TRANSIENT FREQUENCY BEHAVIOUR **CLAUSE: 8.10**

Definition: *The transient frequency behaviour of the transmiter is the variation in time of the transmitter difference from the nominal frequence of the transmitter when the RF output power is switch off.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.10.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *25W Setting*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Transient Period	Frequency Error (kHz)	Pass/Fail
t1	5	*Pass*
t2	0	*Pass*
>t2	0	*Pass*
t3	20	*Pass*

Limits: **Complies:** ***Yes***

Limit Period t1 (5ms) =	25.0kHz
Limit Period t2 (20ms) =	12.5kHz
Limit Period >t2 =	1.5kHz
Limit Period t3 (5ms) =	25.0kHz

Equipment used:

Equipment used refers to item numbers, specified in section 12	*4, 6, 9, 10, 20, 21, 22, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for transient frequency behaviour of the transmitter. (Clause 8.10 EN 301-025)

RESIDUAL MODULATION OF THE TRANSMITTER **CLAUSE: 8.11**

Definition: *The residual modulation of the transmitter is the ratio, in db, of the demodulated RF signal in the absence of wanted modulation, to the demodulated RF signal produced when the normal test modulation is applied.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.11.2.*

Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Rated power: *25.0 Watts*
Supply: *Vnom (12V)*
Channel Tested: *156.800MHz*

Residual Modulation (dB)	156.800MHz	Pass/Fail
	-42	*Pass*

Limit:

Residual modulation shall not exceed	*-40.0dB*	**Complies: *Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22*

Conclusion:

The EUT complies with the requirements of EN 301-025 for residual modulation of the transmitter. (Clause 8.11 EN 301-025)

FREQUENCY ERROR (demodulated DSC signal) **CLAUSE: 8.12**

Definition: *The frequency error for the B- and Y-state is the difference between the measured frequency from the demodulator and the nominal values.*

Product: *RD68 VHF Radio with DSC.*
Method: *As per EN 301-025, clause 8.12.1.*
Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
(Maximum): *Tmax (55°C)*
(Minimum): *Tmin (-15°C)*
Relative Humidity: *32%*
Rated power: *25.0 Watts*
Supply: *Vnom (12V)*
(upper extreme): *Vmin (10.8V)*
(lower extreme): *Vmax(15.6V)*

B-state		Wanted	Tolerance	Value	Pass/Fail
Tnom (20°C)	*Vnom (12V)*	2100	10Hz	2099.7	*Pass*
Tmax (55°C)	*Vmin (10.8V)*	2100	10Hz	2099.8	*Pass*
	Vmax(15.6V)	2100	10Hz	2099.1	*Pass*
Tmin (-15°C)	*Vmin (10.8V)*	2100	10Hz	2099.8	*Pass*
	Vmax(15.6V)	2100	10Hz	2099.1	*Pass*

Y-state		Wanted	Tolerance	Value	Pass/Fail
Tnom (20°C)	*Vnom (12V)*	1300	10Hz	1301.0	*Pass*
Tmax (55°C)	*Vmin (10.8V)*	1300	10Hz	1300.3	*Pass*
	Vmax(15.6V)	1300	10Hz	1300.7	*Pass*
Tmin (-15°C)	*Vmin (10.8V)*	1300	10Hz	1300.9	*Pass*
	Vmax(15.6V)	1300	10Hz	1300.6	*Pass*

Limit:

	(+/-)10Hz

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 21, 22, 31*

Conclusion:

The EUT complies with the requirements of EN 301-025 for frequency error (demodulated DSC signal) (Clause 8.12 EN 301-025)

MODULATION INDEX FOR DSC **CLAUSE: 8.13**

Definition: *This test measures the modulation index in the B and Y states.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.13.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *25.0 Watts*

Supply: *Vnom (12V)*

Modulation Index	Pattern	Freq (Hz)	Dev (Hz)	Pass/Fail
	B-state	2100	3880	Pass
	Y-state	1300	2820	Pass

Limits:

The mod index shall be	2 (+/- 10 %)	**Complies: *Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 21*

Conclusion:

The EUT complies with the requirements of EN 301-025 for modulation index for DSC. (Clause 8.13 EN 301-025)

MODULATION RATE FOR DSC **CLAUSE: 8.14**

Definition: *The modulation rate is the bit stream speed measured in bits per second.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.14.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Rated power: *25.0 Watts*

Supply: *Vnom (12V)*

Modulation Rate	Wanted	Value	Error (ppm)	Pass/Fail
	600	600.0110	18	*Pass*

Limits:

The frequency shall be 600 Hz and (+/-):	*30 (ppm)*

Complies: *Yes*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 21, 22, 31*

Conclusion:

The EUT complies with the requirements of EN 301-025 for modulation rate for DSC. (Clause 8.14 EN 301-025)

TESTING OF GENERATED CALL SEQUENCES **CLAUSE: 8.15**

Definition: *Generated call sequences are calls which comply with the requirements of* ITU-R recommendation M.493-9(5).

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 8.15.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (°C)*

Relative Humidity: *32%*

Rated power: *25.0 Watts*

Supply: *Vnom (12V)*

Testing of generated call sequences

Format Specifier	Category	Received OK?	Required Return Channel	OK?
Distress		Yes	16	Yes
All Ships	Urgency	Yes	Working	Yes
All Ships	Safety	Yes	Working	Yes
Individual	Routine	Yes	Working	Yes
Group	Routine	Yes	Working	Yes

Complies: *Yes*

Limits:

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However in the case of a distress call the transmitter shall tune to channel 16 and automatically select the maximum power.

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 21, 22, 23*

Conclusion:

The EUT complies with the requirements of EN 301-025 for generated call sequences. (Clause 8.14 EN 301-025)

SECTION 10 RECEIVER TEST RESULTS

RECEIVER HARMONIC DISTORTION AND RATED AUDIO FREQUENCY OUTPUT POWER

CLAUSE: 9.1

Definition: *The harmonic distortion at the reciever output is defined as the ratio, expressed as a percentage, of the total r.m.s voltage of the signal delivered by the reciever. The rated audio frequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of the present document are met.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.1.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*
Earphone = >2mW @ 300 ohms

TEST CONDITIONS				At Loudspeaker		At Earphone	
		Signal Level (dBuV)	Fmod (Hz)	Pout (watts)	Dist (%)	Pout (mW)	Dist (%)
Tnom (20°C)	Vnom (12V)	60	300	>6	0.98	>2	4.27
			500	>6	1.96	>2	4.03
			1000	>6	4.06	>2	5.13
		100	300	>6	0.93	>2	7.5
			500	>6	2.05	>2	6.9
			1000	>6	4.03	>2	7.9
			Pass/Fail	*Pass*	*Pass*	*Pass*	*Pass*

Limits:

	At Earphone	At Loudspeaker
AF Outpuit Power	*>2 Watts*	*>1 mW*
AF Harmonic Distortion	*<10 %*	*<10 %*

Complies: Yes

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 2 x 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for harmonic distortion and rated audio-frequency output power. (Clause 9.1 EN 301-025)

RECEIVER AUDIO FREQUENCY RESPONSE **CLAUSE: 9.2**

Definition: *The audio frequency response is defined as the variation in the recievers audio frequency output level as a function of the modulation frequency of the radio frequency signal with constant deviation applied to its input.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.2.2.*

Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel Tested: *156.800MHz*
Rated AF output power: *50 % of rated loudspeaker output.*

Modulating Frequency (Hz)	Upper Limit (db)	Lower Limit (db)	Relative Audio Power			Maximum Level	Minimum Level	Pass/Fail
			Fn (db)	Fn (-1.5kHz)	Fn (+1.5kHz)			
0.30	11.5	7.5	8.7	8.6	8.9	8.9	8.6	*Pass*
0.50	7.0	3.0	5.4	5.3	5.6	5.6	5.3	*Pass*
0.80	2.9	-1.1	1.8	1.8	1.9	1.9	1.8	*Pass*
1.00	1.0	-3.0	0.0	0.0	0.0	0.0	0.0	*Pass*
1.50	-2.5	-6.5	-3.4	-3.3	-3.7	-3.3	-3.7	*Pass*
2.00	-5.0	-9.0	-5.9	-5.6	-6.5	-5.6	-6.5	*Pass*
3.00	-8.5	-12.5	-9.5	-9.0	-11.2	-9.0	-11.2	*Pass*

Complies: *Yes*

Limits:

The audio frequency response shall not deviate by more than +1 db or -3 db, from the characteristic giving the output level as a function of the audio frequency, decreasing by 6 db per octave and passing through the measured point of 0 db at 1 kHz.

