telefication bv
The Netherlands
Chamber of Commerce
09076358
www.telefication.com

telefication

Test report
99788833

based on:
FCC Part 80 (10-1-06 Edition)

VHF handheld radiotelephone
SAILOR
SP3510

Contents

This report comprises of three modules. The total number of pages is: 20

Main module

1 Introduction

This report contains the result of tests performed by:

Telefication B.V.
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).

Ordering party:

Company name	:	Thrane & Thrane A/S
Address	:	Porsvej 2
Zipcode	:	9000
City/town	:	Aalborg
Country	:	Denmark
Date of order	:	30 November 2006

2 Product

A sample of the following product was submitted for testing:

Product name	:	VHF handheld radiotelephone
Product category	:	Portable ship station (non GMDSS)
Manufacturer	:	Thrane & Thrane A/S
Trade mark	:	SAILOR
Type designation	:	SP3510
FCC ID	:	TCOSP3510
Hardware version	:	--
Software version	:	1.00.02
Serial number	:	1234560017

3 Test schedule

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

Tests are carried out at the following locations:

- Telefication, Zevenaar
- TNO EPS, Niekerk
  (FCC listed site nr. 90828)

Tests are carried out between:

- 2 February and 16 March 2007

4 Product documentation

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

Description	Date	Identification
User manual SP3510 VHF	3/2007	TT-98-124292-B

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

The SP 3510 VHF radio operates 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 measurements are carried out, where relevant, with the sample in the highest power mode (5W).

The measurements are carried out on channel 16 only, unless otherwise stated.

6 Summary

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

Portable ship station in the maritime services (non GMDSS)

The sample is tested according to the following specification:

FCC Part 80 (10-1-06 Edition)

7 Conclusions

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

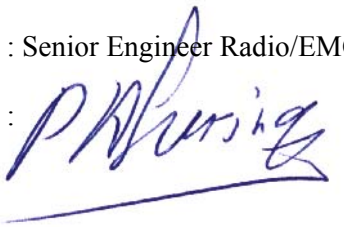
The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

All tests are performed by:

name : ing. P.A. Suringa

function : Senior Engineer Radio/EMC

signature :

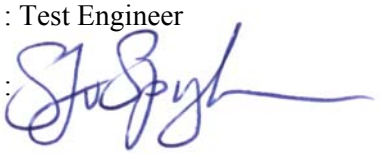


Review of test methods and report by:

name : S.J. van Spijker

function : Test Engineer

signature :



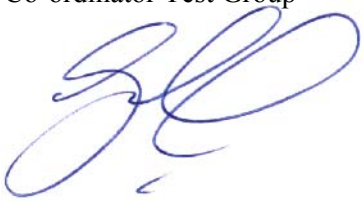
The above conclusions have been verified by the following signatory:

date : 6 June 2007

name : J. P. van de Poll

function : Co-ordinator Test Group

signature :



Test results module

1 Summary

According to FCC Part 80, the following requirements have been assessed:

Port	Reference	Phenomena	Result
Enclosure	§ 80.211 (f) (3)	Radiated emissions	P
RF connector	§ 80.211 (f) (3)	Conducted emissions	P
Antenna	§ 80.211 (f) (1), (2)	Occupied bandwidth	P
Antenna	§ 80.209 (a)	Frequency stability	P
Antenna	§ 80.213 (a) (2)	Frequency deviation	P
Antenna	§ 80.213 (b)	Modulation limitation	P
Antenna	§ 80.215 (e)	Transmitter power	P
Antenna	§ 80.227	Human exposure to RF radiation	P

Results:

