

Test report

20083516301

**(additional to test reports 99788231,
99822232, 20072009301 and 20072009302)**

based on:
FCC Part 80 (10-1-08 Edition)
IC RSS-182 issue 4 (September 2003)

Portable maritime VHF radiotelephone for GMDSS
Sailor
SP 3540

Portable VHF radiotelephone
Sailor
SP 3530

Contents

MAIN MODULE.....	3
1 INTRODUCTION	3
2 PRODUCT	4
3 TEST SCHEDULE	4
4 PRODUCT DOCUMENTATION.....	5
5 OBSERVATIONS AND COMMENTS.....	5
6 SUMMARY.....	5
7 CONCLUSIONS	7
TEST RESULTS MODULE.....	8
1 SUMMARY.....	8
2 EMISSION TESTS	9
2.1 Radiated spurious (< 30 MHz).....	9
2.2 Radiated spurious (> 30 MHz), cabinet radiation	11
2.3 Radiated spurious (> 30 MHz), receiver (IC)	13
2.4 Conducted spurious (> 30 MHz).....	15
2.5 Occupied bandwidth (FCC).....	16
Occupied bandwidth (IC)	18
2.6 Frequency deviation	19
2.6.1 Maximum frequency deviation at modulation frequencies below 3 kHz.....	19
2.6.2 Maximum frequency deviation at modulation frequencies above 3 kHz	20
2.7 Transmitter power	21
2.8 Transmitter Output Power Tolerance (IC).....	22
2.9 Transmitter Output Powers (IC).....	23
2.10 Human exposure to RF radiation.....	24
2.11 Antenna mounting.....	26
2.12 Labelling.....	27
USED TEST EQUIPMENT MODULE.....	28
CROSS REFERENCE.....	29

This report comprises of four modules. The total number of pages is: 29

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication bv
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie). The copyright of this test report is owned by Telefication bv and may not be reproduced except in full without the written approval of Telefication bv.

Ordering party:

Company name : Thrane & Thrane A/S
Address : Porsvej 2
Zipcode : 9200
City/town : Aalborg
Country : Denmark
Date of order : 13 November 2008

2 Product

A sample of the following product was submitted for testing:

Product name	: Portable maritime VHF radiotelephone for GMDSS
Product category	: Stations in the maritime services
Manufacturer	: Thrane & Thrane A/S
Trade mark	: Sailor
Type designation	: SP 3540
FCC ID	: ROJSP3540
IC ID	: 6200B-SP3540
Software release	: 2.00.07
Serial number	: 0123456009

Variant model : SP 3530

3 Test schedule

Tests were carried out in accordance with the specification detailed in chapter 6 "Summary" of this report.

Tests were carried out at the following location:

- Telefication, Zevenaar

Tests were carried out on:

- 9 and 10 February 2009
-

4 Product documentation

For production of this report the following product documentation was used:

Description:	Date:	Identification:
User manual SP3540 ATEX VHF GMDSS, prelim. Issue 3	Not dated	TT-98-124307-A
Electrical diagrams, 5 sheets	Not dated	Doc. No. TT93-127182-D

The above mentioned documentation will be filed at Telefication B.V. Zevenaar for a period of 10 years following the issue of this report.

5 Observations and comments

This report is additional to Telefication test reports 99788231, 99822232, 20072009301 and 20072009302.

The SP 3540 is a VHF GMDSS radio, which operates in the maritime frequency band from 155.000 to 163.425 MHz. The radio is an ATEX version (potentially explosive atmospheres).

In addition to the earlier tested variant model SP 3520 (non ATEX) it was decided to perform limited tests at normal test conditions only. Full tests of the SP 3520 can be found in test reports 99788231 and 20072009302 regarding FCC and IC aspects respectively.

The model SP 3530 is a VHF radio functioning in the maritime frequency band from 155.000 to 163.425 MHz and in the land mobile band from 148.000 to 174.000 MHz. The radio is an ATEX version (potentially explosive atmospheres).

As the SP 3530 is considered as variant model of the earlier tested model SP 3515 (non ATEX), reference concerning FCC and IC aspects is made to Telefication test reports no. 99822232 and 20072009301 respectively.

6 Summary

The product is intended for use in the following application area:

Maritime ship born communication equipment

The sample was tested according to the following specification:

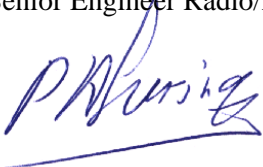
FCC Part 80 (10-1-08 Edition)
IC RSS-182 issue 4 (September 2003)

7 Conclusions

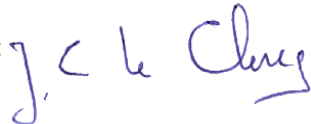
The sample of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 6 of this report.

The results of the tests as stated in this report, are exclusively applicable to the product items as identified in this test report. Telefication accepts no responsibility for any stated properties of product items in this test report, which are not supported by the tests as specified in section 6 “*Summary*”.