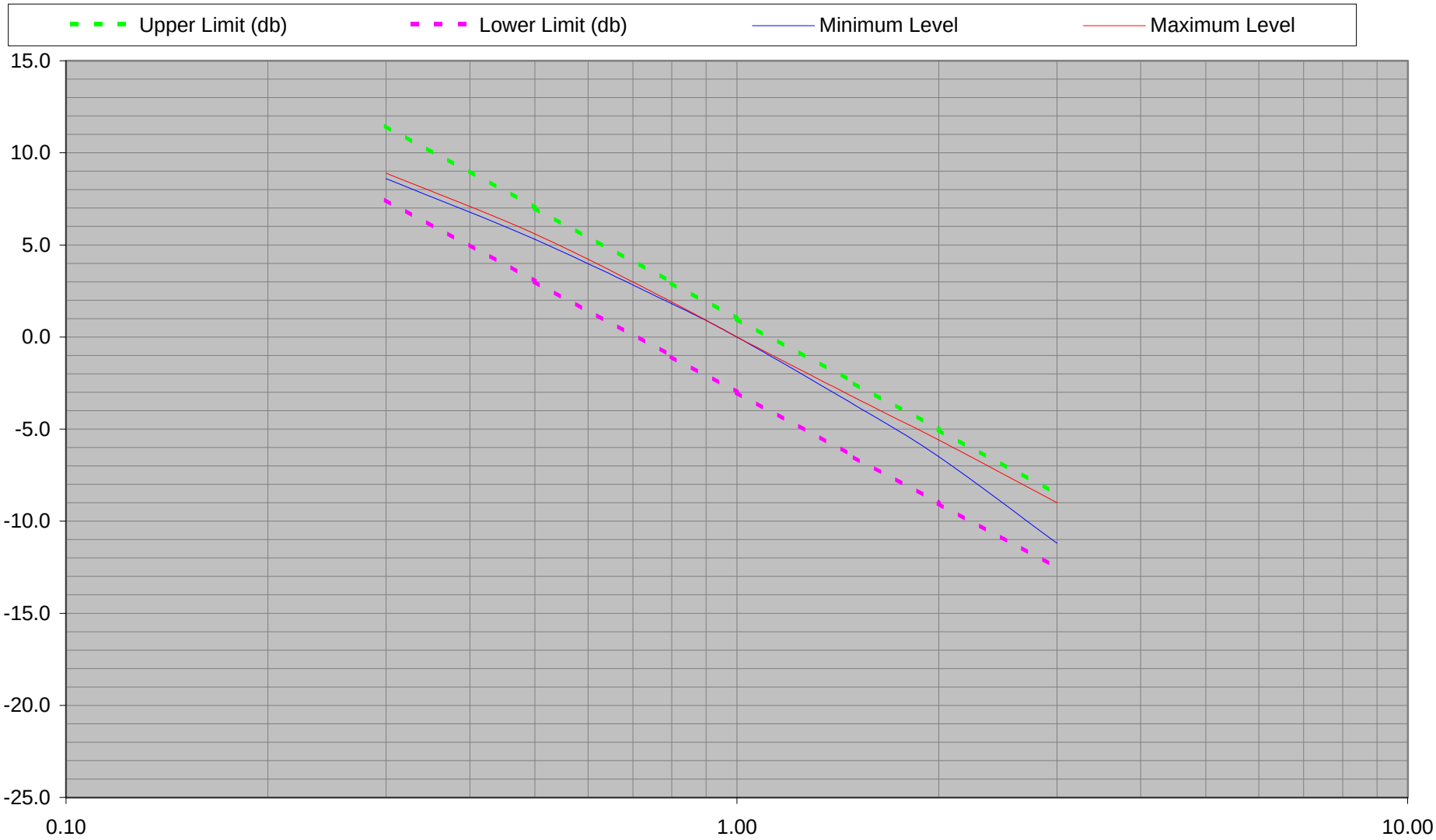
Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 2 x 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for audio frequency response. (Clause 9.2 EN 301-025)

AF Frequency Response - Receive



RECEIVER MAXIMUM USEABLE SENSITIVITY

CLAUSE: 9.3

Definition: *The maximum usable sensitivity of the reciever is the minimum level of the signal (e.m.f) at the nominal frequency of the reciever which, when applied to the reciever input with normal test modulation (subclause 6.3, EN 301-025), will produce:*

- in all cases, an audio frequency output equal to 50 % of the rated o/p power.

- a signal & noise & distortion (SINAD) ratio of 20 dB, measured at the reciever output, through a psophometric telephone filtering network.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.3.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

(Maximum): *Tmax (55°C)*

(Minimum): *Tmin (-15°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

(upper extreme): *Vmax(15.6V)*

(lower extreme): *Vmin (10.8V)*

Channel Tested: *156.800MHz*

Rated AF output power: *50 % of rated loudspeaker output.*

TEST CONDITIONS		Receiver Sensitivity (dbuV)	Pass/Fail
Tnom (20°C)	Vnom (12V)	-3.0	*Pass*
Tmax (55°C)	Vmin (10.8V)	-1.0	*Pass*
	Vmax(15.6V)	-1.5	*Pass*
Tmin (-15°C)	Vmin (10.8V)	-4.0	*Pass*
	Vmax(15.6V)	-3.5	*Pass*

Limits:

Limit under normal conditions =	*6 dBuV*
Limit under extreme conditions =	*12 dBuV*

Complies: Yes

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 20, 21, 2 x 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for maximum usable sensitivity. (Clause 9.3 EN 301-025)

RECEIVER CO - CHANNEL REJECTION RATIO **CLAUSE: 9.4**

Definition: *The co-channel rejection is a measure of the capability of the reciever to receive a wanted modulated signal, without exceeding a given degradation due to the presence of an unwanted modulated signal. Both signals being at the nominal frequency of the reciever.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.4.2.*

Results:

General conditions:
Date of test: *27th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel Tested: *156.800MHz*
Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Frequency of Unwanted Signal	Rejection Ratio (dB)	Pass/Fail
Fn + 3kHz	-4.5	Pass
Fn	-5.5	Pass
Fn - 3kHz	-7.5	Pass

Complies: Yes

Limits:

Limit (upper) =	0.0dB
Limit (lower) =	-10.0dB

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 20, 21, 2 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for co-channel rejection.
(Clause 9.4 EN 301-025)

RECEIVER ADJACENT CHANNEL SELECTIVITY **CLAUSE: 9.5**

Definition: *The reciever adjacent channel selectivity is a measure of the capability of the reciever to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, which differs in frequency from the wanted signal by 25kHz.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.5.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

(Maximum): *Tmax (55°C)*

(Minimum): *Tmin (-15°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

(upper extreme): *Vmax(15.6V)*

(lower extreme): *Vmin (10.8V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Test Conditions		Ratio of Unwanted to Wanted Signal (dB)		
		Fn + 25kHz	Fn - 25kHz	Pass/Fail
Tnom (20°C)	Vnom (12V)	89.0	89.2	*Pass*
Tmin (-15°C)	Vmax(15.6V)	78.0	75.0	*Pass*
	Vmin (10.8V)	79.0	75.0	*Pass*
Tmax (55°C)	Vmax(15.6V)	72.0	69.2	*Pass*
	Vmin (10.8V)	73.0	70.0	*Pass*

Limits:

Limit under normal conditions =	(no less than)	*70.0dB*
Limit under extreme conditions =	(no less than)	*60.0dB*

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 11, 20, 21, 2 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for adjacent channel selectivity. (Clause 9.5 EN 301-025)

SPURIOUS RESPONSE REJECTION RATIO **CLAUSE: 9.6**

Definition: *The spurious response rejection is the capability of the reciever to discriminate between the wanted modulated signal at the nominal frequency, and an unwanted signal at any other frequency at which a response is obtained.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.6.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Frequency of Spurious Responses (Mhz)	Relationship	Ratio (dB)	Pass / Fail
21.4	IF	73	Pass
-42.800	Image	94	Pass
-10.700	"Half IF"	94	Pass
160.025	2nd Rx LO	74	Pass
2nd Receiver - informative only			
17.9	IF		
138.625	Image		
147.575	"Half IF"		
153.300	1st Rx LO		

