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Pages : 10  
Annexes : 0  
Total no. of sheets : 10

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EMC Test report : 97/7096/4

Item tested : Pilot

**NON - CONTROLLED**

Equipment type : Maritime VHF on aeronautical frequencies

Client : Norbit

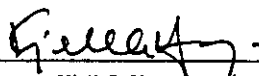
Tested according to :

prETS 300 339 General electromagnetic compatibility (EMC) for radio communications equipment

Date of issue :

15.1.98

Authorised by :

  
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The results detailed in this test report are valid only for the particular sample(s) tested and with configuration(s) as implemented during testing.

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## **1 GENERAL INFORMATION**

### **1.1 Test Laboratory**

Name : ComLab  
Address : Instituttveien 23, P.O. Box 96  
N-2007 Kjeller, Norway  
Telephone : +47 22 82 49 00  
Telefax : +47 22 82 49 90  
Test service manager : Kjell Haga

### **1.2 Client Information**

Name : Norbit AS  
Address : Postboks 141, 7501 Stjørdal  
Telephone : 74 82 04 30  
Telefax : 74 82 04 31

**Contact:**

Name : Steffen Kirknes

### **1.3 Manufacturer ( if other than client)**

Name :  
Address :  
Telephone :  
Telefax :

## **2 TEST INFORMATION**

### **2.1 Test Item**

Name : Pilot  
Model/version :  
Serial number : 006

#### **Remarks**

Maritime VHF for use on aeronautical frequencies 121.5 and 123.1 MHz. Class of emission A3E.

### **2.2 Test Environment**

#### **2.2.1 Normal Test Conditions**

Temperature : 20.5 - 21.3 °C  
Relative humidity : 18.2 - 22.4 %

The values are the limits registered during the test period.

### **2.3 Test Period**

Test item received date : 3.7.97  
Test period : from 23.12.97 to 6.1.98

### **2.4 Standards and Regulations / Test Engineer/s**

- Draft prETS 300 339, General electromagnetic compatibility (EMC) for radio communications equipment, June 1997 with guidance of DTS/RES-01030 (ETSI WG RES-01).
- Geir Antonsen

### **2.5 Additional information**

#### **2.5.1 Test Methods**

According to relevant standards.

#### **2.5.2 Selection Criteria**

According to table 4 in ETS 300 339.

#### **2.5.3 Test Equipment**

See page 10

### 3 TEST REPORT SUMMARY

#### 3.1 Abbreviations

- P Passed, the equipment fulfils the requirement  
F Failed, the equipment does not fulfil the requirement  
I Inconclusive, the test does not give a conclusive verdict  
NA Not applicable, the requirement is not applicable  
NT Not tested, the test is not performed even though the requirement is relevant

#### 3.2 List of measurements

Standard	Clause in this report	Measurement	Result (Pass/Fail)
EN 61000-4-3	5.1	Radiated, radio-frequency electromagnetic field - Immunity test	P
EN 61000-4-2	5.2	Electrostatic discharge (ESD) immunity test	P
EN 61000-4-6		Immunity to conducted disturbances, induced by radio-frequency fields	NA *)
EN 61000-4-4		Electrical fast transient/burst (EFT/B) immunity test	NA *)
EN 61000-4-5		Surge immunity tests	NA *)
EN 61000-4-11		Voltage dips, short interruptions and voltage variations immunity tests	NA *)

\*) Portable equipment with only antenna port.

#### Result

Tested equipment complies with the requirements of relevant standards.

## **4 OTHER COMMENTS**

### **Measurement conditions:**

Radiated, radio-frequency immunity tests are performed in an anechoic shielded chamber.

### **Specific conditions of use:**

Pilot is a transceiver intended for communication between life boats and rescue helicopters/planes. It is powered from internal Lithium battery.

Operating frequencies are 121.5 and 123.1 MHz. All tests are performed on 123.1 MHz (due to risk of interference on the emergency channel).

The equipment has only one switch with 3 positions: on (121.5 MHz) - off - on (123.1 MHz) and 2 knobs (one for squelch and one for volume).

The antenna is permanently attached to the EUT and is approx. 60 cm. long.

### **List of ports:**

Signal port:	Antenna port.
Control and power ports:	None.

## 5 IMMUNITY TESTS

### 5.1 Electromagnetic Field Immunity On Enclosure Port.

EN 61000-4-3

Radiated, radio-frequency immunity tests are performed in an anechoic shielded chamber.

Test signal

Test generator settings:

Frequency			Settings		
Start	Stop	Step	Modulation	Mod.freq.	Field strength
80 MHz	1000 MHz	1 %	80 %	400 Hz	3V/m (-0/+6dB)

Exclusion band (defined in standard):

Transmitter:  $f_c \pm$  twice the occupied bandwidth.

Receiver:  $\pm 5\%$  of the centre frequency from the edges of the operating frequency band.

