

Test report

99817532

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

MF/HF radio capable of transmitting and receiving
DSC, NBDP and radiotelephony
SAILOR
SAILOR SYSTEM 5000 MF/HF

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	6
TEST RESULTS MODULE.....	7
1 SUMMARY.....	7
2 TEST RESULTS	8
2.1 Radiated spurious (> 30 MHz), cabinet radiation	8
2.2 Conducted spurious at the antenna terminal.....	9
2.3 Occupied bandwidth.....	13
2.4 Transmitter power	17
2.5 Frequency stability with temperature.....	18
2.6 Frequency stability with supply voltage	19
2.7 Audio frequency response of SSB telephony.....	20
2.8 Level control and/or limiter for SSB.....	21
USED TEST EQUIPMENT MODULE.....	22

This report comprises of three modules. The total number of pages is: 22

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). 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 : 9000
City/town : Aalborg
Country : Denmark
Date of order : 27 October 2006

2 Product

A sample of the following product was submitted for testing:

Product name	: MF/HF radio capable of transmitting and receiving DSC, NBDP and radiotelephony
Manufacturer	: Thrane & Thrane A/S
Trade mark	: SAILOR
Type designation	: SAILOR SYSTEM 5000 MF/HF
Units	: Transceiver unit SAILOR TU5160 Proto 2
	Control unit SAILOR CU5100 Proto 2
	Antenna tuner unit SAILOR ATU5215 Proto 2
	Alarm panel SAILOR AP5065 Proto 2
	Power supply unit PCH5083 Proto 4
FCC ID	: ROJTU5160
Software version	: TU: 1.35.15, CU: 1.35.15, ATU: 101.2.0
Hardware version	: CU 60122876 P standard TU 60122878 E standard TU 60122879 F standard TU 60122880 D standard TU 60123937 A 150W FCC
Serial number (TU)	: 12345678

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 location:

- Telefication, Zevenaar

Tests are carried out between:

- 22 October and 9 November 2007

4 Product documentation

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

Description	Identification	Date
Technical manual SYSTEM 5000	TT-98-123451-THR-A	0715
User manual CU5100	TT-98-124350-THR-A	0725

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

None.

6 Summary

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

SHIP STATION IN THE MARITIME SERVICE (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.

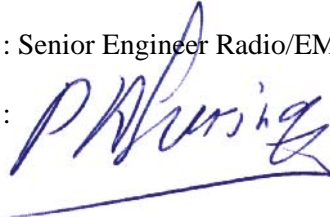
The results of the tests as stated in this report, are exclusively applicable to the product item as identified in this report. Telefication does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

All tests are performed by:

name : 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 :



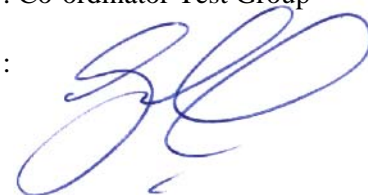
The above conclusions have been verified by the following signatory:

date : 4 December 2007

name : J. P. van de Poll

function : Co-ordinator Test Group

signature :



Test results module

1 Summary

According to FCC Parts 2 & 80, the following requirements have been assessed:

Port	Reference	Phenomena	Result
Enclosure	§ 80.211 (a) (3)	Radiated emissions	P
RF connector	§ 80.211 (a) (3)	Conducted spurious at the antenna terminal	P
RF connector	§ 80.211 (a) (1), (2)	Occupied bandwidth	P
RF connector	§ 80.209 (a)	Frequency stability	P
RF connector	§ 80.213 (b)	Modulation limitation	P
RF connector	§ 80.215 (d)	Transmitter power	P
RF connector	§ 2.1055 (d) (1)	Frequency stability vs. voltage	P
RF connector	§ 2.1047 (a)	Audio frequency response of SSB telephony	P
RF connector	§ 2.1047 (b) (c)	Level control and/or limiter for SSB	P

Results:

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

2 Test results

2.1 Radiated spurious (> 30 MHz), cabinet radiation

Requirement reference : FCC part 2, section 2.1053 (a)

Method : Measurements in the range 0.03 – 1 GHz are performed in a 3 m compact fully anechoic room (CFAC).
The CFAC has been calibrated for e.(i).r.p. measurements.

Compliance limit : > 60 dB attenuation w.r.t. mean power

Results : In the table, “c” refers to the fundamental carrier frequency of 25.070 MHz.

Frequency	dBm e.i.r.p.	Attenuation
1c	55 ^{*)}	0
2c	-61	116
3c	-40	98
4c	-40	98
5c	-60	115
6c	-30	85
7c	-43	98
8c	-42	97
9c	-45	100
10c	-42	97
11c	-47	102
12c	-60	115
13c	-53	108
14c	-46	101
15c	-46	101
16c	-55	110
17c	-51	106
18c	-62	117
19c	-57	112
20c	-60	115
21c	-59	114
22c	-55	110

^{*)} 3 dBi antenna gain is assumed.

Used equipment:

Equipment used (refers to item numbers in section “used test equipment”)	1, 2, 4, 6, 9, 10, 13, 18, 20
--	-------------------------------