Limits:

Reciever spurious response rejection ratio	*70.0dB*

Complies: Yes

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 20, 21, 2 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for spurious response rejection. (Clause 9.6 EN 301-025)

RECEIVER INTERMODULATION RESPONSE **CLAUSE: 9.7**

Definition: *The intermodulation response is a measure of the capability of a reciever to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.7.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Frequency of Unwanted Signal	Rejection Ratio (dB)	Pass/Fail
Upper Side	73.3	*Pass*
Lower side	73.1	*Pass*

Complies: Yes

Limits:

Reciever Intermodulation Response Ratio:	*68.0dB*

Equipment used:

Equipment used refers to item numbers, specified in section 10	*6, 4, 5, 9, 12, 20, 21, 4 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for intermodulation response. (Clause 9.7 EN 301-025)

RECEIVER BLOCKING OR DESENSITISATION **CLAUSE: 9.8**

Definition: *Blocking is a change (generally a reduction) in the wanted output power of the reciever or a reduction of the SINAD ratio due to an unwanted signal on another frequency.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.8.2.*

Results:

General conditions:
Date of test:
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel Tested: *156.800MHz*
Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Frequency of Unwanted Signal	Rejection Ratio (dB)	Pass/Fail
Fn + 10MHz	91.5	*Pass*
Fn + 5MHz	91	*Pass*
Fn + 2MHz	90.5	*Pass*
Fn + 1 MHz	90	*Pass*
Fn - 1MHz	90	*Pass*
Fn - 2MHz	91	*Pass*
Fn - 5MHz	92	*Pass*
Fn - 10Mhz	92	*Pass*

Complies: ***Yes***

Limits:

Blocking level	*90 dBuV*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 20, 21, 2 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for blocking or desensitization. (Clause 9.8 EN 301-025)

RECEIVER CONDUCTED SPURIOUS EMISSIONS **CLAUSE: 9.9**

Definition: *Spurious emissions from the reciever are components at any frequency, present at the reciever input port. The level of spurious emissions shall be as the power level at the antenna.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.9.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Frequency of Spurious Emissions	Spurious Emission Level (nW)	Pass / Fail
135.4	0.014	*Pass*
270.8	0.002	*Pass*
406.2	0.004	*Pass*
541.6	0.003	*Pass*
677	0.0001	*Pass*
812.4	0.0001	*Pass*
947.8	0.0001	*Pass*

Limits:

Spurious emission power shall not exceed:	*2.0nW*

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*7, 9, 21*

Conclusion:

The EUT complies with the requirements of EN 301-025 for conducted spurious emissions. (Clause 9.9 EN 301-025)

RECEIVER RADIATED SPURIOUS EMISSIONS **CLAUSE: 9.10**

Definition: *Radiated spurious emissions from the reciever, are components at any frequency radiated by the equipment cabinet and structure.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.10.2.*

Results:

General conditions:

Date of test:

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *Loudspeaker = 6 W @ 4 ohms*

Results from this test can be found at section 13, Plot 5 - 6, showing all measured radiated transmitter spurious emissions in the required test frequency range.

Limits: **Complies: *Yes***

Spurious emission power shall not exceed:	*2.0nW*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*1, 3, 13, 16, 17*

Conclusion:

The EUT complies with the requirements of EN 301-025 for radiated spurious emissions. (Clause 9.10 EN 301-025)

RECEIVER RESIDUAL NOISE LEVEL **CLAUSE: 9.11**

Definition: *The reciever residual noise level is defined as the ratio, in db, of the audio-frequency power of the noise and hum, resulting from spurious effects of the power supply system or from other causes to the audio-frequency power produced by a high-frequency signal of average level, modulated by the normal test modulation and applied to the reciever input.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.11.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: 6 Watts @ 4 Ohms

Hum and Noise level(dB)		Pass/Fail
	-53.4dB	*Pass*

Complies: ***Yes***

Limits:

The receiver residual noise level shall not exceed	*-40.0dB*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for reciever noise and hum level. (Clause 9.11 EN 301-025)

RECEIVER SQUELCH OPERATION **CLAUSE: 9.12**

Definition: *The purpose of the squelch facility is to mute the reciever audio output signal when the level of the signal at the reciever input is less than a given value.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.12.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: 6 Watts @ 4 Ohms

	Results	Pass/Fail
Relative Output Power (dB)	-58.2	*Pass*
SINAD (dB)	24.4	*Pass*
Input Level (dBuV)	-107	*Pass*

Limits: **Complies:** ***Yes***

AF Output power limit (method a) =	-40.0dB
Input level limit =	6 dBuV
SINAD Limit =	20.0dB

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for squelch operation.
(Clause 9.12 EN 301-025)

RECEIVE SQUELCH HYSTERESIS **CLAUSE: 9.13**

Definition: *Squelch hysteresis is the difference in db, between the reciever input signal levels at which the squelch opens and closes.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.13.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: 6 Watts @ 4 Ohms

	Input Level (dBuV)	Pass/Fail
Squelch Open	-107.0	
Squelch Closed	-111.5	
Difference (dB)	4.5	*Pass*

Limits:

Upper Limit =	6.0dB
Lower Limit =	3.0dB

Complies: Yes

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 20, 21, 22, 24*

Conclusion:

The EUT complies with the requirements of EN 301-025 for squelch hysteresis. (Clause 9.13 EN 301-025)

RECEIVER MULTIPLE WATCH CHARACTERISTIC **CLAUSE: 9.14**

Definition: *The scanning period is the time between the start of two successive samples of the priority channel in the absence of a signal on that channel. The dwell time on the priority channel is the time between the start and finish of any sample of the priority channel in the absence of a signal on that channel. The dwell time on the additional channel is the time between the start and finish of any sample of the additional channel.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 9.14.2.*

Results:

General conditions:

Date of test: *27th March 2000*

Temperature: *Tnom (20°C)*

Relative Humidity: *32%*

Supply: *Vnom (12V)*

Channel Tested: *156.800MHz*

Rated AF output power: *6 Watts @ 4 Ohms*

Test Conditions		Scan Period	Dwell Time Fp	Dwell Time Fa	Pass/Fail
Tnom (20°C)	Vnom (12V)	1.350S	132.0mS	1.218S	*Pass*
Tmin (-15°C)	Vmax(15.6V)	1.388S	138.0mS	1.250S	*Pass*
	Vmin (10.8V)	1.380S	130.0mS	1.250S	*Pass*
Tmax (55°C)	Vmax(15.6V)	1.370S	130.0mS	1.240S	*Pass*
	Vmin (10.8V)	1.380S	128.0mS	1.252S	*Pass*

Limits:

Limit of scan period =	2.0S
Limit of dwell period (Fp) =	150.0mS
Limit of dwell time (Fa) =	850.0mS

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*4, 6, 9, 10, 20, 21, 2 x 22, 24, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for multiple watch characteristic. (Clause 9.14 EN 301-025)

SECTION 11 DSC 2ND RECEIVER TEST RESULTS

MAXIMUM USABLE SENSITIVITY (DSC Reciever) CLAUSE: 10.1

Definition: *The maximum usable sensitivity of the reciever is the minimum level of the signal (e.m.f) at the nominal frequency of the reciever, which when applied to the reciever input with a test modulation will produce a bit error ratio of 10 x 10(-2)*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.1.2.*

Results:

General conditions: *To detect a bit error, 10 successive DSC messages shall be sent to the EUT, and be successfully decoded with no errors present.*