P = pass NA = not applicable
F = fail NP = not performed

2 Test results

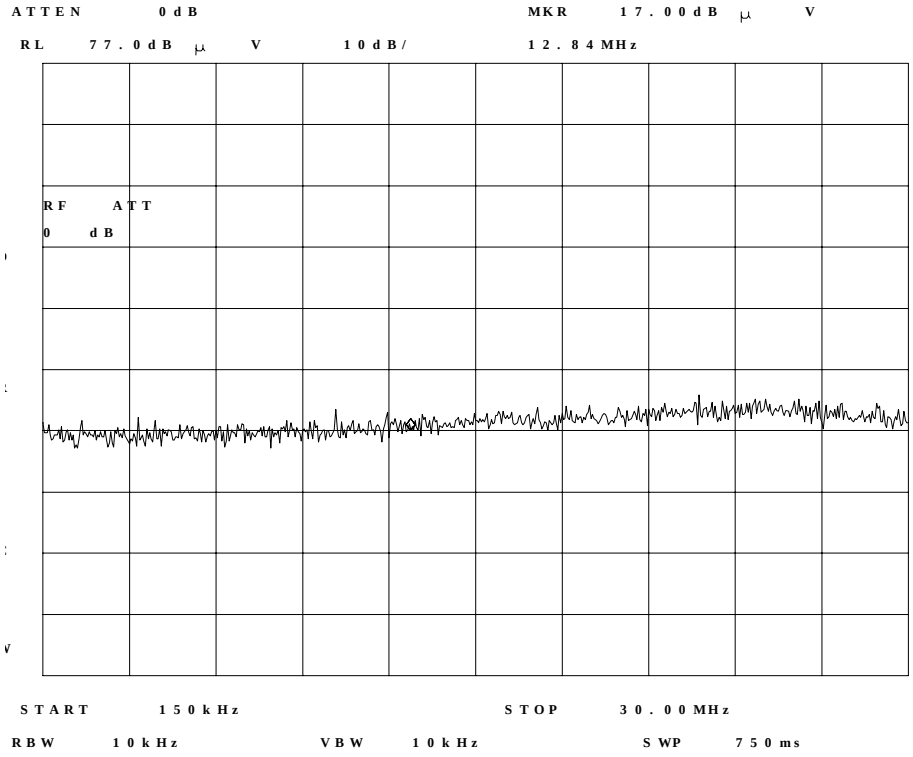
2.1 Radiated spurious (< 30 MHz), exploratory

Requirement reference : FCC part 80, section 211(f) (3)

Method : Exploratory measurements in the range 0.01 – 30 MHz are carried out in a large triple loop antenna.

Compliance limit : according to section 80.211 (f) (3): -13 dBm
conversion to a dBµV/m limit for a 3 m OATS
yields: -13 dBm + 103.4 dB = 90.4 dBµV/m

Results (dBµV/m, exploratory) :



Remark: As no emissions above measuring system noise floor are detected, measurements on the Open Area Test Site were deemed not necessary.

Used equipment:

Equipment used (refers to item numbers in section "used test equipment"	1, 12, 19

2.2 Radiated spurious (> 30 MHz), cabinet radiation

Requirement reference : FCC part 80, section 80.211 (f) (3), FCC part 2, section 2.1053 (a)