All tests are performed by:

name : ing. P.A. Suringa
function : Senior Engineer Radio/EMC
signature : 

Review of test methods and report by:

name : ing. J.C. le Clercq
function : Test engineer
signature : 

The above conclusions have been verified by the following signatory:

date : 23 March 2009
name : ing. P.A.J.M. Robben
function : Co-ordinator Test Group
signature : 

Test results module

1 Summary

According to FCC Part 80, the following tests have been performed:

Port	Reference	Phenomena	Result
Enclosure	§ 80.211 (f) (3)	Radiated emissions	P
Antenna	§ 80.211 (f) (3)	Conducted emissions	P
Antenna	§ 80.211 (f) (1), (2)	Occupied bandwidth	P
Antenna	§ 80.209 (a)	Frequency stability	NP
Antenna	§ 80.213 (a) (2)	Frequency deviation	P
Antenna	§ 80.215 (e) (1)	Transmitter power	P
Antenna	§ 80.227	Human exposure to RF radiation	P
Antenna	§ 80.271 (a) (3)	Effective radiated power	P ^{*)}
Antenna	§ 80.271 (a) (2)	Receiver sensitivity	NP
Antenna	§ 80.271 (a) (6)	Antenna mounting	P
Enclosure	§ 80.271 (a) (5)	Labelling	P
Battery	§ 80 271 (a) (4)	Capacity of the battery	NP

^{*)} measured according to EN 300 225 (Telefication test report no. 20083516300)

Results:

P = pass

F = fail

NA = not applicable

NP = not performed

2 Emission tests

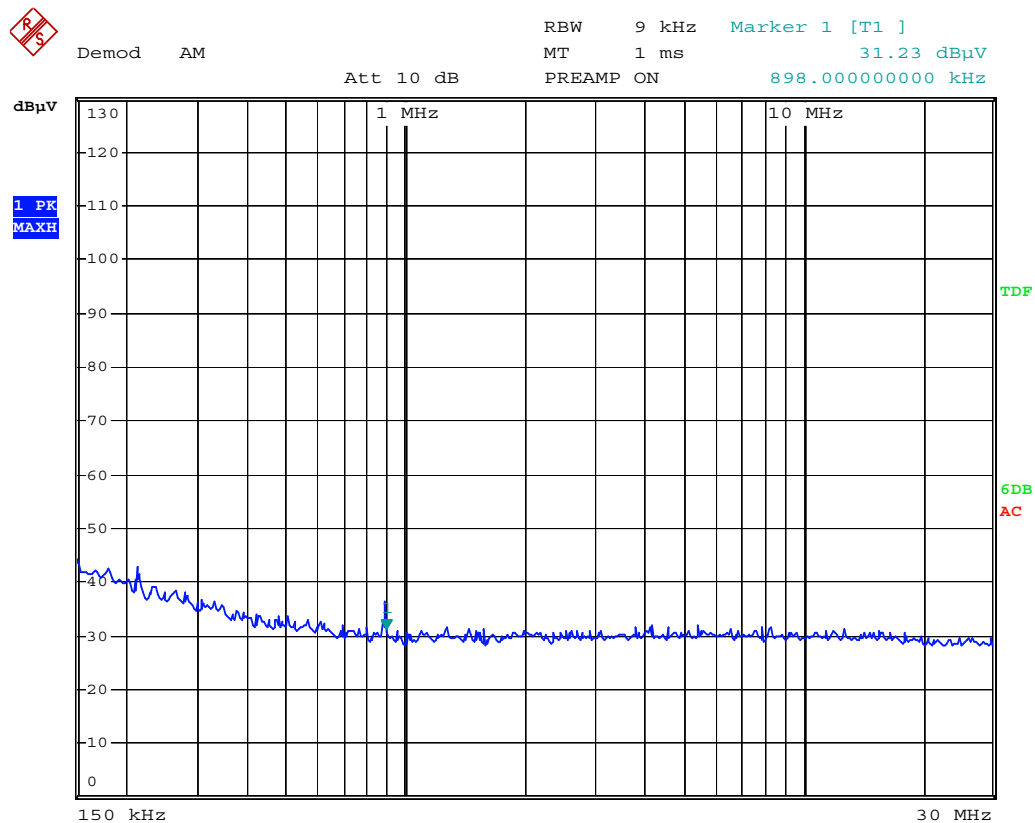
2.1 Radiated spurious (< 30 MHz)

Compliance standard : FCC part 2, section 2.1053 (a); FCC part 80 section 80.211 (f) (3)

Compliance limit : Transmitting power is 2 W, antenna gain -4.0 dBd*.
Limit = transmitting power minus attenuation as required per section 80.211 (f) (3).
 $29 \text{ dBm} - (43 \text{ dB} + (-1 \text{ dB})) = -13 \text{ dBm}$
Conversion to the dB μ V/m limit for a 3 m OATS yields: $-13 \text{ dBm} + 113.4 \text{ dB} = 100.4 \text{ dB}\mu\text{V/m}$

* calculated value, taken from Telefication report no. 20083516300

Results :
(dB μ V/m)



Measurement uncertainty	+1.9 / -2.1 dB
-------------------------	----------------

Test equipment used: (Item numbers)	3, 4, 7
-------------------------------------	---------

Item numbers refer to the used test equipment module.