Date of test: *28th March 2000*

Temperature: *Tnom (20°C)*

(Maximum): *Tmax (55°C)*

(Minimum): *Tmin (-15°C)*

Relative Humidity: *34%*

Supply: *Vnom (12V)*

(upper extreme): *Vmax(15.6V)*

(lower extreme): *Vmin (10.8V)*

Channel Tested: *156.525MHz*

Test Conditions		Carrier Frequency	Input Level (dBuV)	Bit error ratio	Pass / Fail
Tnom (20°C)	Vnom (12V)	Fn	0	1.0%	*Pass*
		Fn + 1.5kHz	0	1.0%	*Pass*
		Fn - 1.5kHz	0	1.0%	*Pass*
Tmin (-15°C)	Vmax(15.6V)	Fn	6	1.0%	*Pass*
	Vmin (10.8V)	Fn	6	1.0%	*Pass*
Tmax (55°C)	Vmax(15.6V)	Fn	6	1.0%	*Pass*
	Vmin (10.8V)	Fn	6	1.0%	*Pass*

Limits:

The bit error ratio shall be equal to or less than 1 %

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 11, 21, 22, 23*

Conclusion:

The EUT complies with the requirements of EN 301-025 for DSC maximum usable sensitivity. (Clause 10.1 EN 301-025)

CO-CHANNEL REJECTION (DSC Receiver) **CLAUSE: 10.2**

Definition: *The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal, without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.*

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.2.1.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *34%*
Supply: *Vnom (12V)*
Channel Tested: *156.525MHz*

Test Conditions		Input level of unwanted	Frequency of unwanted signal	Bit error ratio	Pass / Fail
Tnom (20°C)	Vnom (12V)	-5dBuV	fn - 3.0kHz	1.0%	*Pass*
			fn	1.0%	*Pass*
			fn + 3.0kHz	1.0%	*Pass*

Limits:

The bit error ratio shall be equal to or less than 1 %

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*4, 6, 9, 21, 22, 23, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for DSC Co-Channel rejection. (Clause 10.2 EN 301-025)

ADJACENT CHANNEL SELECTIVITY (DSC Receiver) **CLAUSE: 10.3**

Definition: The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal, without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted by 25kHz.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.3.2.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
(Maximum): *Tmax (55°C)*
(Minimum): *Tmin (-15°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
(upper extreme): *Vmax(15.6V)*
(lower extreme): *Vmin (10.8V)*
Channel tested: *156.525MHz*

Test Conditions		Unwanted signal freq	Unwanted I/p level (dbuV)	Wanted I/p level (dbuV)	Bit error ratio	Pass/Fail
Tnom (20°C)	Vnom (12V)	fn + 25kHz	73	3	1.0%	Pass
		fn - 25kHz	73	3	1.0%	Pass
Tmin (-15°C)	Vmax(15.6V)	fn + 25kHz	63	9	1.0%	Pass
		fn - 25kHz	63	9	1.0%	Pass
	Vmin (10.8V)	fn + 25kHz	63	9	1.0%	Pass
		fn - 25kHz	63	9	1.0%	Pass
Tmax (55°C)	Vmax(15.6V)	fn + 25kHz	63	9	1.0%	Pass
		fn - 25kHz	63	9	1.0%	Pass
	Vmin (10.8V)	fn + 25kHz	63	9	1.0%	Pass
		fn - 25kHz	63	9	1.0%	Pass

Limits:

The bit error ratio shall be equal to or less than 1 %

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 11, 21, 22, 23, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for DSC adjacent channel selectivity. (Clause 10.3 EN 301-025)

SPURIOUS RESPONSE AND BLOCKING IMMUNITY (DSC Receiver) **CLAUSE: 10.4**

Definition: The spurious response and blocking immunity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal with frequencies outside the pass band of the receiver.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.4.2.*

Results:

General conditions:

Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Rated power: *1 Watt / 25 Watts*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Frequency of Spurious Responses	Relationship	Unwanted Level	Bit error ratio limit	Pass / Fail
	Spurii			
17.900MHz	First IF	73 dBuV	1.0%	*Pass*
120.725MHz	Image	73 dBuV	1.0%	*Pass*
147.575MHz	"1/2 IF"	73 dBuV	1.0%	*Pass*
153.300MHz	First Rx LO	73 dBuV	1.0%	*Pass*
	Blocking			
166.525MHz	fn + 10Mhz	93 dBuV	1.0%	*Pass*
161.525MHz	fn + 5Mhz	93 dBuV	1.0%	*Pass*
158.525MHz	fn + 2Mhz	93 dBuV	1.0%	*Pass*
157.525MHz	fn + 1Mhz	93 dBuV	1.0%	*Pass*
155.525MHz	fn - 1Mhz	93 dBuV	1.0%	*Pass*
154.525MHz	fn - 2Mhz	93 dBuV	1.0%	*Pass*
151.525MHz	fn - 5Mhz	93 dBuV	1.0%	*Pass*
146.525MHz	fn - 10 Mhz	93 dBuV	1.0%	*Pass*

Limits:

The bit error ratio shall be equal to or less than 1 %	**Complies: *Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 4, 9, 21, 22, 23, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for DSC spurious and blocking immunity. (Clause 10.4 EN 301-025)

INTERMODULATION RESPONSE (DSC Receiver) **CLAUSE: 10.5**

Definition: The intermodulation response is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specifec frequency relationship to the wanted signal frequency.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.5.2.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Frequency of Unwanted Signal		Bit error ratio limit	Pass/Fail
Upper Side	fn+50,+100kHz	1.0%	Pass
Lower side	fn-50,-100kHz	1.0%	Pass

Limits:

The bit error ratio shall be equal to or less than 1 %

Complies: ***Yes***

Equipment used:

Equipment used refers to item numbers, specified in section 12	*4, 5, 6, 9, 12, 21, 3 x 22, 23, 30*

Conclusion:

The EUT complies with the requirements of EN 301-025 for intermodulation response. (Clause 10.5 EN 301-025)

DYNAMIC RANGE (DSC Receiver) **CLAUSE: 10.6**

Definition: The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the bit error ratio in the output of the decoder does not exceed a specified value.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.6.2.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Dynamic Range	Bit error ratio limit	Pass/Fail
	1.0%	*Pass*

Limits:

The bit error ratio shall be equal to or less than 1 %	**Complies: Yes**

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 21, 22, 23*

Conclusion:

The EUT complies with the requirements of EN 301-025 for DSC dynamic range. (Clause 10.6 EN 301-025)

SPURIOUS CONDUCTED EMISSIONS (DSC Receiver) **CLAUSE: 10.7**

Definition: Spurious emissions from the receiver are components at any frequency, present at the receiver input port. The level of spurious emissions shall be measured as the power level at the antenna.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.7.2.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Frequency of Spurious Emissions	Spurious Emission Level (nW)	Pass / Fail
138.625	0.0001	*Pass*
277.25	0.0001	*Pass*
415.875	0.0160	*Pass*
554.5	0.0010	*Pass*
693.125	0.0084	*Pass*
831.75	0.0037	*Pass*
970.375	0.0028	*Pass*

Limits:

Spurious emission power shall not exceed:	*2.0nW*

Complies: *Yes*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*7, 9, 21*

Conclusion:

The EUT complies with the requirements of EN 301-025 for conducted spurious emissions. (Clause 10.7 EN 301-025)

RADIATED SPURIOUS EMISSIONS (DSC Receiver) **CLAUSE: 10.8**

Definition: Radiated spurious emissions from the receiver are components at any frequency radiated by the equipment cabinet and structure.

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.8.2.*

Results:

General conditions:
Date of test: *28th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Results from this test can be found at section 13, Plot 5 - 6, showing all measured radiated spurious emissions in the required test frequency range.

Limits: **Complies: *Yes***

purious emission power shall not exceed:	*2.0nW*

Equipment used:

Equipment used refers to item numbers, specified in section 12	*1, 3, 13, 16, 17*

Conclusion:

The EUT complies with the requirements of EN 301-025 for radiated spurious emissions. (Clause 10.8 EN 301-025)

VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS

CLAUSE: 10.9

Definition: DSC calls sequences are calls that comply with ITU-R recommendation M.493-9 (5).