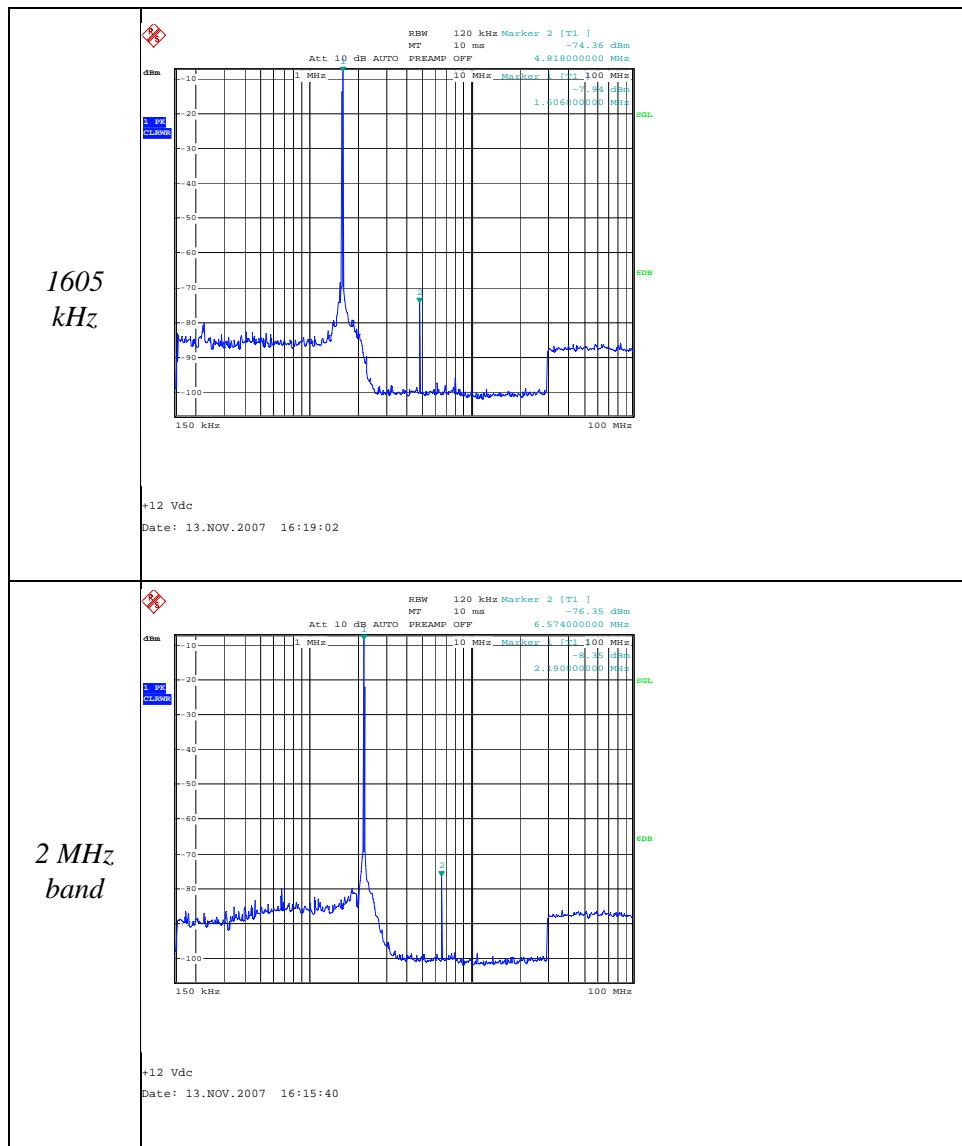
2.2 Conducted spurious at the antenna terminal

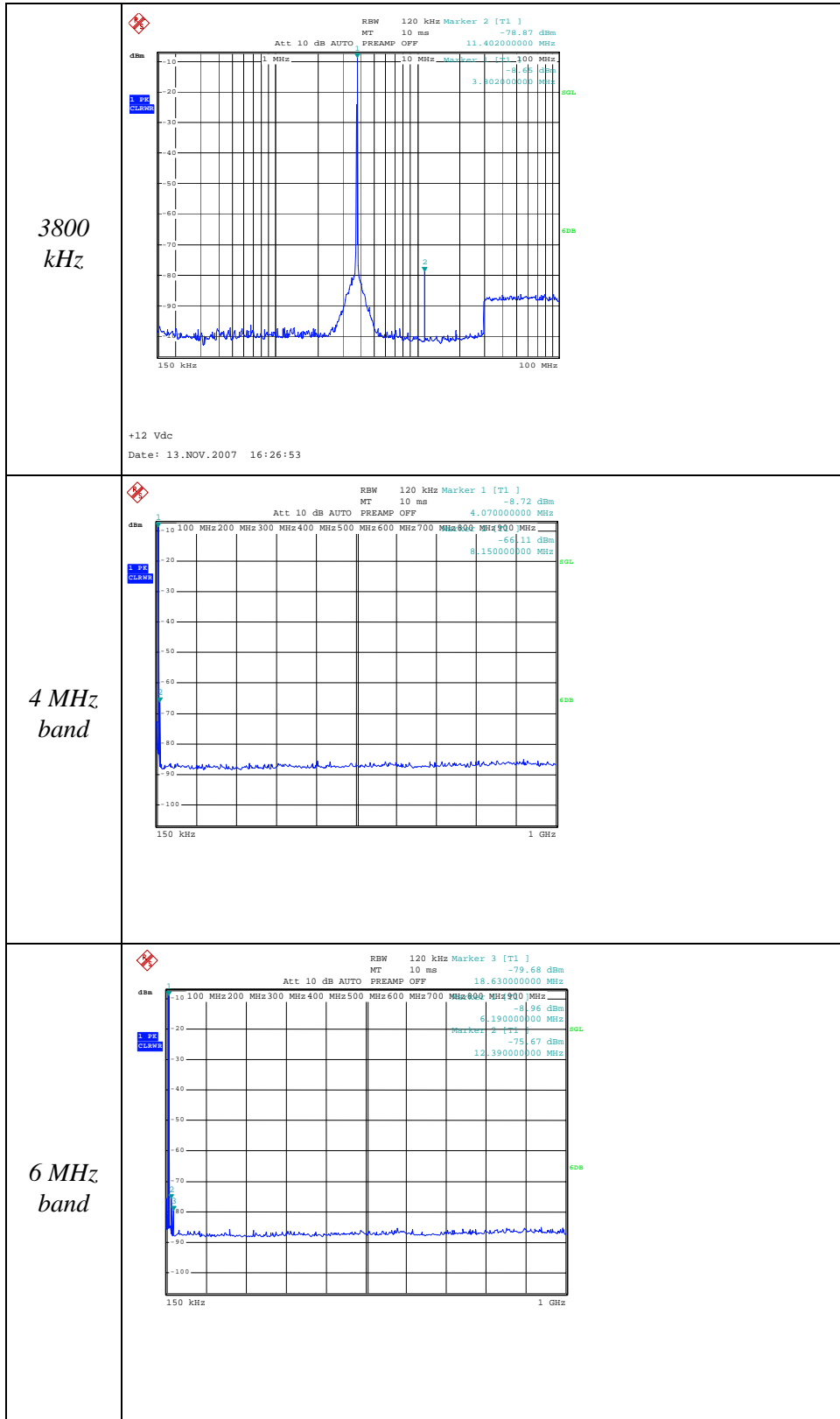
Requirement reference : FCC part 80, section 80.211 (a) (3)