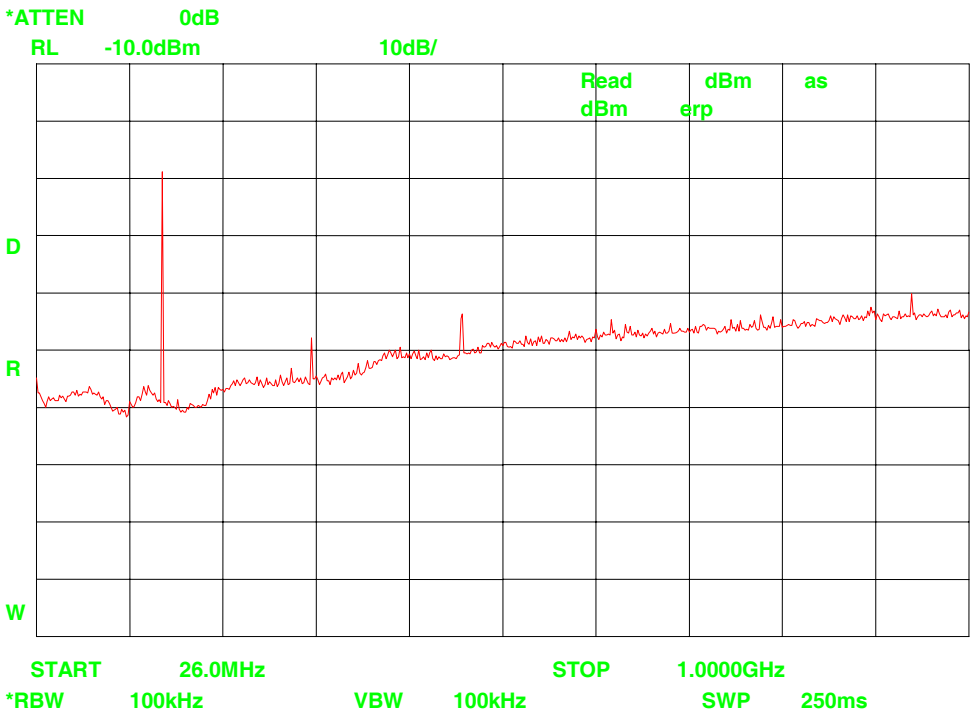
Method : Exploratory measurements in the range 0.03 – 1 GHz are performed in a 3 m compact fully anechoic room (CFAC).
Compliance measurements in the range 1 – 4 GHz are performed in a 3 m compact fully anechoic room (CFAC).
The CFAC has been calibrated for e.(i).r.p. measurements.
Compliance measurements in the range 0.03 – 1 GHz are carried out on a 3 m Open Area Test Site (OATS) at TNO EPS, Niekerk.

- FCC listed nr. 90828

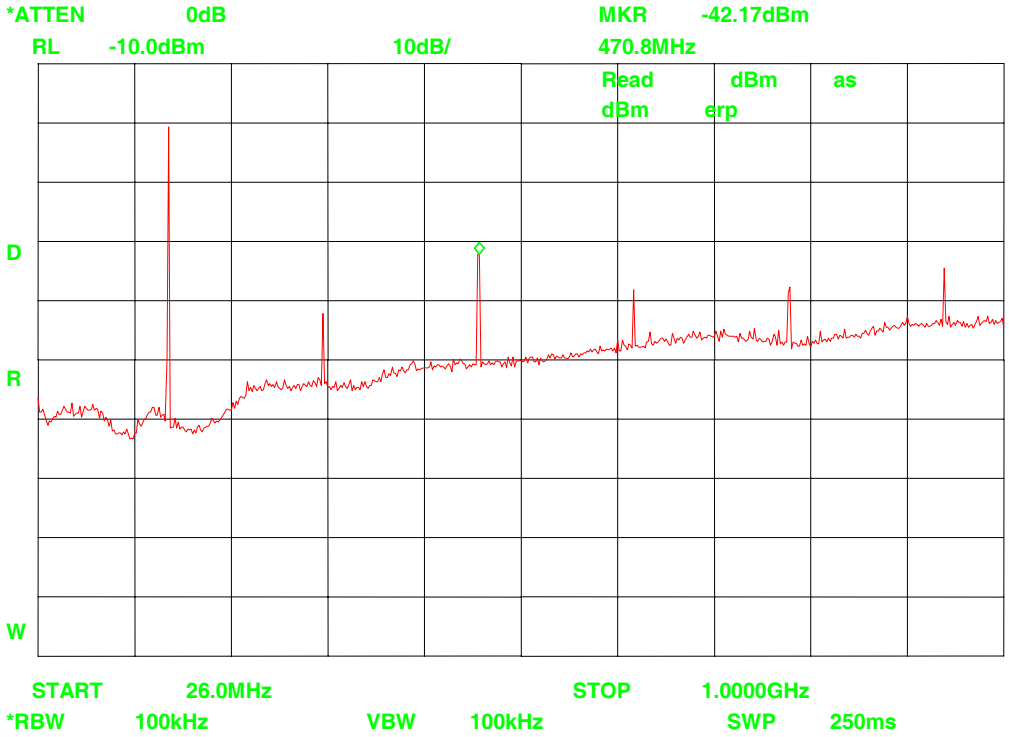
Compliance limit : according to section 80.211 (f) (3):-13 dBm
conversion to the dBµV/m limit for a 3 m OATS
yields: -13 dBm + 103.4 dB = 90.4 dBµV/m