Product: *RD68 VHF Radio with DSC.*

Method: *As per EN 301-025, clause 10.9.2.*

Results:

General conditions:
Date of test: *30th March 2000*
Temperature: *Tnom (20°C)*
Relative Humidity: *32%*
Supply: *Vnom (12V)*
Channel tested: *156.525MHz*

Format Specifier	Category	Type	Requested Channel	Received OK?	Set to Channel OK?	Pass / Fail
Distress		F3E/G3E	16	Yes	Yes	*Pass*
All Ships	Distress	Distress Ack	-	Yes	Yes	*Pass*
All Ships	Distress	Distress Relay	-	Yes	Yes	*Pass*
All Ships	Urgency	F3E/G3E	16	Yes	Yes	*Pass*
All Ships	Safety	F3E/G3E	06	Yes	Yes	*Pass*
Individual	Urgency	F3E/G3E	16	Yes	Yes	*Pass*
Individual	Safety	F3E/G3E	08	Yes	Yes	*Pass*
Individual	Routine	F3E/G3E	08	Yes	Yes	*Pass*
Group	Routine	F3E/G3E	06	Yes	Yes	*Pass*

Limits: **Complies: Yes**

The decoded call sequences at the output of the receiver shall be examined for correct technical format, including error-check characters. The EUT shall be capable of switching to a channel identified in the DSC call.

Equipment used:

Equipment used refers to item numbers, specified in section 12	*6, 9, 21, 22, 23*

Conclusion:

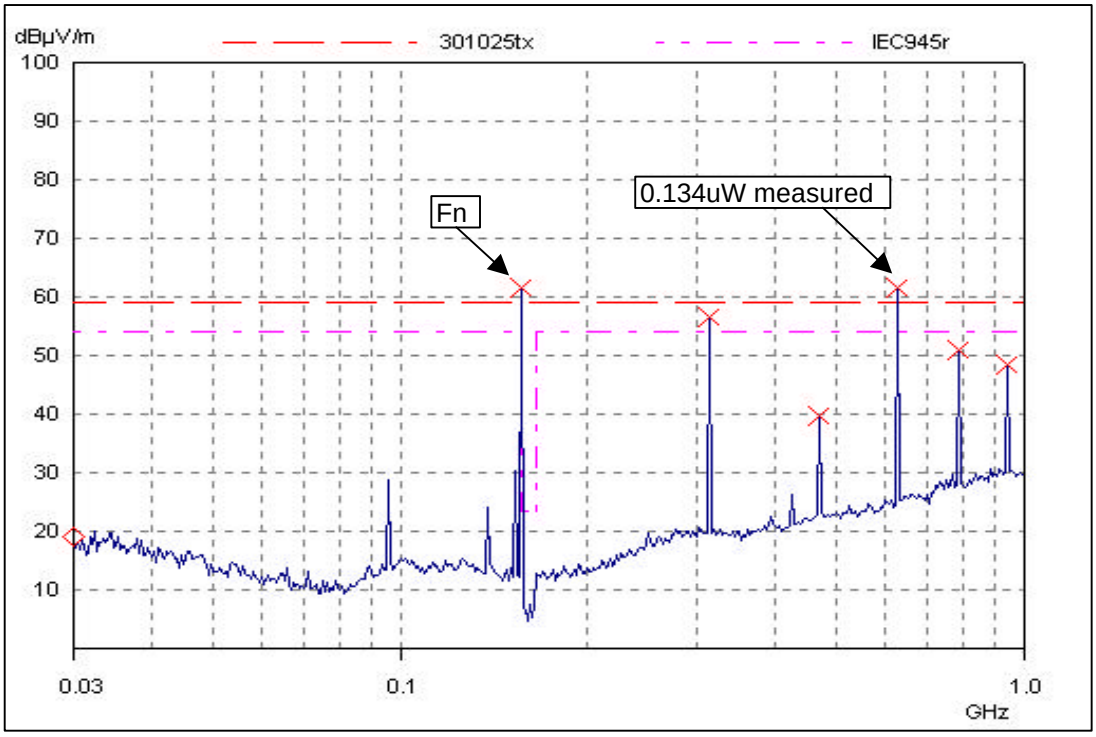
The EUT complies with the requirements of EN 301-025 for verification of correct . decoding of various types of DSC. (Clause 10.9 EN 301-025)

SECTION 12 EQUIPMENT LIST

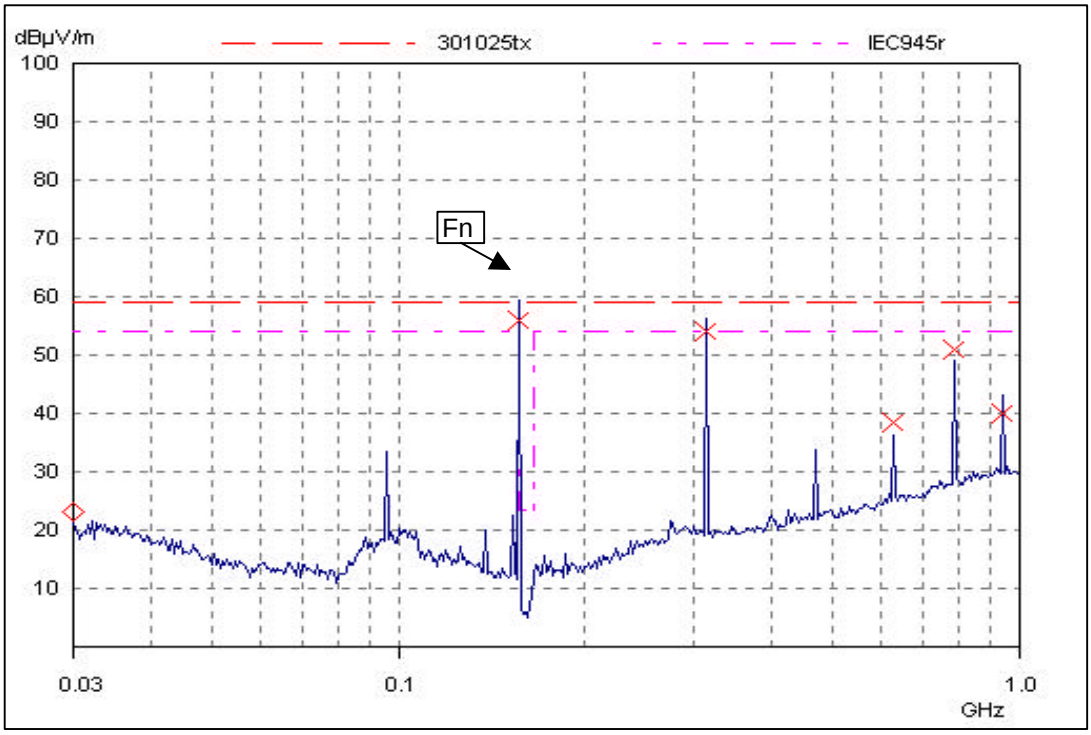
ITEM	MANUFACTURE	TYPE	DESCRIPTION	NAVICO SERIAL
1	Rohde & Schwarz	ESVS10	EMI Test Receiver	Nav 284
2	IFR	2023B	Signal Generator	Nav 1309
3	Xantrex	XHR33-33	Power Supply	Nav 1312
4	IFR	2041	Signal Generator	Nav 1310
5	Marconi	2041	Signal Generator	Nav 280
6	Rohde & Schwarz	CMTA54	Radio Comms Set	Nav 1329
7	Rohde & Schwarz	FSEA	Spectrum Analyser	Nav 1308
8	Solar Electronics	9607-1N	Current Injection Clamp	Nav 1331
9	Thurby Thandar	TSX3510	Power Supply	Nav 1328
10	Lecroy	9361C	Oscilloscope	Nav 1320
11	Design Enviromental Ltd	B5125-40	Enviromental Chamber	Nav 1381
12	Mini-Circuits	15542	Splitter	Nav 1379
13	Antenna Research Ltd	LPB2513	Log Periodic Antenna	Nav 1376
14	Chase	VHA9103	Dipole 30-300Mhz	Nav 893
15	Chase	VHA9105	Dipole 300-1000Mhz	Nav 894
16	MPE	C1162-D1	Anechoic Chamber	Nav 1307
17	Reseda	-	Pc - Running Software	Nav 1232
18	Chauvin Arnoux	C.A.43	Field Meter	Nav 1334
19	IFR	SMX100	Power Amplifier	Nav 1401
20	In - House	-	Ptt Connection Box	-
21	In - House	Cable	PL259 to Bnc Lead	-
22	In - House	Cable	1m Bnc Lead	-
23	ICS	DSC2	GMDSS Controller	Nav 1688
24	In - House	-	Isolation Transformer	TJ0250
25	Castle	GA601	Acoustic Calibrator	Nav 1457
26	In - House	-	Band Pass Filter	TJ0249
27	Bird	-	20db Attenuator	Nav 1380
28	In - House	Cable	Chamber to Receiver	TJ0224/C
29	In - House	Cable	Antenna to Chamber	TJ0224/B
30	In - House	Cable	5m Bnc to Bnc	TJ0248
31	Racal Dana	1991	Frequency Counter	Konav CR018
32	Rohde & Schwarz	ESHS10	EMI Test Receiver	Nav 283
33	Chase	HLA6120	Loop Antenna	Nav 1338
34	Chase	CBP9720	DC Battery Supply	Nav 1339
35	Rohde & Schwarz	ESH3-Z-5	LISN	Nav 282
36	Rendar	Safebloc	Safety Connect Block	Nav 363
37	Haefely	PSD-25B	ESD Tester	Nav 279
38	In - House	-	10db Transient Limiter	TJ0133
39	Solar Electronics	9125-1	Calibration Jig	Nav 1332