2.2 Radiated spurious (> 30 MHz), cabinet radiation

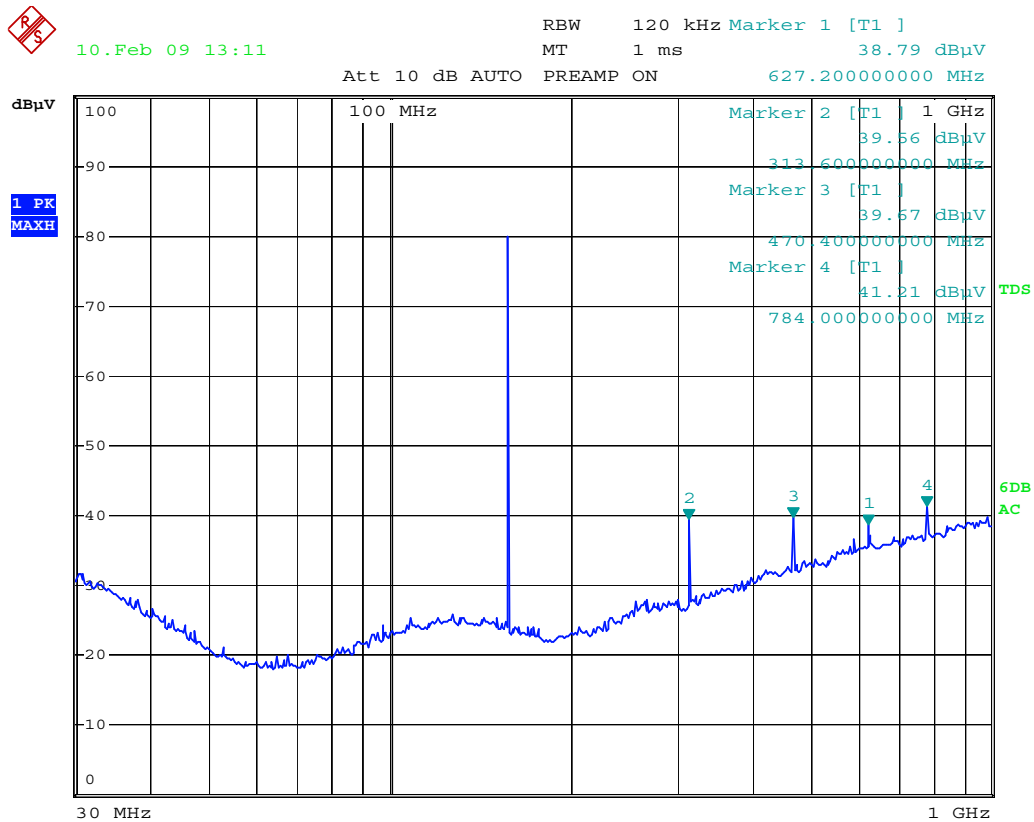
Compliance standard : FCC part 80, section 80.211 (f) (3), FCC part 2, section 2.1053 (a)

Compliance limit : Transmitting power is 2 W, antenna gain -4.0 dBd*.
Limit = transmitting power minus attenuation as required per section 80.211 (f) (3).
 $29 \text{ dBm} - (43 \text{ dB} + (-1 \text{ dB})) = -13 \text{ dBm}$
Conversion to the dB μ V/m limit for a 3 m OATS yields: $-13 \text{ dBm} + 113.4 \text{ dB} = 100.4 \text{ dB}\mu\text{V/m}$

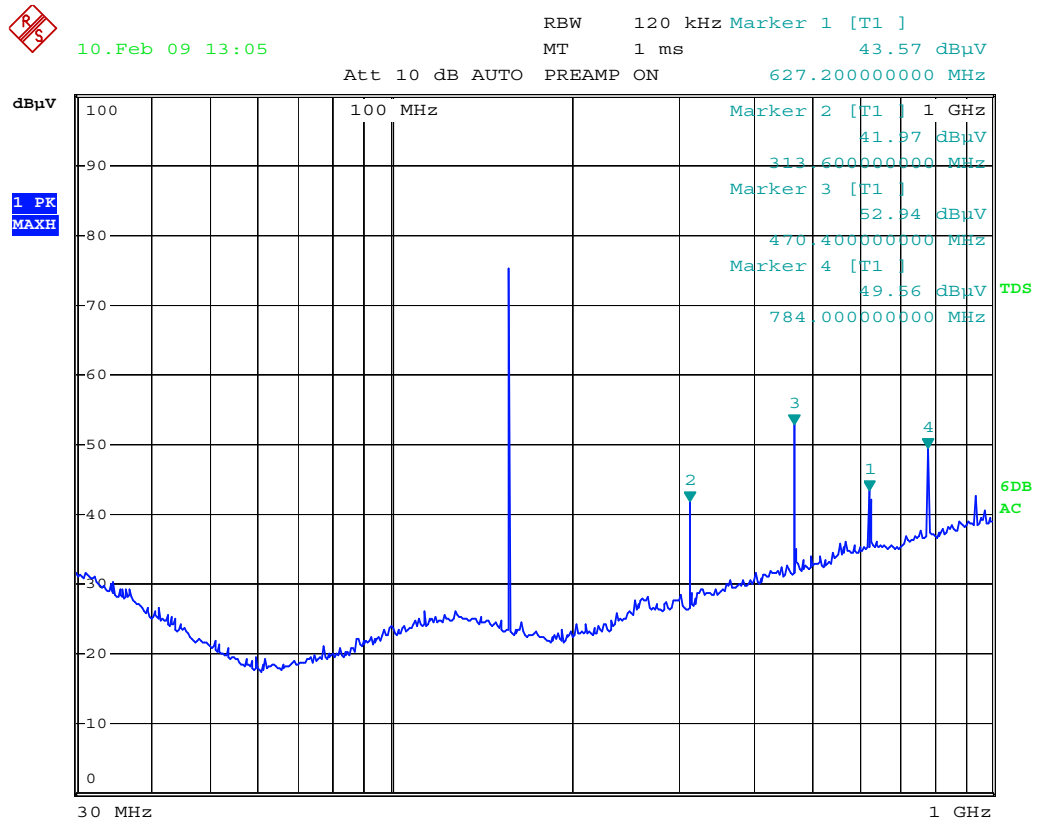
* calculated value, taken from Telefication report no. 20083516300