CFAC results (< 1GHz) :
(dBm e.r.p. , exploratory)

Horizontal polarization



Vertical polarization

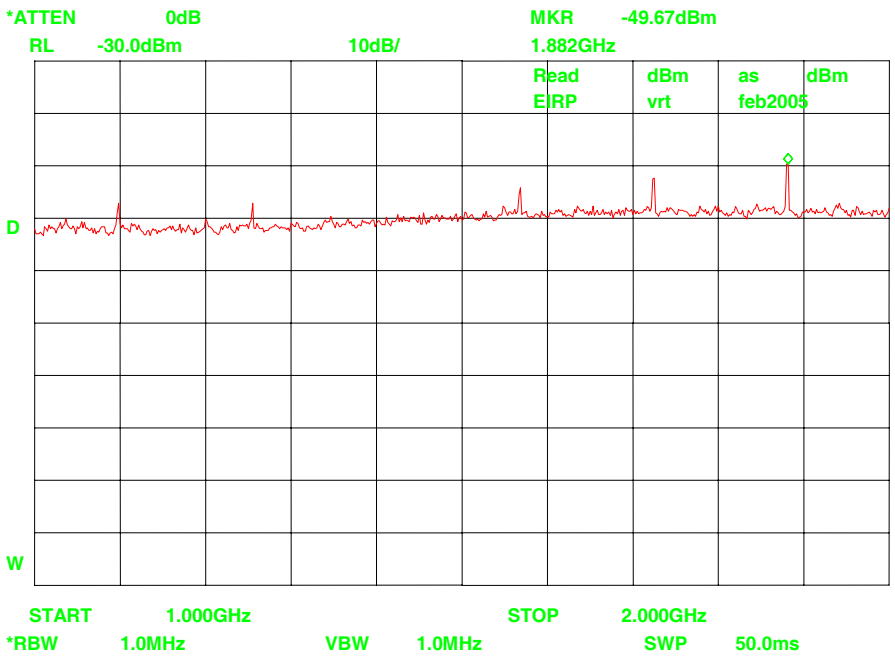


OATS results (< 1 GHz):
(dBµV/m, compliance)

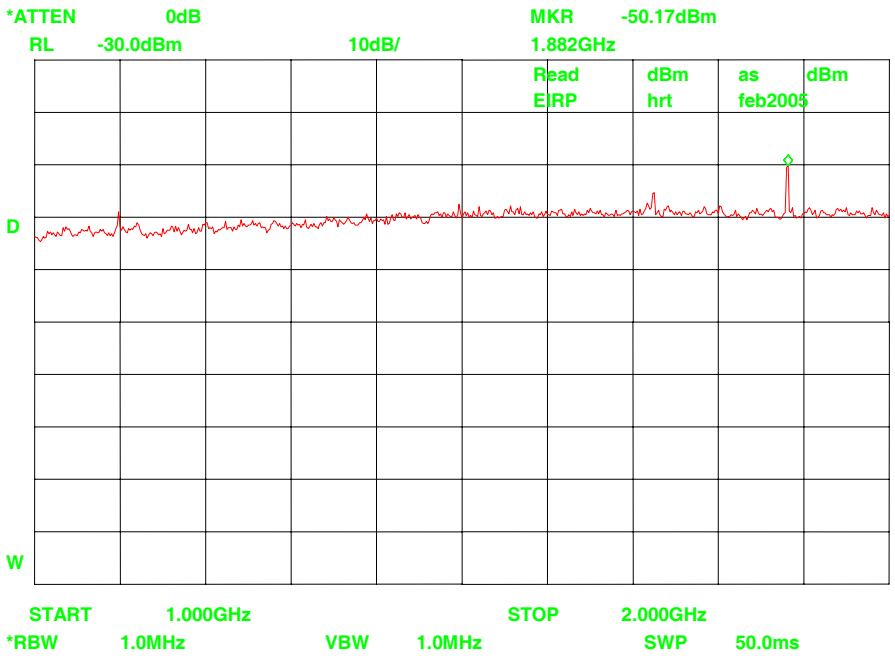
Frequency (MHz)	Polarization H/V	Level (dBµV/m) (QP)	Limit (dBµV/m) @ 3m distance
313.6	V	48.3	90.4
313.6	H	33.7	90.4
470.4	V	55.9	90.4
470.4	H	42.9	90.4
627.2	V	45.6	90.4
627.2	H	37.1	90.4
784.0	H/V	Masked by ambient noise	90.4
940.8	H/V	Masked by ambient noise	90.4