SECTION 13 MEASUREMENT SCAN RESULTS

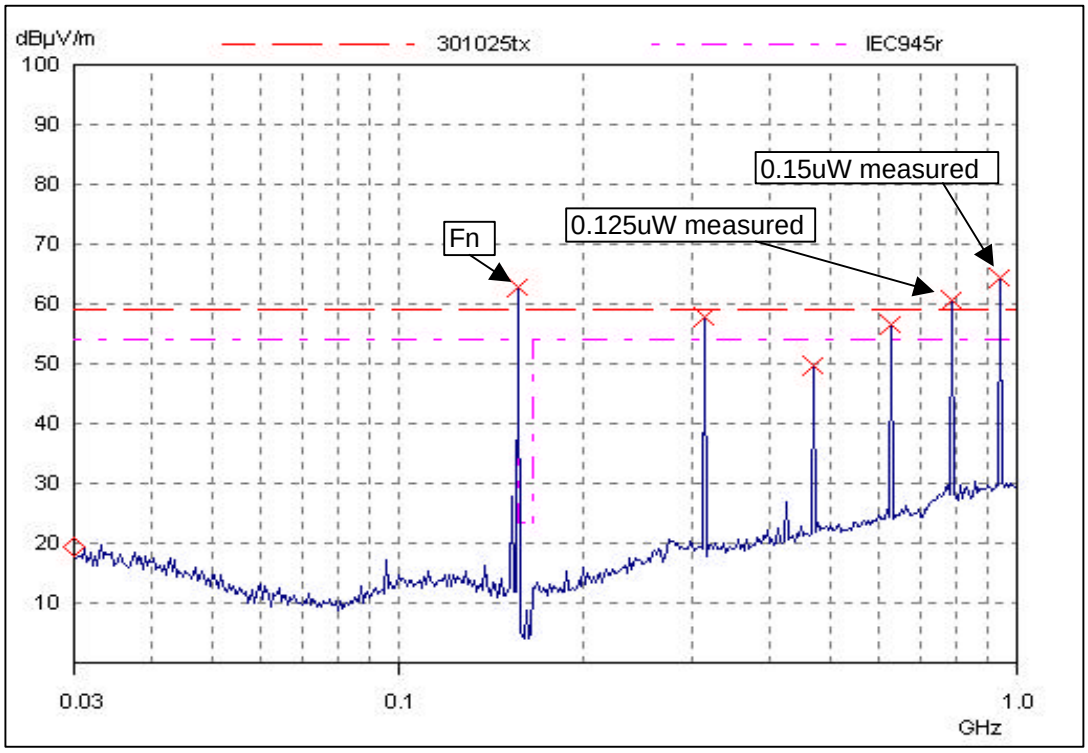
PLOT 1 Transmitter (1w setting)Radiated Emissions in Horizontal Polarization



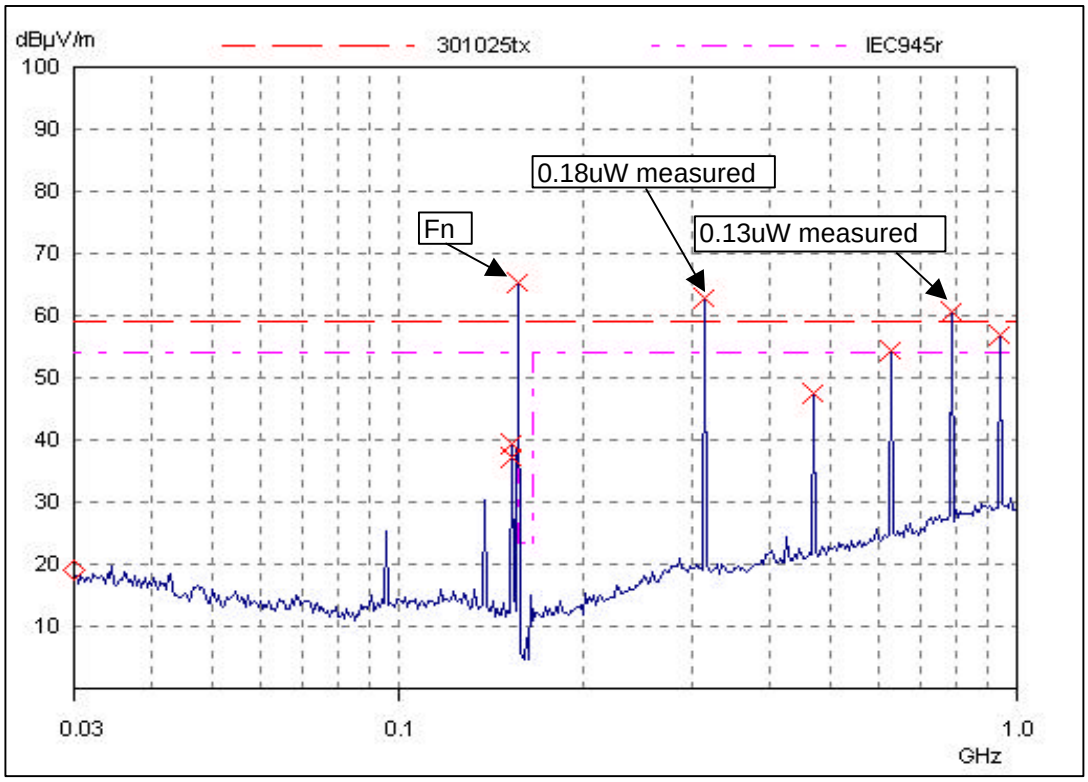
PLOT 2 Transmitter (1w setting)Radiated Emissions in Vertical Polarization



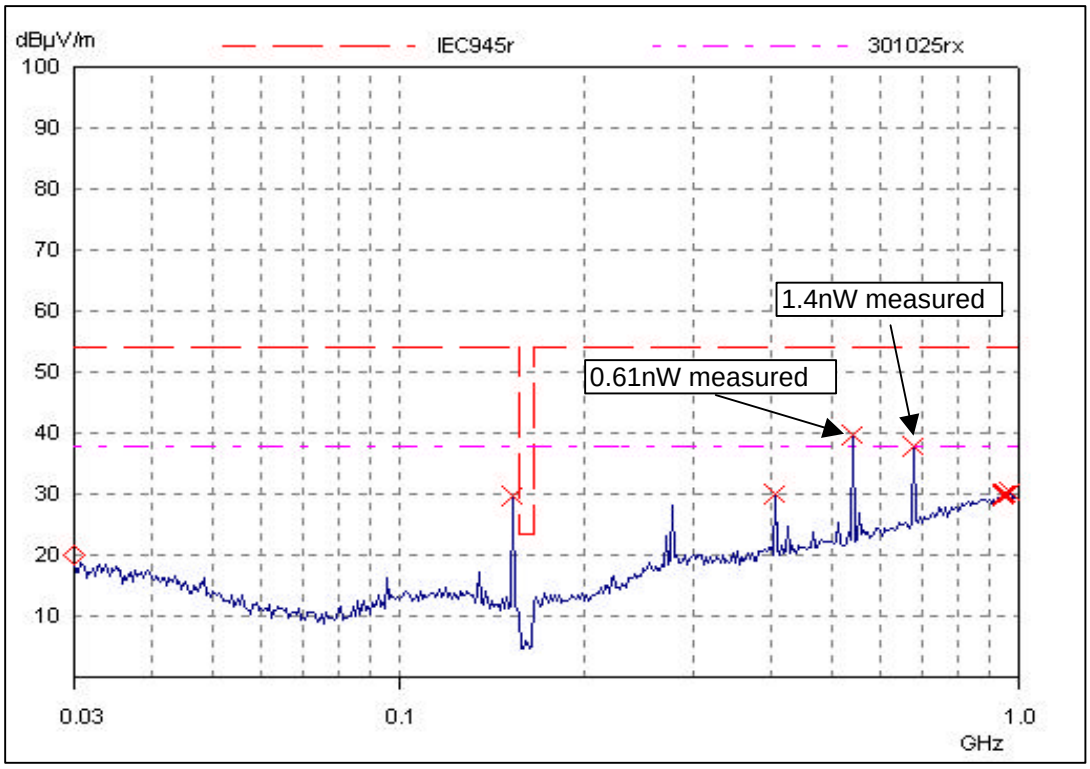
PLOT 3 **Transmitter (25w setting)Radiated Emissions in Horizontal Polarization**