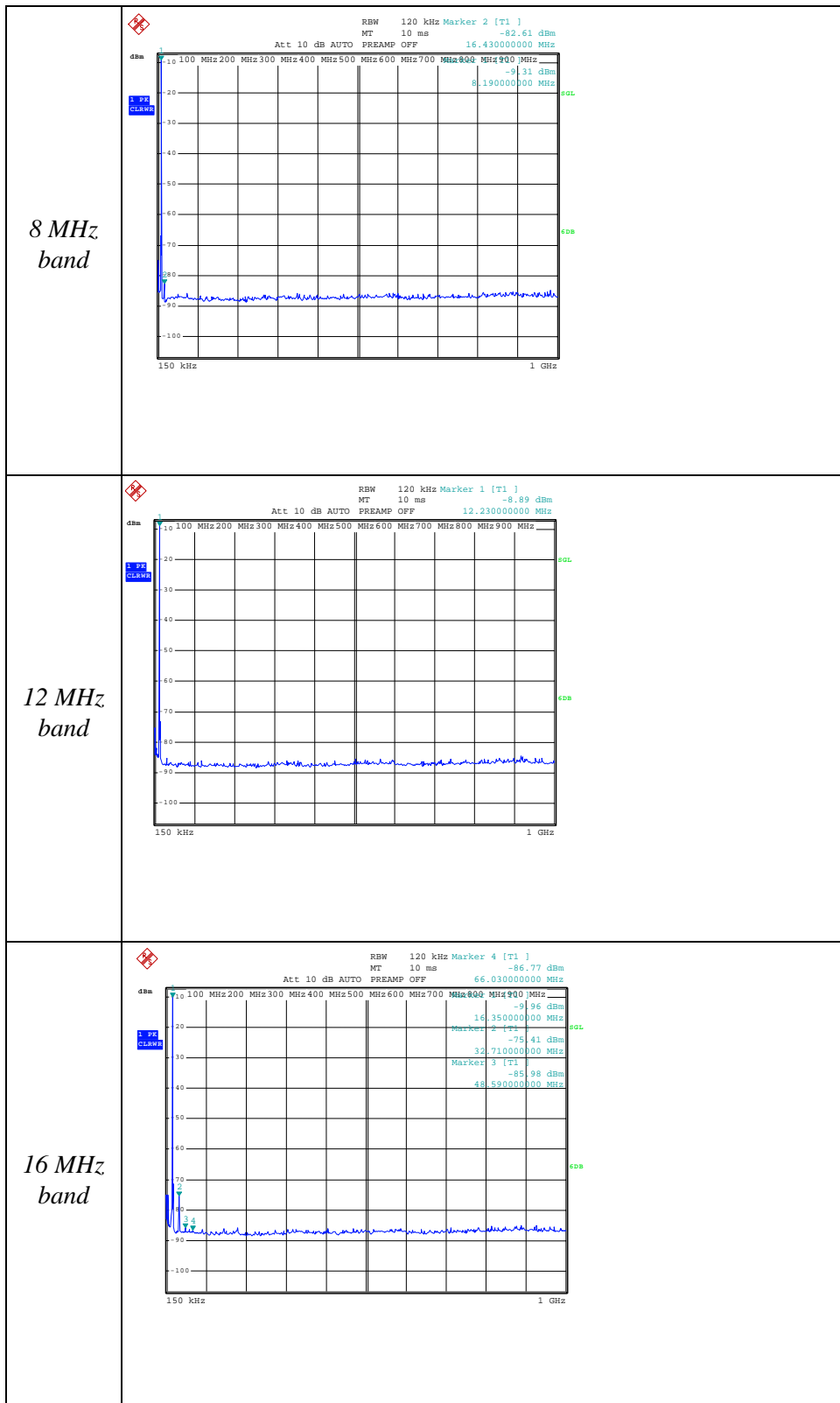
Compliance limit : attenuation > 43 dB + 10 log P = 43 + 22 = 65 dB