#### EUT configuration during test

The EUT was standing on a wooden table with a height of 80 cm. and was exposed to RF signals both towards the front and one side of the EUT with vertical and horizontal polarisation.

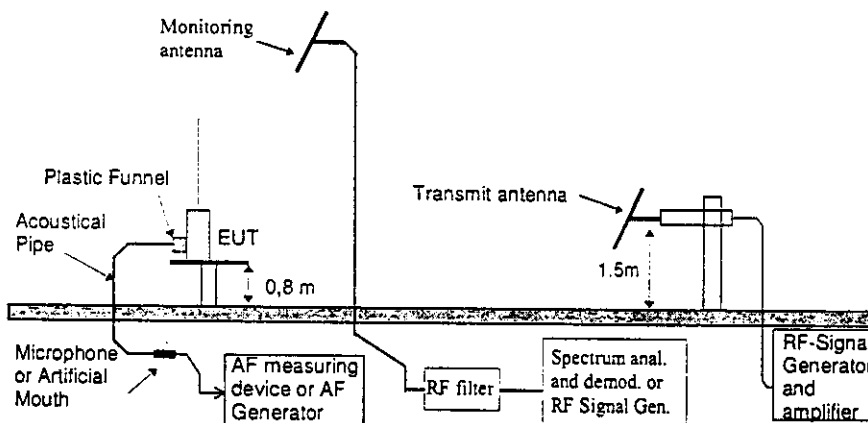
#### EUT mode during test

The EUT was tested both in transmit and in receive mode.

In transmit mode the microphone was fed with an audio signal through an acoustical pipe and a plastic funnel from an AF generator and an artificial mouth. The AF signal was 1 kHz with a level leading to 70% modulation. The output of the transmitter was picked up by a monitoring antenna inside the chamber and lead out of the chamber via a bandpass filter to the measuring devices.

In receive mode the receiver was fed with a wanted signal with an amplitude of 30 dB above the receiver maximum usable sensitivity (12 dB SINAD on the AF output). The AF from the loudspeaker was picked up through a plastic funnel and an acoustical pipe and led out of the test chamber to the measuring devices.

#### Test setup



#### Monitoring the EUT.

In transmit mode the spectrum analyzer was used to look for changes in the RF spectrum from the EUT and the demodulator was used to demodulate and measure the SINAD of the signal from EUT.

In receive mode the AF measuring device was used to measure the SINAD on the demodulated signals from EUT. The spectrum analyzer was also used to see if the EUT was unintentional transmitting.

**Performance criteria for EUT**

**Transmitter:** During and after the test, the SINAD of the demodulated transmitter signal shall be better than 12 dB. No change of settings. Spectrum analyzer was used to detect any changes in the transmitted spectrum from the EUT.

**Receiver:** During and after the test, the SINAD of the receiver shall be better than 12 dB. No change of settings and no unintentionally transmission.

**Results**

Frequency (MHz)	EUT mode during test (Transmit / Receive)	EUT position (side facing EM- field) and polarisation (V/H)	Field strength (V/m)	Criteria (see note)		Result
				During test	After test	
80 - 1000	Transmit	Front (V)	3	1)	1)	Pass
80 - 1000	Transmit	Front (H)	3	1)	1)	Pass
80 - 1000	Transmit	Side (V)	3	1)	1)	Pass
80 - 1000	Transmit	Side (H)	3	1)	1)	Pass
80 - 1000	Receive	Front (V)	3	1)	1)	Pass
80 - 1000	Receive	Front (H)	3	1)	1)	Pass
80 - 1000	Receive	Side (V)	3	1)	1)	Pass
80 - 1000	Receive	Side (H)	3	1)	1)	Pass

**Note:**

Numbering refers to the following criterias:

- 1) Normal performance within the specification limits.
- 2) Temporary degradation or loss of function or performance which is self-recoverable.
- 3) Temporary degradation or loss of function or performance which requires operator intervention or system reset.
- 4) Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data.

Test Equipment Used: 1, 2, 3, 4, 5, 6, 7, 8, 9, 23, 24, 32, 33, 37



**5.2 Electrostatic Discharge (ESD) Immunity Test.****EN 61000-4-2**

The Electrostatic Discharges were applied according to the following test plan:

Discharges applied to EUT		ESD generator:			Result
Application mode:	Test point	Voltage [ kV ]	Coupling mode:	Number of discharges	
DA	EUT Enclosure, metal body (all sides of the EUT)	±2 and ±4	CD	> 10	P
DA	EUT Enclosure, metal part located at antenna conn.	±2 and ±4	CD	> 10	P
DA	EUT Enclosure (all sides of the EUT)	±2, ±4 and ±8	AD	> 10	P
DA	EUT Enclosure, plastic body located at antenna	±2, ±4 and ±8	AD	> 10	P
DA	EUT Enclosure, plastic cover located at switch	±2, ±4 and ±8	AD	> 10	P
IA	Horizontal Coupling Plane (HCP)	±2 and ±4	CD	> 10	P
IA	Vertical Coupling Plane (VCP)	±2 and ±4	CD	> 10	P

**ABBREVIATIONS USED IN THE TABLE:**

Application mode: DA = Direct application of discharges; IA = Indirect application of discharges  
Coupling mode: CD = Contact discharges mode; AD = Air discharges mode

**Cable configuration during test**

The antenna of the EUT was isolated from the Horizontal Coupling Plane (HCP) by positioned it on insulating bakelite plates (0.5 mm thick).