Results (dB μ V/m) :

Horizontal polarization



Vertical polarization



Measurement uncertainty	Horizontal polarization	
	30 – 200 MHz	4.5 dB
	200 – 1000 MHz	3.6 dB
	Vertical polarization	
	30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB	

Test equipment used: (Item numbers)	2, 3, 4, 8
-------------------------------------	------------

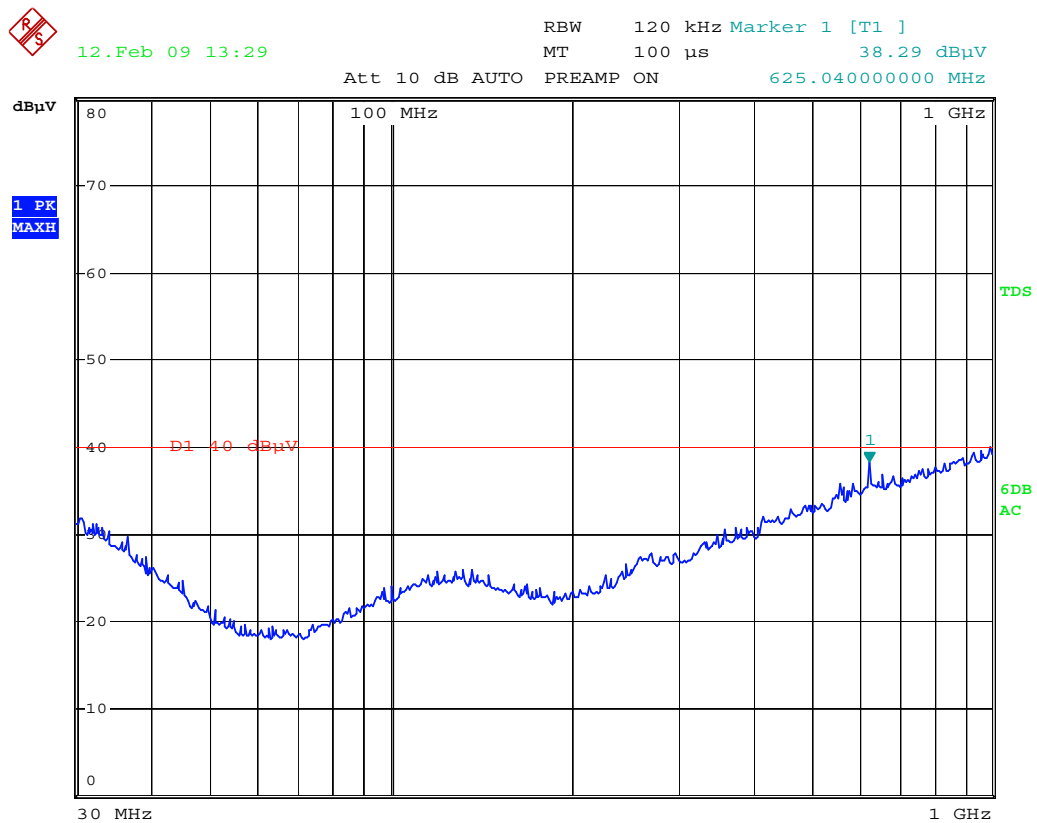
Item numbers refer to the used test equipment module.