CFAC results (>1 GHz) :
(dBm e.i.r.p., compliance)

Horizontal polarization



Vertical polarization



Used equipment:

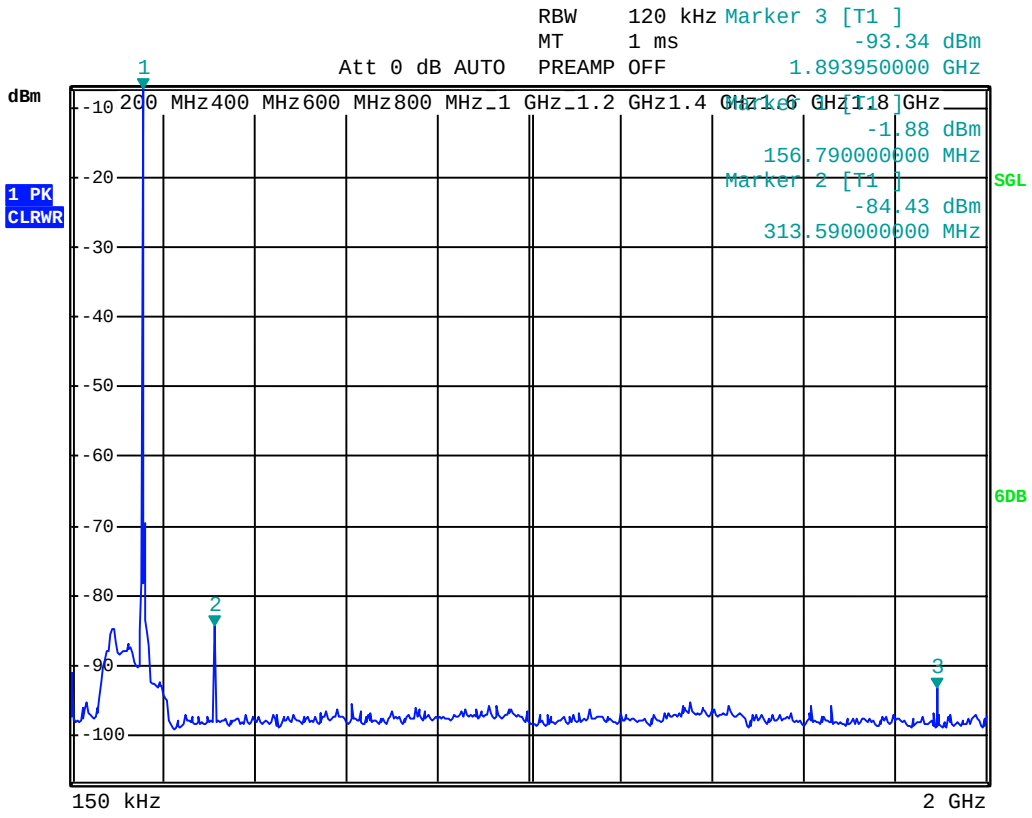
Equipment used (refers to item numbers in section “used test equipment”	1, 2, 3, 4, 5, 6, 18, 20, 21, 22

2.3 Conducted spurious at the antenna terminal

Requirement reference : FCC part 80, section 80.211 (f) (3)

Compliance limit : attenuation > 43 dB + 10 log P = 43 + 7 = 50 dBc

Result :



Note: to determine absolute values, the marker values in the plot must be compensated for 40 dB external attenuation.