**Test set-up**

The test set-up was according to EN 61000-4-2 clause 7.1. A Ground Reference Plane (GRP) of 1.5mm thick aluminium (1m×2m) was placed on the floor. The GRP was connected to the protective earth with a 10 mm<sup>2</sup> thick copper cable.

The EUT was tested as a TABLE TOP EQUIPMENT according to EN 61000-4-2, clause 7.1.1 and the test set-up consists of the following: A wooden table (0.8 m high) was located on the GRP. A Horizontal Coupling Plane (HCP) consisting of 1.5mm thick aluminium (0.8m×1.6m) was placed on the table. An insulating bakelite plate (0.5 mm thick) was placed on the HCP and the EUT was placed on the insulating plate during the test. The antenna of the EUT was isolated from the HCP by positioned it on insulating bakelite plates (0.5 mm thick).

**EUT mode during test:**

The EUT was tested both in transmit and in receive mode.

In transmit mode the EUT was set to send an unmodulated carrier. The output of the transmitter was picked up by an monitoring antenna and lead a spectrum analyzer.

In receive mode the receiver was fed with a wanted signal with an amplitude of approx. 30 dB above the receiver maximum usable sensitivity (12 dB SINAD on the AF output). The spectrum analyzer was also used to see if the EUT was unintentional transmitting.

**Test Level:**

The test level was selected on basis of ETS 300 339, clause 9.1.1.

**Performance criteria for EUT**

During the test: No unintentional responses. No change of actual operating state and stored data.

After the test: Operate as intended. SINAD ratio of receiver and demodulated signal better than 12 dB.

**Results**

The results complies with the performance criteria described above during and after the ESD test.

Test Equipment Used: 25, 33, 34

## 6 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.

No	Instrument/Ancillary	Type	Manufacturer	Ref. No.
1	Spectrums Analyzer	R3271	Advantest	LR 1123
2	Amplifier	25A100M1	Amplifier Research	LR 1155
3	Amplifier	25W1000M1	Amplifier Research	LR 1156
4	Hybrid	H-9	Anzac	LR 1091
5	Measuring amp. with mic.	2610	B&K	LT 0573
6	Acoustic coupler		Comlab	LR 1259
7	Field probe	FP3000	EMC Automation	LR 1175
8	System Interface	SI100	EMC Automation	LR 1152
9	Switch Module	SM-1	EMC Automation	LR 1153
10	GTEM!	5311	EMCO	LR 1171
11	Current probe (injection)	F-120-9	Fischer	LR 1316
12	Current probe	F-33-2	Fischer	LR 1315
13	Coupling/decoupling network	FCC-801-C1/50N	Fischer	LR 1313
14	Coupling/decoupling network	FCC-801-M2-16	Fischer	LR 1312
15	Coupling/decoupling network	FCC-801-M3-16	Fischer	LR 1314
16	Decoupling network	DEC1A	Haefely	LR 1306
17	Coupling Clamp	IP4A	Haefely	LR 1301
18	Coupling network	IP6.2	Haefely	LR 1305
19	EFT/B generator	PEFT Junior	Haefely	LR 1297
20	Line Interference tester	PLINE 1610	Haefely	LR 1298
21	Surge tester	PSURGE	Haefely	LR 1307
22	Plotter	HP 7475A	Hewlett Packard	LR 1063
23	Generator, AF	PM5109	Philips	LR 1015
24	Radiocomm. tester	CMTA	R&S	LR 1066
25	Test Receiver	ESAI	R&S	LR 1089/1090
26	Current Probe	ESH2-Z1	R&S	LR 1011
27	Pulse Limiter	ESH3-Z2	R&S	LR 1074
28	T-ISN	ESH3-Z4	R&S	LR 1075
29	AMN	ESH3-Z5	R&S	LR 1076
30	Test Receiver	ESN	R&S	LR 1237
31	T-ISN	EZ-10	R&S	LR 1271
32	Antenna	HL023	R&S	LR 0282
33	RF Generator	SMT	R&S	LR 1230
34	ESD generator	NSG435	Schaffner	LR 1281
35	T-ISN	NTFM8132	Schwarzbeck	LR 1254
36	Cable	RG223	Suhner	No. 1
37	Filter, Bandpass	5VF95/190	Trilithic	LR 1167
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43				