2.3 Radiated spurious (> 30 MHz), receiver (IC)

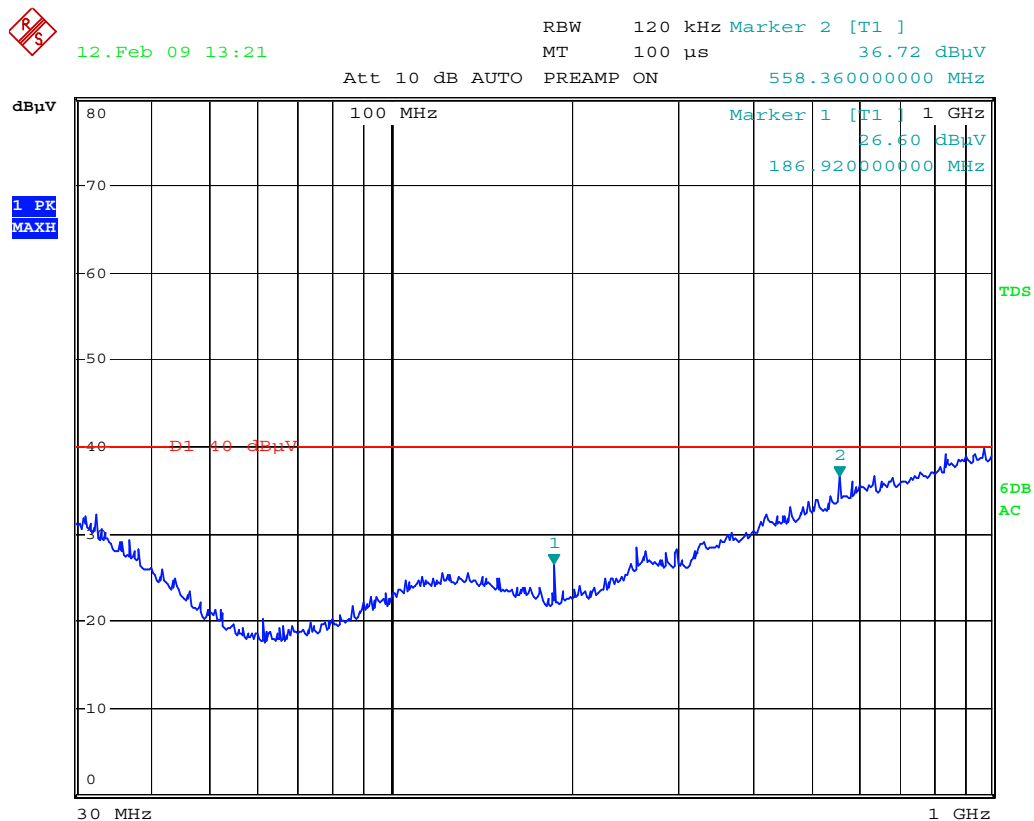
Compliance standard : IC RSS-182 , section 6.7(a)

Compliance limit : 150 μ V/m (88 - 216 MHz), 200 μ V/m (216 - 960 MHz), 500 μ V/m (> 960 MHz)

Horizontal polarization



Vertical polarization



Measurement uncertainty	Horizontal polarization	
	30 – 200 MHz	4.5 dB
	200 – 1000 MHz	3.6 dB
	Vertical polarization	
30 – 200 MHz	5.4 dB	
200 – 1000 MHz	4.6 dB	

Test equipment used: (Item numbers)	2, 3, 4
-------------------------------------	---------

Item numbers refer to the used test equipment module.

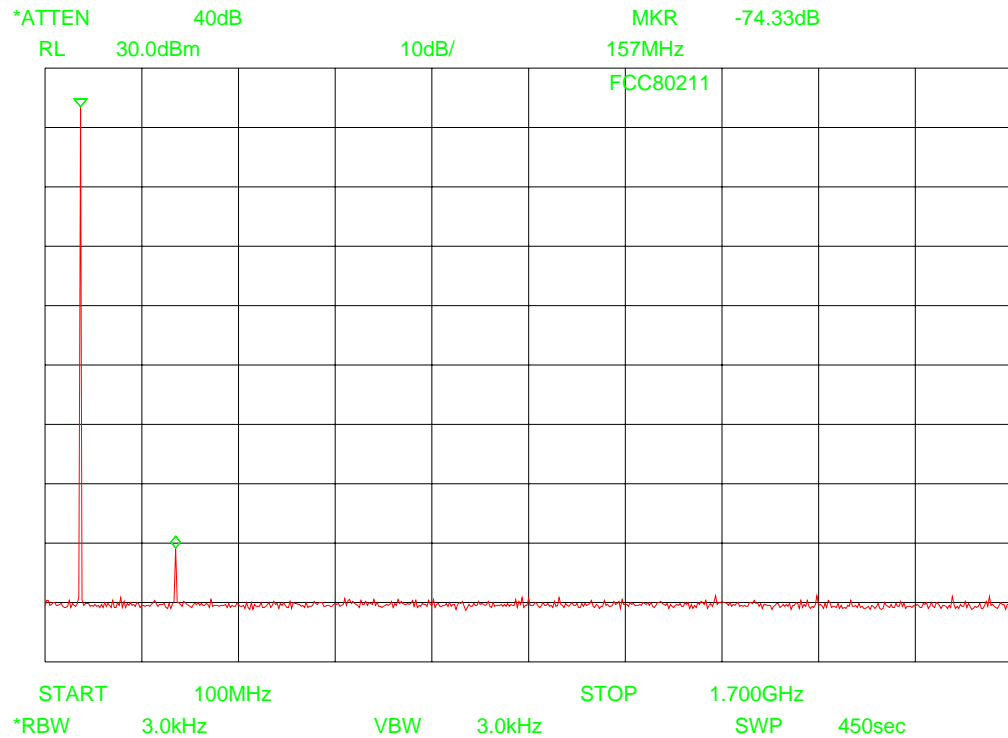
2.4 Conducted spurious (> 30 MHz)

Compliance standards : FCC part 80, section 80.211 (f) (3)

Justification : Compliance measurements have been carried out on the antenna connector.