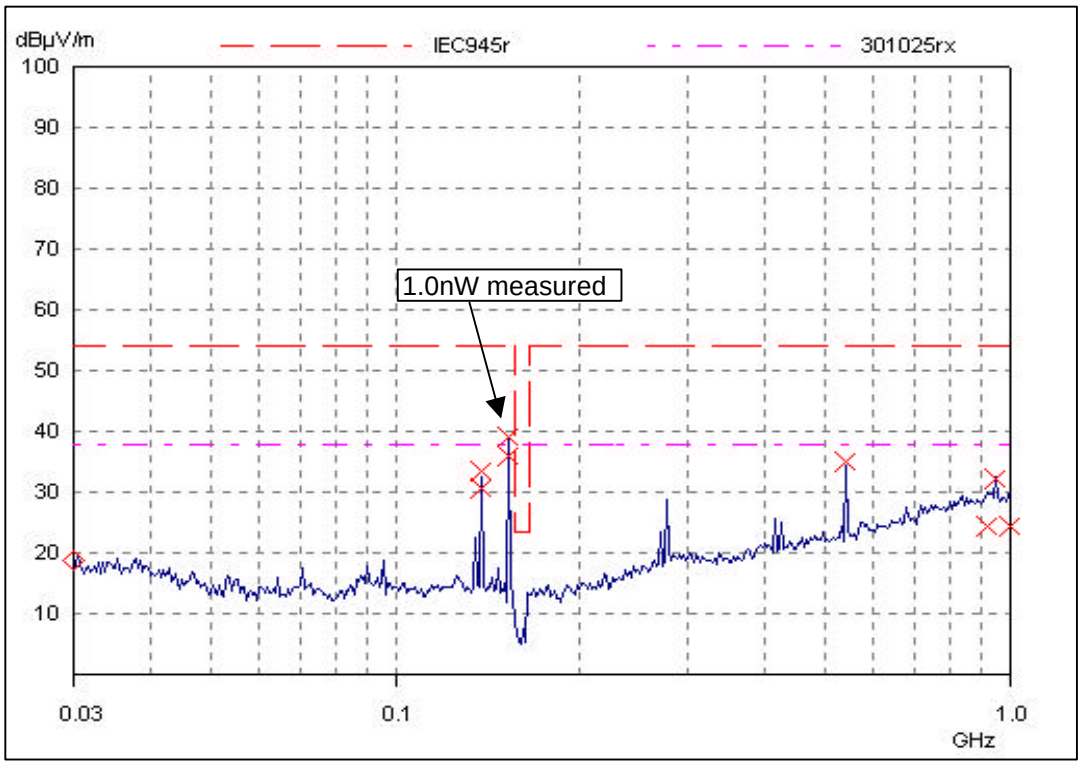
PLOT 4 **Transmitter (25w setting)Radiated Emissions in Vertical Polarization**