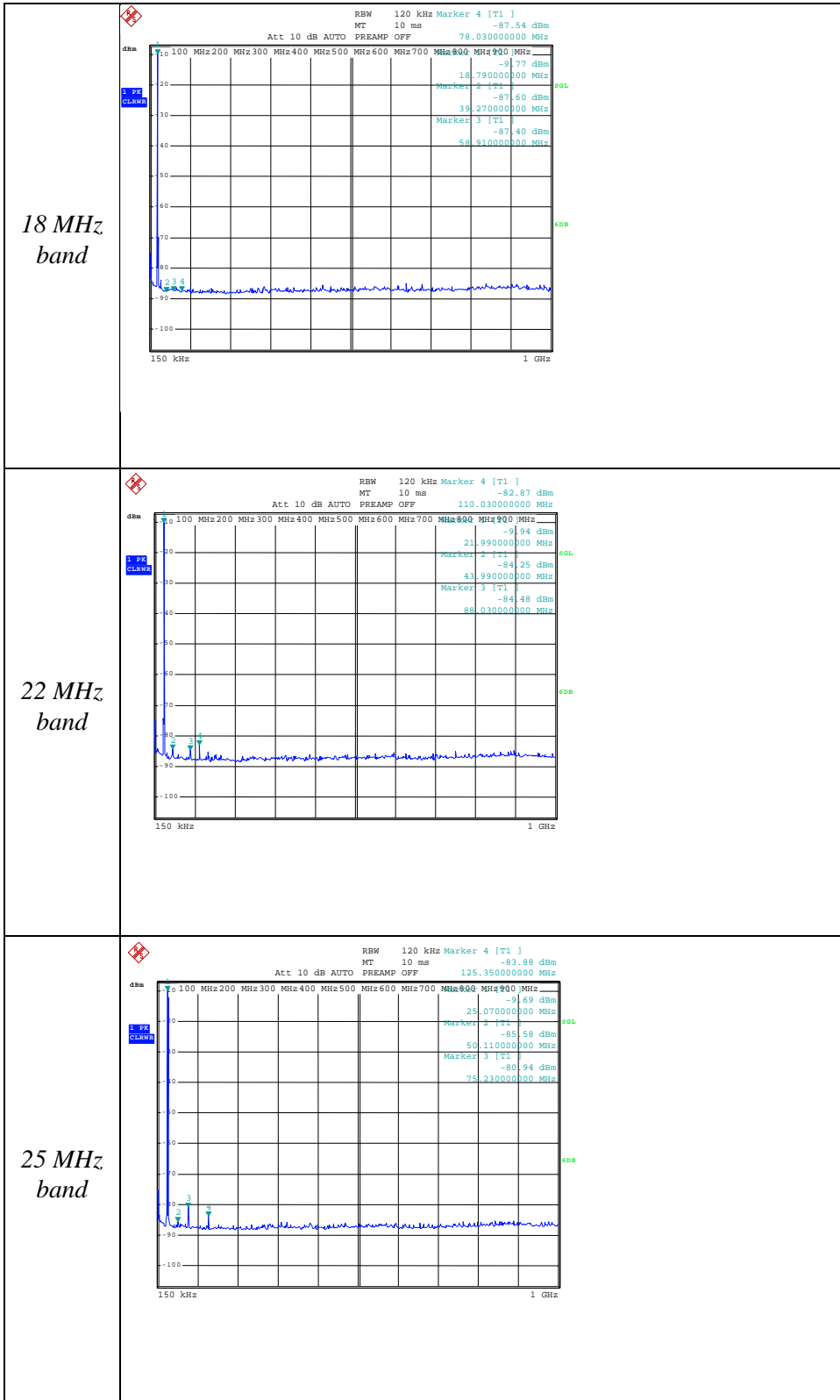
Method : Modulated in J3E mode with 400 and 1800 Hz tones with a level 10 dB greater than that necessary to produce rated peak envelope power.

Results :









Note: to determine absolute values, the marker values in the plot must be compensated for 60 dB external attenuation.

Used equipment:

<p>Equipment used (refers to item numbers in section “used test equipment”)</p>	<p>9, 10, 11, 13, 16, 17, 20</p>
---	----------------------------------