Compliance limit : $\text{attenuation} > 43 \text{ dB} + 10 \log P = 43 + 3 = 46 \text{ dBc}$

Result :



Measurement uncertainty	+1.7/-1.9 dB
-------------------------	--------------

Test equipment used: (Item numbers)	1, 5
-------------------------------------	------

Item numbers refer to the used test equipment module.

2.5 Occupied bandwidth (FCC)

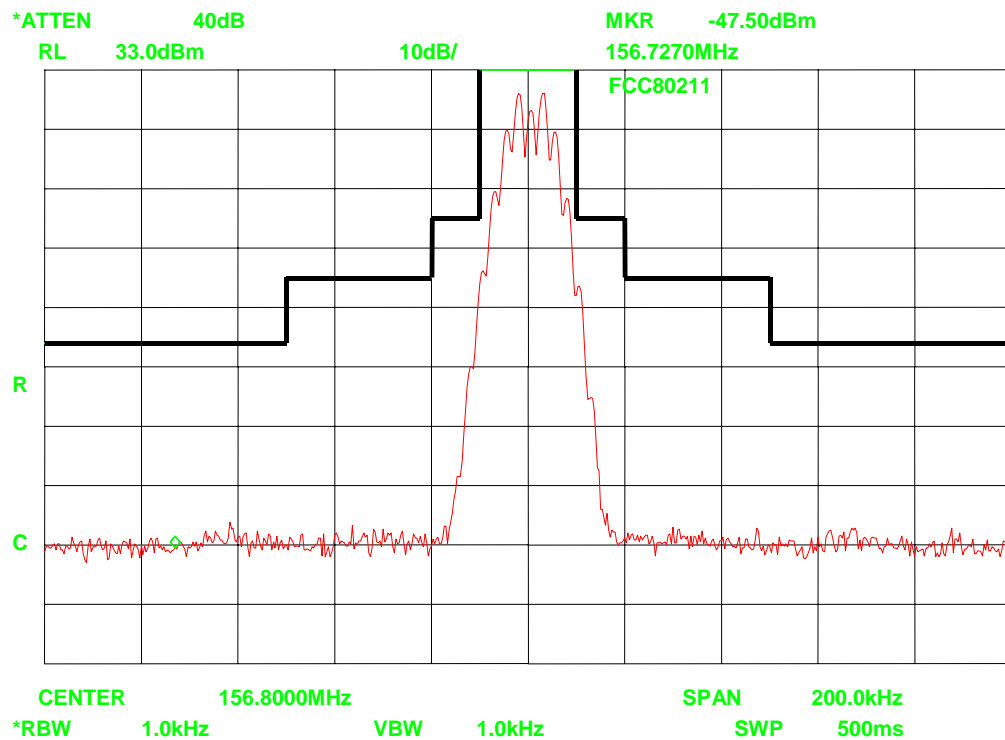
Compliance standard : FCC part 80, sections 80.211(f) (1); 80.211(f) (2)

Justification : Compliance measurements have been carried out on the antenna connector.

Compliance limit : See spectrum mask in plot.

Results :

Spectrum with 2500 Hz modulation (at a level of 16 dB greater than that necessary to produce 50% modulation)



Measurement uncertainty	+1.7/-1.9 dB (level)
	+/- 2.3 kHz (frequency)

Test equipment used: (Item numbers)	1, 5
-------------------------------------	------

Item numbers refer to the used test equipment module.

Occupied bandwidth (IC)