PLOT 5 **Receiver Radiated Emissions in Horizontal Polarization**

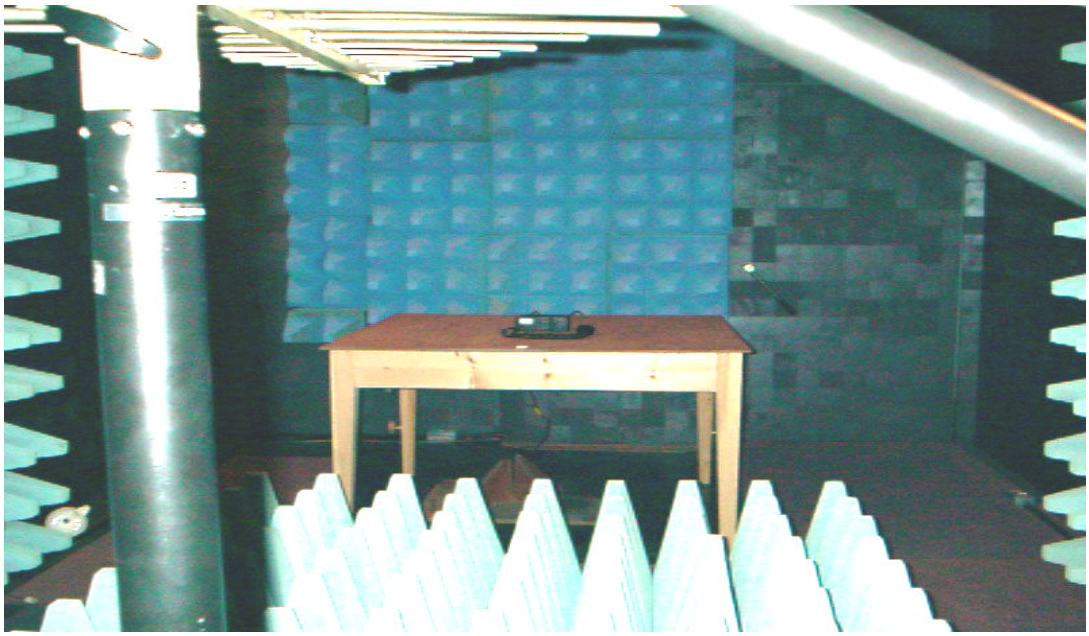


PLOT 6 **Receiver Radiated Emissions in Vertical Polarization**

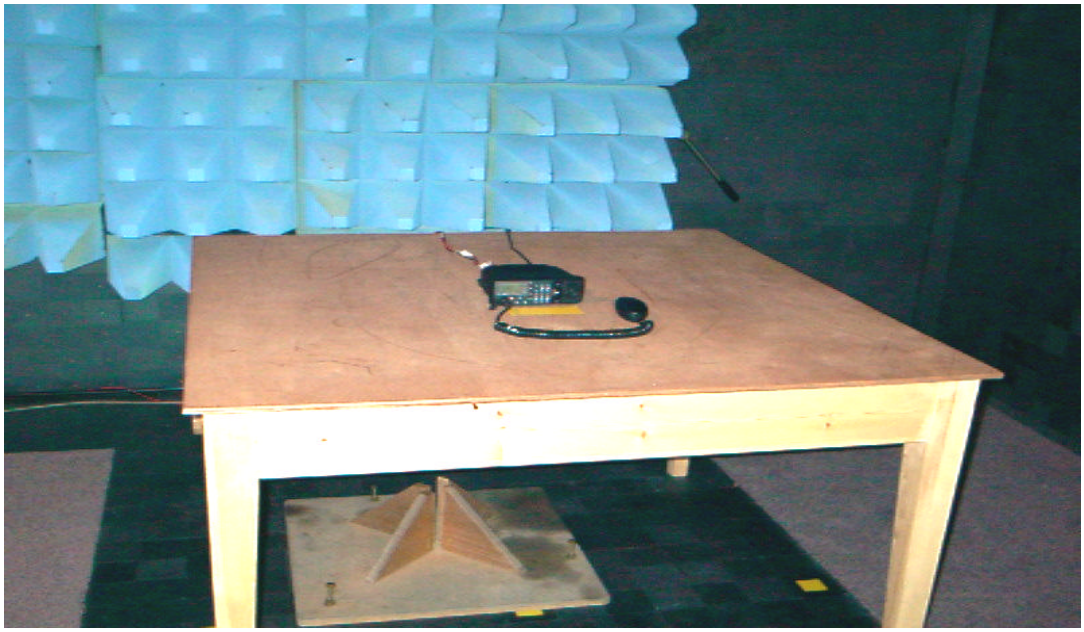


SECTION 14 PHOTOGRAPHS OF RD68

PHOTOGRAPH 1 Layout view of RD68 during radiated emissions test

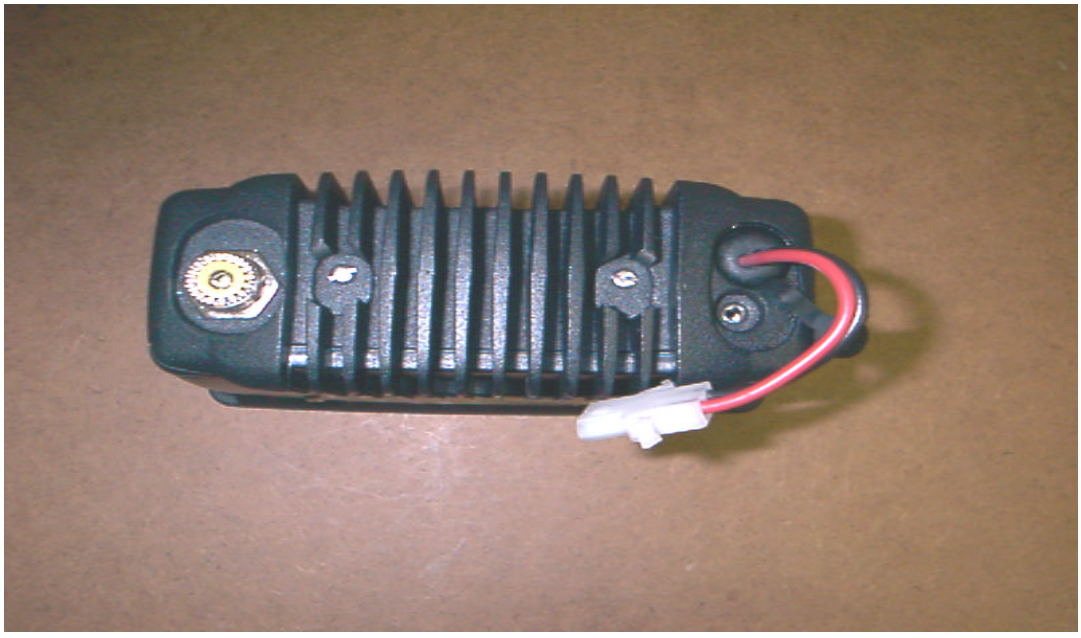


PHOTOGRAPH 2 Close up view of RD68 during radiated emissions test



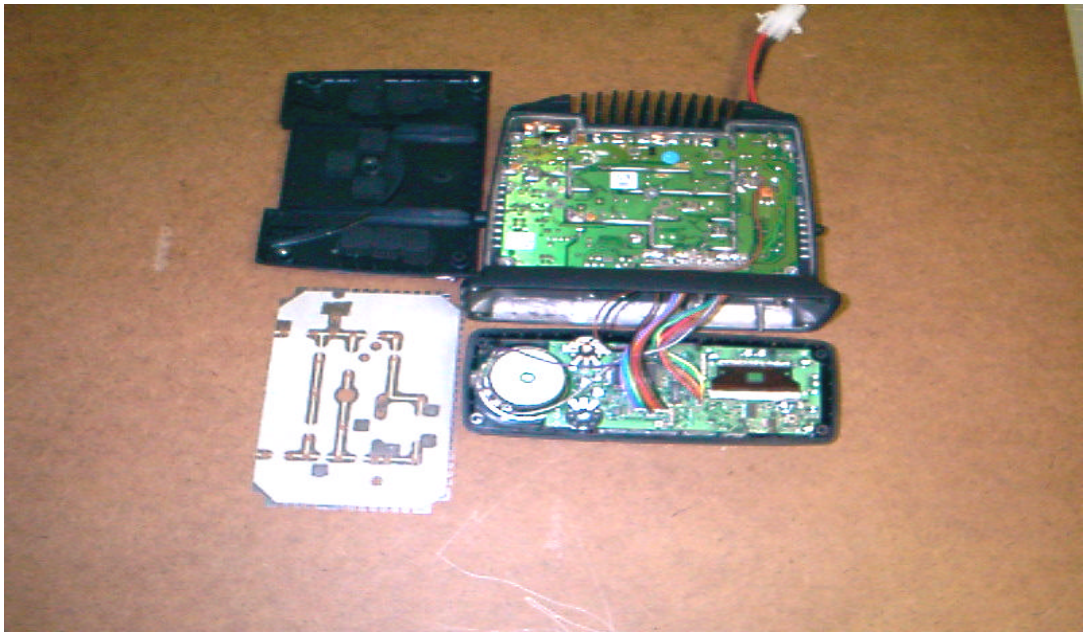
PHOTOGRAPH 3 General view of RD68 radiotelephone with DSC

PHOTOGRAPH 4 Rear view of RD68 radiotelephone with DSC



PHOTOGRAPH 5 RD68 showing the Rx/Tx & front panel sections

PHOTOGRAPH 6 Internal view of the Rx/Tx transceiver, front panel, screen & lid sections



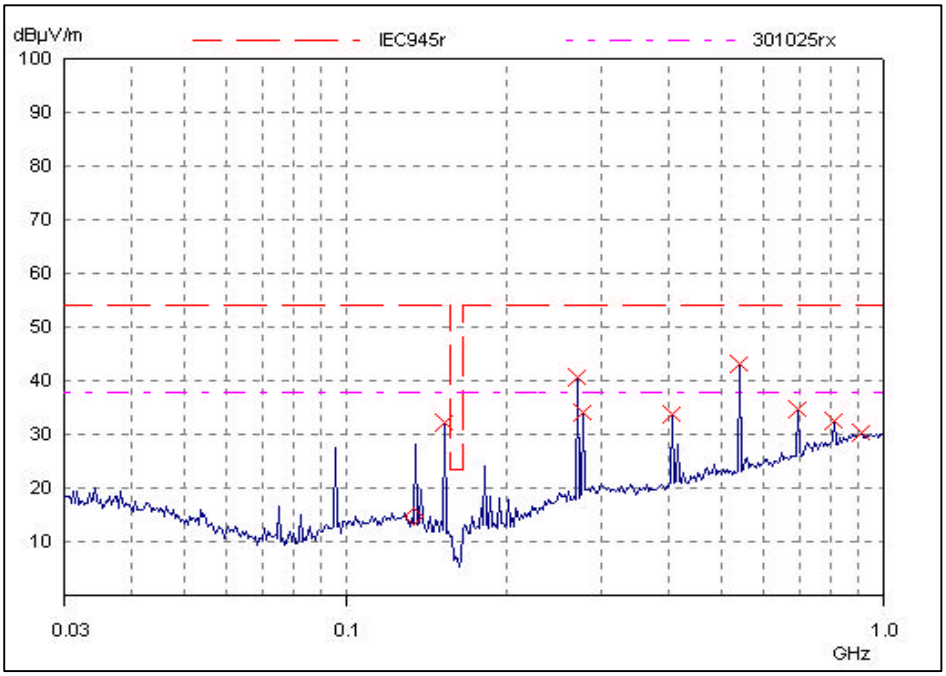
PHOTOGRAPH 7 General view of ptt connection box used during testing

PHOTOGRAPH 8 Front view of RD68 hand-microphone

AMENDMENT

In order to improve sensitivity of the RD68 2nd receiver, capacitor C86 - 100pf was removed from the front panel PCB assembly (E03658).
This was initially fitted to the CKOUT line for EMC precaution purposes, however no emissions were produced from the removal of the capacitor during horizontal / vertical emission measurement re-tests.
The frequency under investigation was 3.579545 MHz.
Additional testing carried out as a result to changes in decoupling of the control circuitry to improve performance.
Due to the purpose of the capacitor, no other TA measurements need re-testing to conform to EN301-025.
The re-tested emission scan results are shown below:

RD68 in Rx / Front / Horizontal polarization



RD68 in Rx / Front / Vertical Polarization