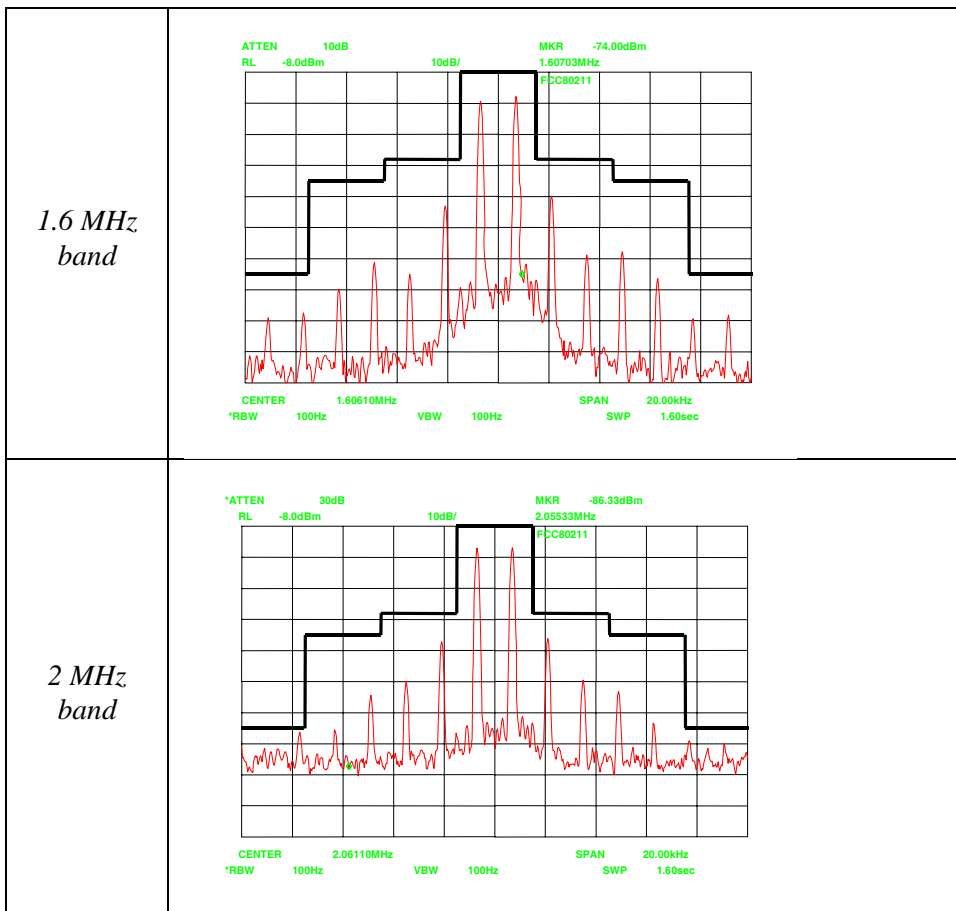
2.3 Occupied bandwidth

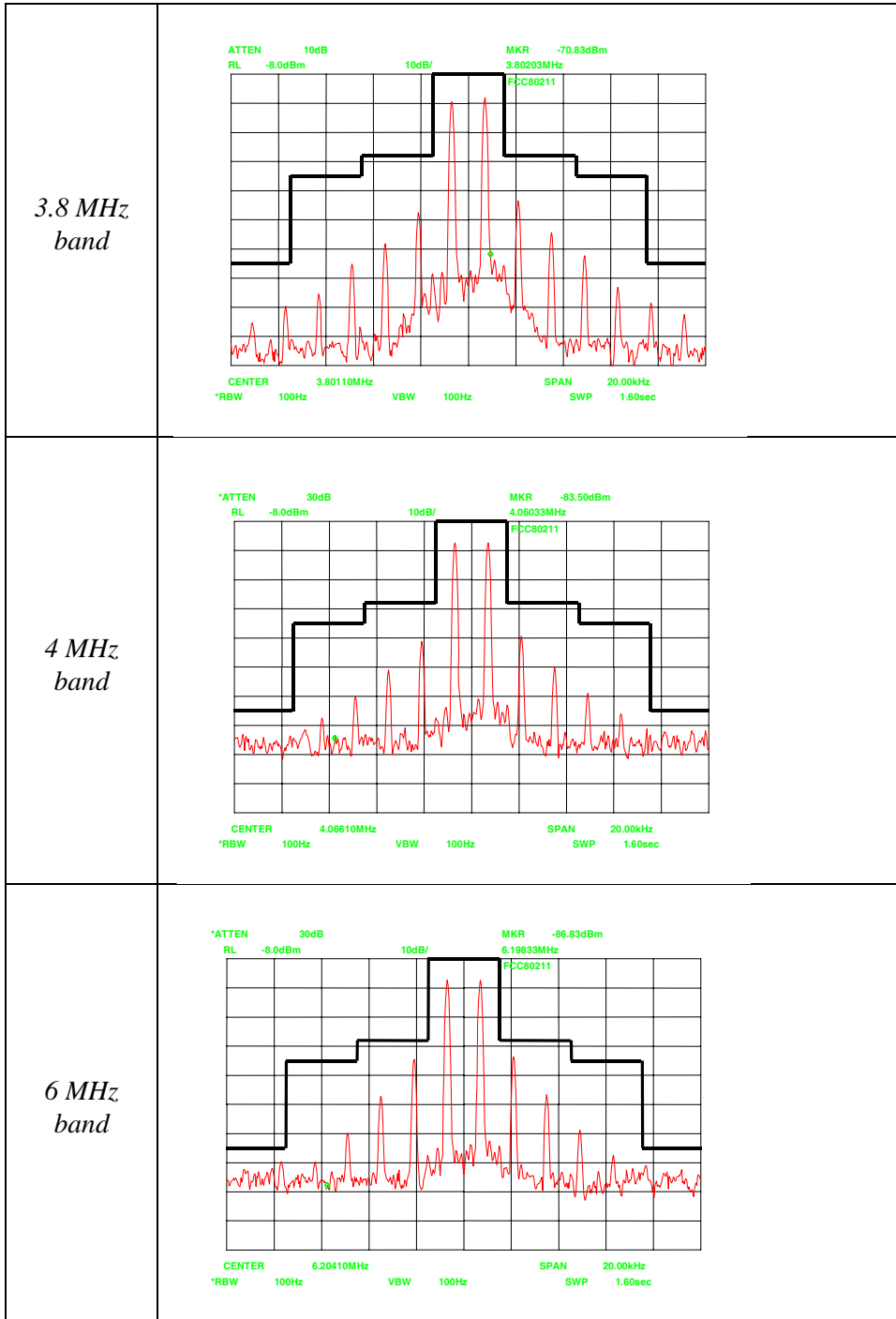
Requirement reference : FCC part 80, sections 80.211(a) (1); 80.211(a) (2)
FCC part 2, section 2.1049 (c) (4)