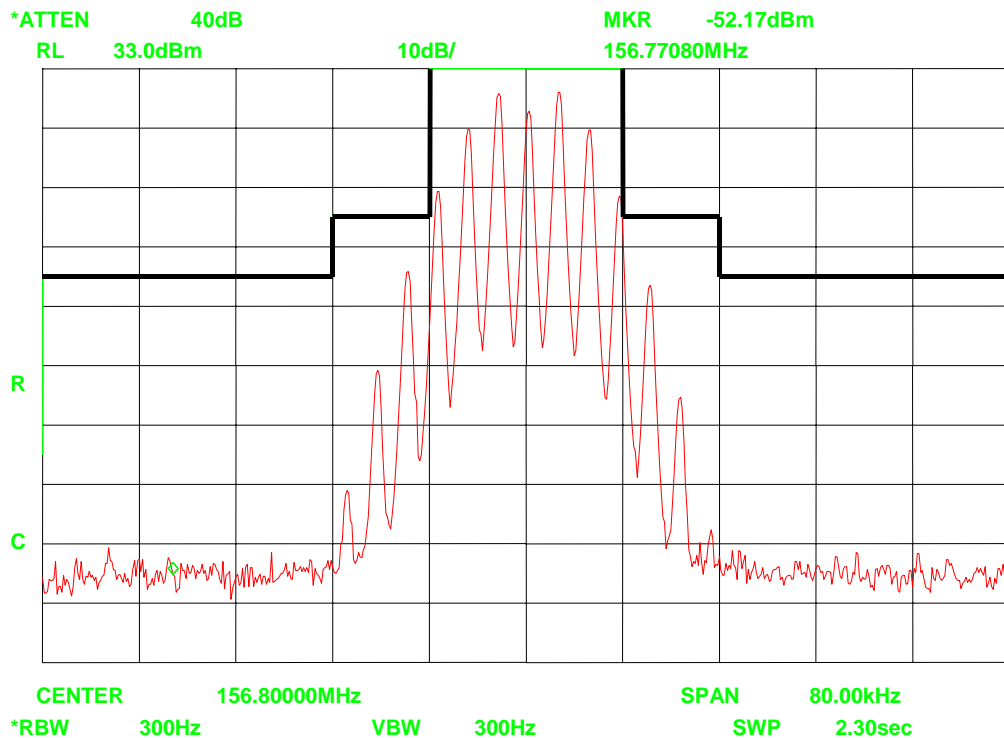
Compliance standard : IC RSS-182, section 6.3(a)

Justification : Compliance measurements have been carried out on the antenna connector.

Compliance limit : See spectrum mask in plot.

Results :

Spectrum with 2500 Hz modulation (at a level of 16 dB greater than that necessary to produce 2.5 kHz deviation)



Measurement uncertainty	+1.7/-1.9 dB (level)
	+/- 0.9 kHz (frequency)

Test equipment used: (Item numbers)	1, 5
-------------------------------------	------

Item numbers refer to the used test equipment module.

2.6 Frequency deviation

Compliance standard : FCC part 80, section 80.213 (a) (2)

2.6.1 Maximum frequency deviation at modulation frequencies below 3 kHz

CHANNEL	FMOD (Hz)	FREQUENCY DEVIATION Df			
		High Power		Low Power	
		Df (kHz)		Df (kHz)	
		+	-	+	-
16	100	0.1	0.1	0.1	0.1
	300	3.75	3.8	3.75	3.8
	500	3.9	4.0	3.9	4.0
	1000	4.2	4.4	4.2	4.4
	1500	4.1	4.3	4.1	4.3
	2000	4.3	4.4	4.3	4.4
	2500	4.3	4.4	4.3	4.4
	3000	3.9	4.0	3.9	4.0
Measurement Uncertainty	100 Hz - 3000 Hz: 0.98 dB - 0.37 dB.				
Limits	Df < 5 kHz The transmitter was modulated with an audio tone at a level 20 dB above that required to produce normal test modulation (Fmod = 1 kHz → Df = 3 kHz).				

Test equipment used: (Item numbers)	6
-------------------------------------	---

Item numbers refer to the used test equipment module.

2.6.2 Maximum frequency deviation at modulation frequencies above 3 kHz

fmod (kHz)	Frequency deviation Df (kHz)			
	Channel 16			
	High Power		Low Power	
	+	-	+	-
3	4.0	4.1	4.0	4.1
3.5	3.3	3.4	3.4	3.5
4	1.0	1.1	1.0	1.0
4.5	0.2	0.2	0.2	0.2
5	0.06	0.06	0.05	0.05
6	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
7	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
8	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
9	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
10	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
12	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
14	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
16	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
18	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
20	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
22	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
25	≤ 0.06	≤ 0.06	≤ 0.05	≤ 0.05
Measurement uncertainty	0.37 dB			
Limits	Df < 5 kHz			

Test equipment used: (Item numbers)	6
-------------------------------------	---

Item numbers refer to the used test equipment module.

2.7 Transmitter power

Compliance standard : FCC part 80, section 80.215 (e) (1)

Test conditions		Carrier Power (W)				
		Lowest Channel		Channel 16		Channel 17
Temperature	Voltage	High	Low	High	Low	High
T _{nom} = 24 °C	V _{nom}	---	--	2.089*	0.813*	--
T _{min} = -20 °C	V _{min}			--	--	
	V _{max}			--	--	
T _{max} = +55 °C	V _{min}			--	--	
	V _{max}			--	--	
Measurement uncertainty		0.5 dB				

* measured value, taken from Telefication report no. 20083516300.

Test equipment used: (Item numbers)	6
-------------------------------------	---

Item numbers refer to the used test equipment module.

2.8 Transmitter Output Power Tolerance (IC)

Compliance standard : IC RSS-182, section 3.7

Results:

Channel : 16

Power setting	Rated Power (W)	Output Power (W)	Deviation from Rated Power (dB)
High	1.7 ± 0.7 dB	2.089*	0
Low	0.8 ± 1 dB	0.813*	0
Measurement uncertainty		0.5 dB	

* measured value, taken from Telefication report no. 20083516300.