Used equipment:

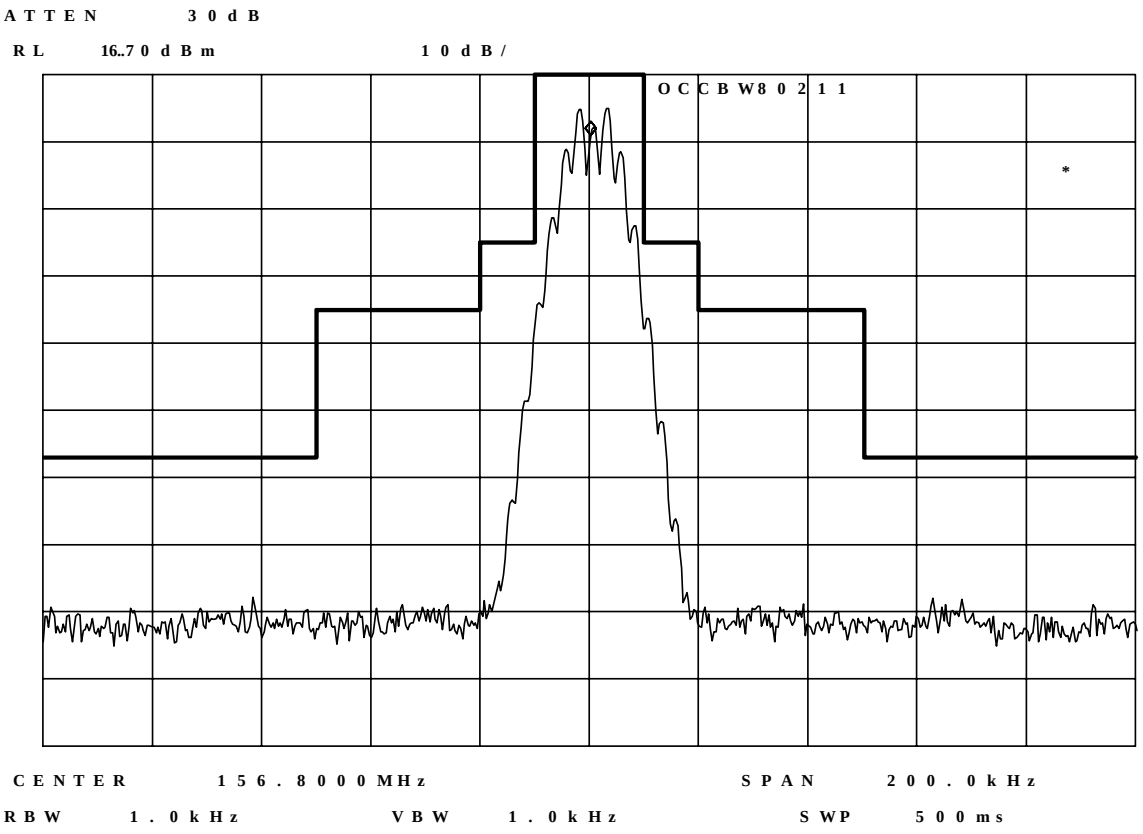
Equipment used (refers to item numbers in section "used test equipment"	10, 16, 17

2.4 Occupied bandwidth

Requirement reference : FCC part 80, sections 80.211(f) (1); 80.211(f) (2)

Compliance limit : see plot below

Method : *Measure the spectrum with 2500 Hz modulation (at a level of 16 dB greater than that necessary to produce 50% modulation)*



Used equipment:

Equipment used (refers to item numbers in section “used test equipment”	1, 8, 10, 15

2.5 Frequency deviation

Requirement reference : FCC part 80, sections 80.213 (a) (2)

Method : *$E_{mod} \leq 3$ kHz: a modulation signal at a frequency of 1 kHz was applied at a level, which produced a frequency deviation of 3 kHz The level was then increased by 20 dB and the resulting frequency deviation was measured.*
$E_{mod} > 3$ kHz: a modulation signal at a frequency of 1 kHz was applied at a level, which produced a frequency deviation of 3 kHz The resulting frequency deviation was then measured.