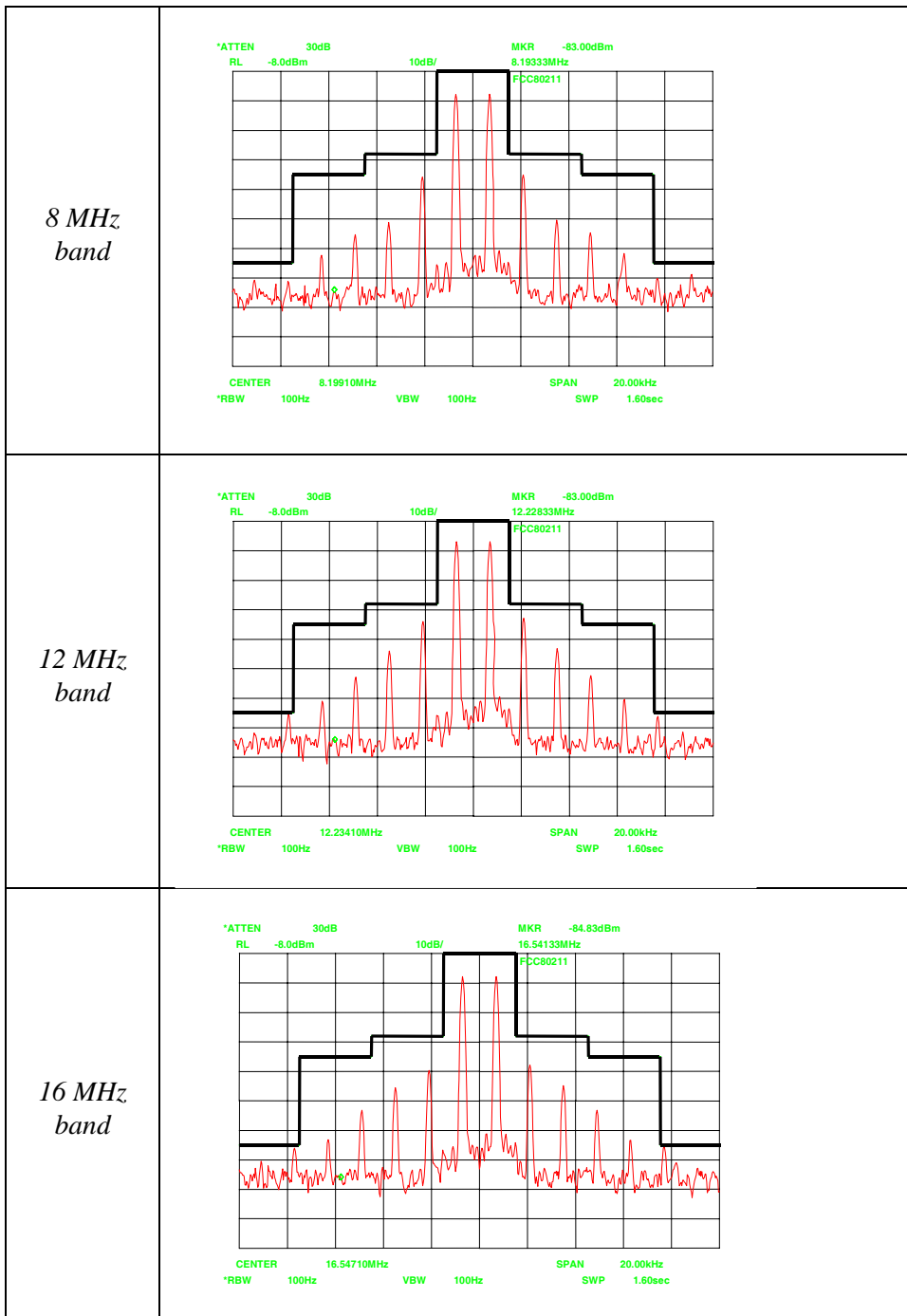
Compliance limit : see plots below

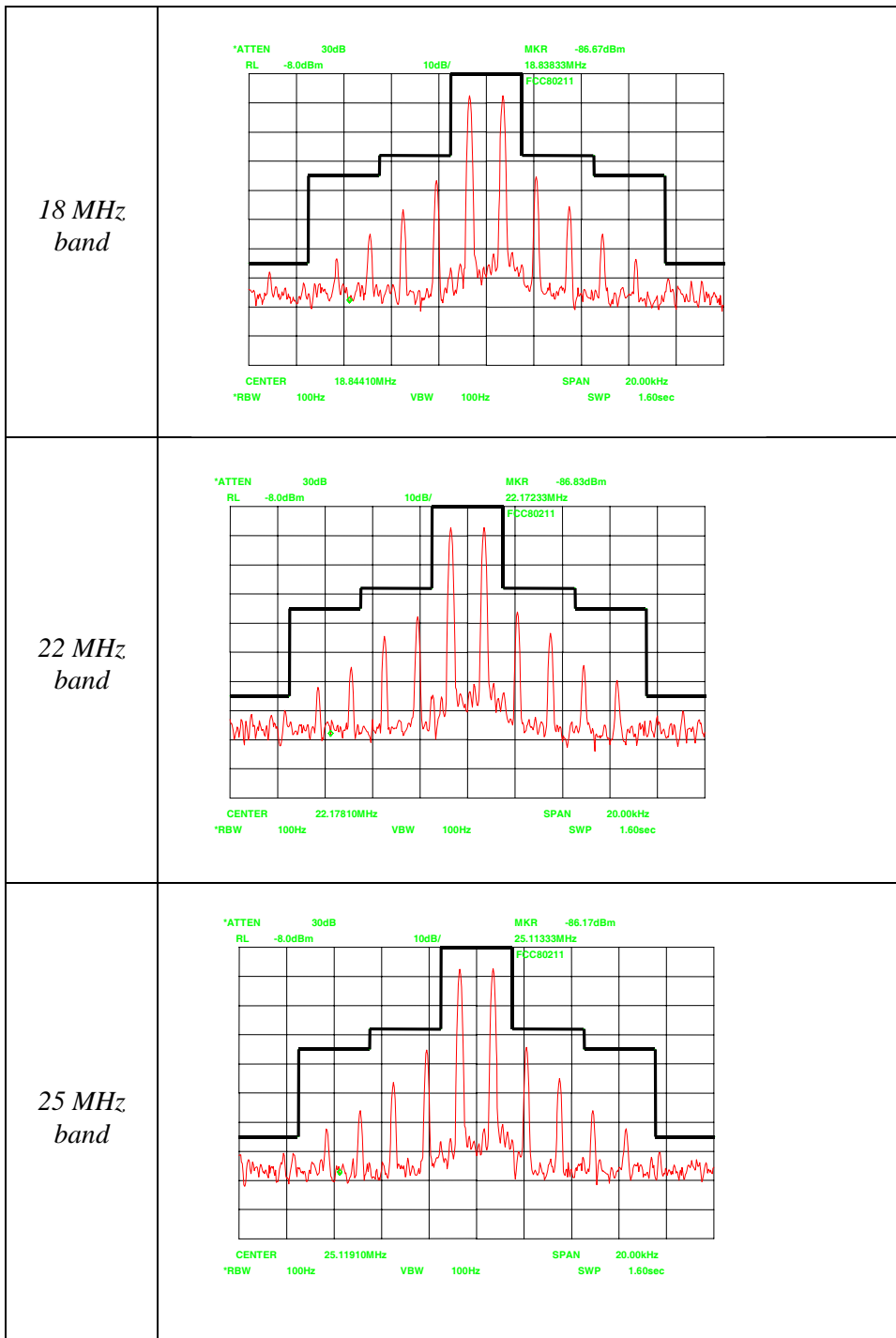
Method : Modulated in J3E mode with 400 and 1800 Hz tones with a level 10 dB greater than that necessary to produce rated peak envelope power.

Microphone input









Note: to determine absolute values, the marker values in the plot must be compensated for 60 dB external attenuation.