Limits:

Output Power	± 1 dB of the manufacturer's rated power.
--------------	---

Test equipment used: (Item numbers)	6
-------------------------------------	---

Item numbers refer to the used test equipment module.

2.9 Transmitter Output Powers (IC)

In accordance with RSS-182 clause 3.7

Criteria	Note	Justification
Should have a minimum e.i.r.p. of 0.25 watt. When this equipment provides for on-board communications, the output power should not exceed 1 watt on the on-board authorized frequencies.	See: section 2.8	YES
Means should be provided to reduce the carrier power for <i>ship station</i> transmitters to 1 watt or less for use at short ranges.	See: section 2.8	YES
The VHF radio transmitters must be equipped with an automatic timing device that deactivates the transmitter and reverts the transmitter to the receive mode after an uninterrupted transmission period of 5 minutes, plus or minus 10 percent.	TX timer: 5 min 1 sec	YES
These transmitters should have a device that indicates when the automatic timer has deactivated the transmitter.	TX indication turned Off	YES

2.10 Human exposure to RF radiation

Requirement reference : FCC part 80, section 80.227

The applicant has included adequate information in the user manual, see below.

Training information

SAILOR SP3540 ATEX VHF GMDSS is designed for "occupational use only". It must be operated by licensed personnel only.

The SP3540 complies with the FCC RF exposure limits for "Occupational Use Only".

- FCC OET Bulletin 65 Supplement C, evaluating compliance with FCC guidelines for human exposure to radio frequency electromagnetic fields.
- American National Standards Institute (C95.1) IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz.
- American National Standards Institute (C95.3) IEEE recommended practice for the measurement of potentially hazardous electromagnetic fields - RF and microwaves.



Warning! Your Thrane & Thrane VHF radio generates electromagnetic RF (radio frequency) energy when transmitting. To ensure that you are not exposed to excessive amounts of energy and thus to avoid health hazards from excessive exposure to RF energy, all persons must be at least 5 cm away from the antenna when the radio is transmitting.

Correct use

For best performance, hold the radio vertically and 10 cm away from the head when talking into the microphone.

2.11 Antenna mounting

Requirement reference : FCC part 80, section 80.271 (a) (6)

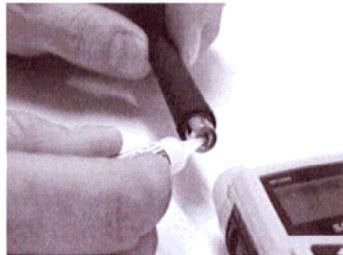
The applicant has provided the following information, see below.



To Whom It May Concern:

This letter serves as a statement on how the Sailor SP3540 ATEX GMDSS VHF is in compliance with FCC part 80 section 80.271.

For the U.S. market the antenna is glued at the factory.



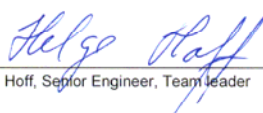
There is developed a special box for delivery to the user with room for the transceiver with the non-detachable antenna.



Aalborg

2009-02-13

Date


Helge Hoff, Senior Engineer, Team leader

2.12 Labelling

Requirement reference : FCC part 80, section 80.271 (a) (5)

A picture of the label is given below.



Used test equipment module

Ref	Description	Telefication ident.	Manufacturer	Model
1	Spectrum analyzer	TE 00099	HP	8562E
2	Logger/bow-tie antenna	TE 00967	Chase	CBL6112A
3	EMI receiver	TE 11128	R & S	ESCI
4	Semi Anechoic Chamber	TE 00861	Comtest	--
5	RF attenuator	TE 00075	Radiall	R41601000
6	Radio communication analyzer	TE 00217	R & S	CMT
7	Active loop antenna	TE 00746	R & S	HFH2-Z2
8	Termination	TE 00076	Radiall	R404588000

Cross reference

IC RSS-182 Reference	Items	FCC part reference	Remark w.r.t. to IC RSS-182
3	Certification Requirements		
3.6	Interface Impedances	--	
3.7	Transmitter Output Powers	§ 80.215 (e) (1)	
5	General Standard Specifications		
5.1	Quality Control	--	
5.2	Equipment Labels	§ 80.271 (a) (5)	
5.3	User Manual	--	
5.4	External Controls	--	
5.5	Exposure of Humans to Radio Frequency Fields	§ 80.227	
6	Transmitter and Receiver Standard Specifications (25 kHz channel spacing)		
6.1	Frequency Stability	§ 80.209 (a)	
6.2	Transmitter Output Power tolerance	--	+/- 1 dB from rated
6.3	Transmitter Unwanted Emissions – Mask B	§ 80.211 (f) (1), (2), (3)	Narrower mask compared to FCC req.
6.4	Audio filter characteristics	§ 2.1047 (a)	NA for ship stations
6.5	Transmitters not exceeding 120 mW	--	
6.6	Data modem	--	NA for voice
6.7 (a)	Receiver Spurious Emissions (Radiated)	--	150 – 500 μ V/m
6.7 (b)	Receiver Spurious Emissions (Conducted)	--	2 nW/4 kHz