Compliance limit : $3.75 \leq \Delta f \leq 5$ kHz (between 75 and 100 percent)

F_{mod} (Hz)	**Frequency deviation Δf (kHz)**	
	$+\Delta f$	**$-\Delta f$**
500	4.63	4.79
600	4.64	4.80
700	4.61	4.68
1000	4.52	4.68
2000	4.22	4.40
3000	3.83	4.00
Measurement uncertainty:	± 0.3 dB	

Used equipment:

Equipment used (refers to item numbers in section “used test equipment”	8, 11, 13

2.6 Modulation limitation

Requirement reference : FCC part 80, sections 80.213 (b)

Method : *A modulation signal at a frequency of 1 kHz was applied at a level, which produced a frequency deviation of 1 kHz .The level was then increased by 20 dB and the resulting frequency deviation was measured.*

Compliance limit : ≤ 5 kHz

Temperature	**Voltage**	**Maximum frequency deviation (kHz)**
T_{nom}= 24 °C	V_{nom}	± 4.36
T_{min}= -20 °C	V_{nom}	± 4.60
	V_{min}	± 4.60
T_{max}= +55°C	V_{max}	± 4.30
	V_{min}	± 4.30
Measurement uncertainty		± 0.3 dB

V_{min} = 7.0 Volt
V_{nom} = 7.2 Volt
V_{max} = 10.5 volt

Used equipment:

Equipment used (refers to item numbers in section “used test equipment”	8, 11, 13, 14

2.7 Transmitter power

Requirement reference : FCC part 80, section 80.215 (e)

Compliance limit : ≤ 10 W

Test conditions		Carrier Power (W)					
		Channel 60		Channel 16		Channel 88	
Temperature	**Voltage**	**High power**	**Low power**	**High power**	**Low power**	**High power**	**Low power**
T_{nom}= 22 °C	V_{nom}	4.266	0.964	4.236	0.933	4.198	0.918
T_{min}= -15 °C	V_{min}	4.256	0.955	4.227	0.933	4.178	0.914
	V_{max}	5.152	0.975	5.035	0.955	4.943	0.933
T_{max}= +55°C	V_{min}	4.140	0.979	4.130	0.955	4.198	0.933
	V_{max}	5.358	1.000	5.176	0.975	5.260	0.959
Measurement uncertainty		0.5 dB					

V_{min} = 7.0 Volt
V_{nom} = 7.2 Volt
V_{max} = 10.5 Volt

Channel 16 = 156.8 MHz
Channel 60 = 156.025 MHz
Channel 88 = 157.425 MHz

Used equipment:

Equipment used (refers to item numbers in section “used test equipment”	8, 11, 13, 14

2.8 Frequency stability

Requirement reference : FCC part 80, section 80.209

Compliance limit : 10 ppm (1.57 kHz)

Results :

Temperature °C	Supply voltage * Vdc	Frequency error (Hz)
-20	7.2	*-32*
-10	7.2	*+17*
0	7.2	*0*
10	7.2	*+43*
20	7.2	*+33*
30	7.2	*+53*
40	7.2	*+52*
50	7.2	*+16*

** during the test it was observed that frequency error did not change due to extreme supply voltages, therefore, for simplicity's sake, only results at nominal supply voltage are stated..*