Used equipment:

<p>Equipment used (refers to item numbers in section “used test equipment”)</p>	<p>1, 9, 10, 11, 20</p>
---	-------------------------

2.4 Transmitter power

Requirement reference : FCC part 80, section 80.215 (d); part 2, section 2.1046 (b)

Compliance limit : ≤ 150 W PEP

Method : Modulated in J3E mode with 400 and 1800 Hz tones with a level 10 dB greater than that necessary to produce rated peak envelope power.

Frequency	Final voltage (V)	Final current (A)	Peak envelope power (W)
1605 kHz	24.0	11.9	108
2187.5 kHz	24.0	13.0	114
3800 kHz	24.0	12.7	113
ITU ch 401	24.0	13.1	142
ITU ch 601	24.0	12.8	137
ITU ch 801	24.0	12.5	129
ITU ch 1201	24.0	14.1	143
ITU ch 1601	24.0	13.1	120
ITU ch 1801	24.0	13.0	123
ITU ch 2201	24.0	13.7	126
ITU ch 2501	24.0	13.2	124
Measurement uncertainty	0.5 dB		

Used equipment:

Equipment used (refers to item numbers in section "used test equipment")	9, 10, 12, 13, 18, 20
--	-----------------------

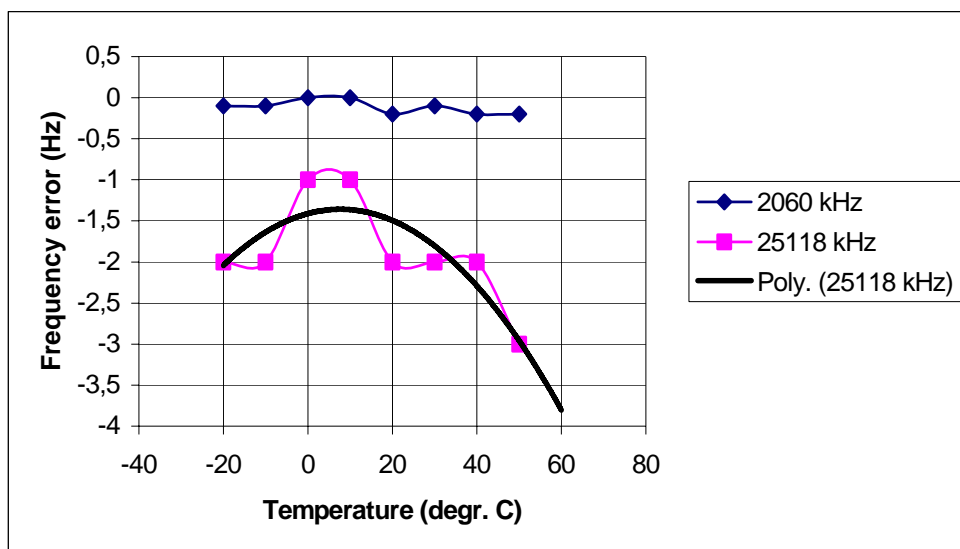
2.5 Frequency stability with temperature

Requirement reference : FCC part 80, section 80.209 (a)

Compliance limit : +/-10 Hz (radiotelephony mode)

Results :

Temperature °C	Frequency error (Hz)	
	2060 kHz	25118 kHz
-20	-0.1	-2.0
-10	-0.1	-2.0
0	0.0	-1.0
10	0.0	-1.0
20	0.0	-2.0
30	-0.1	-2.0
40	-0.2	-2.0
50	-0.2	-3.0



Used equipment:

Equipment used (refers to item numbers in section "used test equipment")

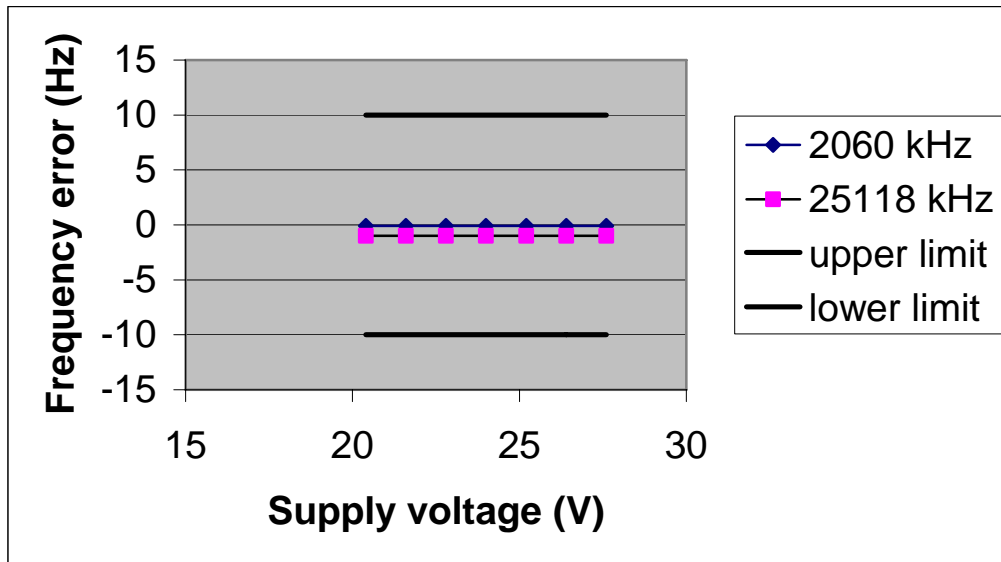
7, 9, 10, 11, 13, 14

2.6 Frequency stability with supply voltage

Requirement reference : FCC part 80, section 80.209 (a)

Compliance limit : +/-10 Hz (radiotelephony mode)

Voltage variation (%)	Voltage (V)	Frequency error (Hz)	
		2060 kHz	25118 kHz
-15	20.4	-0.1	-1.0
-10	21.6	-0.1	-1.0
-5	22.8	-0.1	-1.0
0	24.0	-0.1	-1.0
5	25.2	-0.1	-1.0
10	26.4	-0.1	-1.0
15	27.6	-0.1	-1.0



Used equipment:

Equipment used (refers to item numbers in section "used test equipment")	7, 9, 10, 11, 13
--	------------------