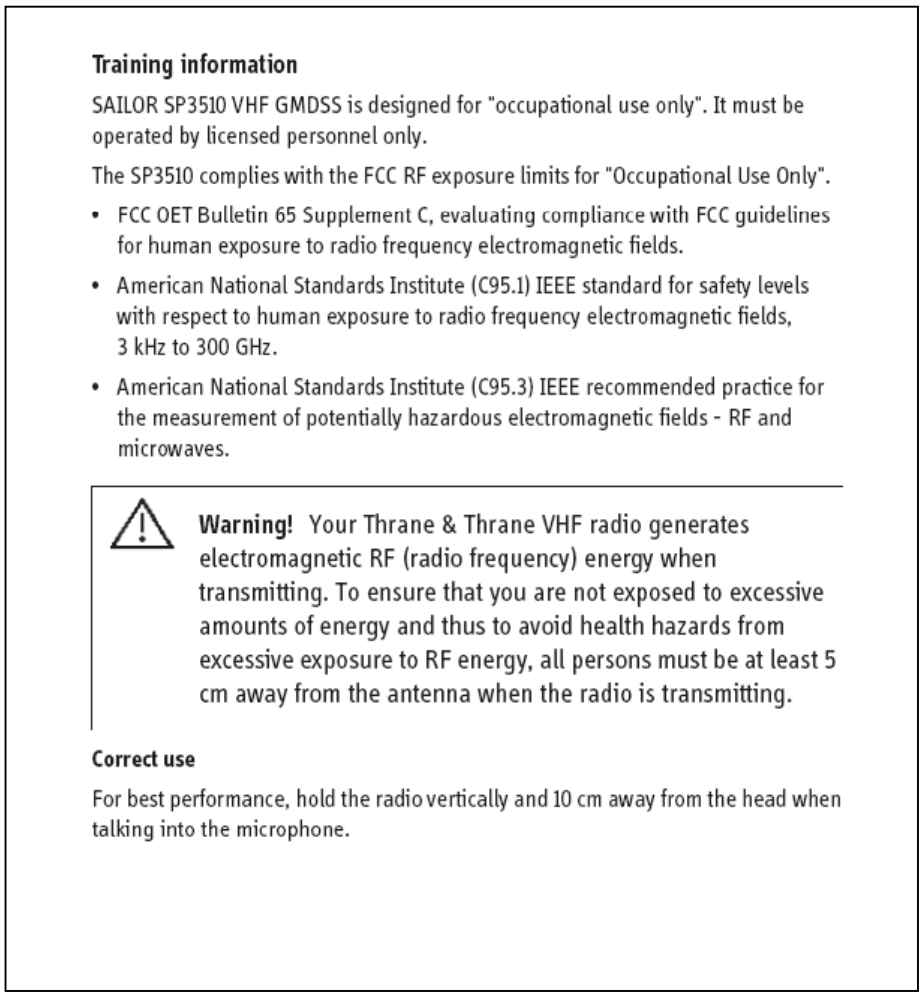
Used equipment:

Equipment used (refers to item numbers in section "used test equipment"	7, 10, 11, 13, 14

2.9 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 SP3510 VHF GMDSS is designed for "occupational use only". It must be operated by licensed personnel only.

The SP3510 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.

Used equipment:

Equipment used (refers to item numbers in section “used test equipment”	Not applicable

Used test equipment module

Ref	Description	Telefication ident.	Manufacturer	Model
1	Spectrum analyzer	TE 00099	HP	8562E
2	Pre-amplifier	TE 00344	R & S	ESV-Z3
3	Pre-amplifier	TE 00092	HP	8449B
4	Logper/bow-tie antenna	TE 00700	EMCO	3143
5	Horn antenna	TE 00531	EMCO	3115
6	Compact Full Anechoic Chamber (CFAC)	TE 01064	Euroshield	RFD-F-100
7	Microwave counter	TE 00252	HP	5350B
8	Radio communication service mon.	TE 11129	R & S	CMS54
9	RF attenuator	TE 00380	Bird	8325
10	RF attenuator	TE 00127	Tenuline	8343-200
11	Power supply	TE 00581	Delta	MST030-10
12	Triple loop antenna	TE 01066	Telefication	--
13	Digital multimeter	TE 00143	HP	34401
14	Climate chamber	TE 00741	CTS	C-40/350
15	Mouth simulator	TE 00530	Bruel & Kjaer	4227
16	Test receiver	TE 11128	R & S	ESCI
17	RF attenuator	TE 00128	Termaline	8343-100
18	50 Ω termination	TE 00077	Radiall	R404588000
19	Pre-amplifier 0.01 – 30 MHz	TE 00036	Telefication	--

The following measurement equipment is used at TNO EPS Niekerk:

20	Test receiver	S/n 15667	Rohde & Schwarz	ESCS 30
21	Open Area Test Site	13886	Comtest	TNO EPS
22	Biconilog antenna	S/n 15633	Chase	CBL6111B