2.7 Audio frequency response of SSB telephony

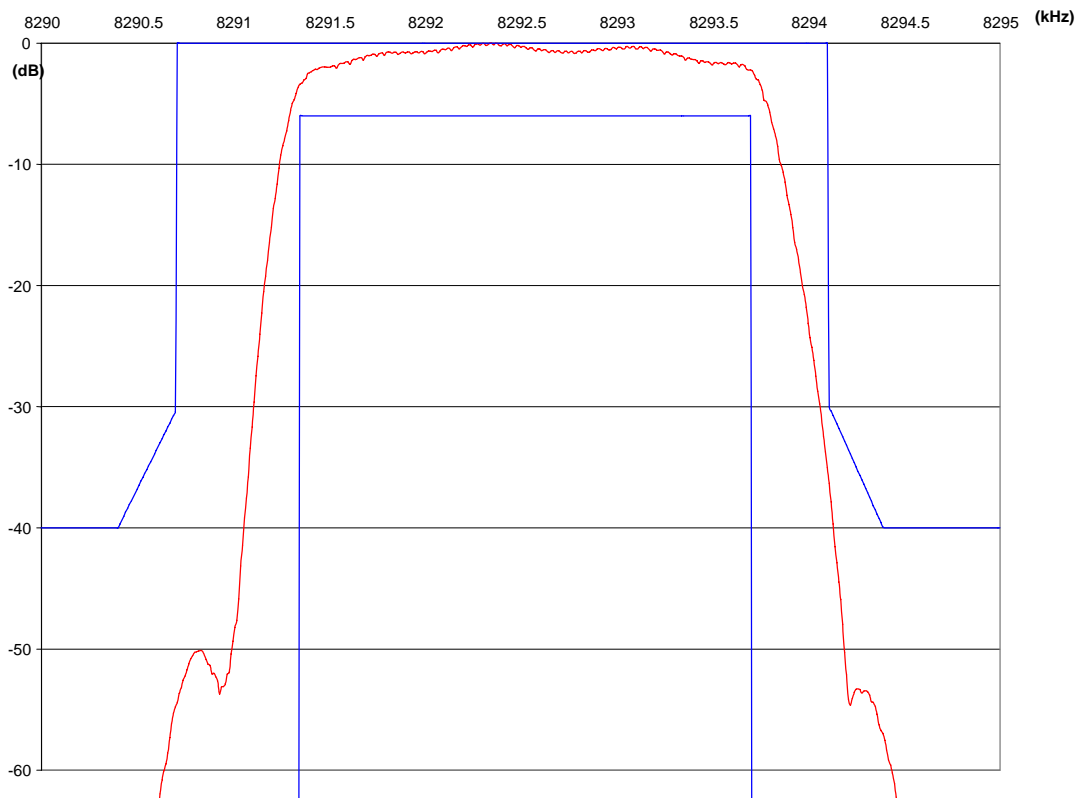
Requirement reference : FCC part 2, section 2.1047 (a)

Compliance limit : Not applicable (notwithstanding the plot mask)

Method : The frequency of the AF test signal is varied between 100 Hz and 10 kHz. The level of the AF test signal is adjusted so that the output power is 10 dB below the rated output power.

Test frequency: 8291 kHz

Microphone input:



Used equipment:

Equipment used (refers to item numbers in section "used test equipment")	8, 9, 10, 11, 13, 22
--	----------------------

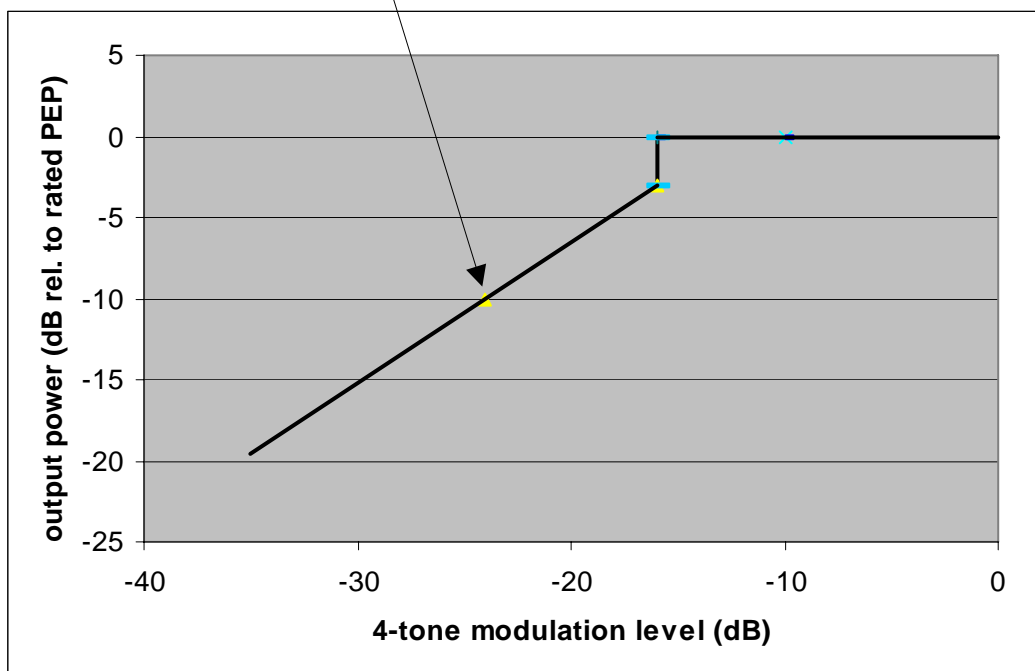
2.8 Level control and/or limiter for SSB

Requirement reference : FCC part 2, section 2.1047 (b) (c)

Compliance limit : Not applicable

Method : The modulation in J3E mode was four tones at frequencies 700 Hz, 1100 Hz, 1700 Hz and 2500 Hz. The output power relative to rated peak envelope power was measured with a spectrum analyser.

*Microphone input
(32 mV input voltage for -10 dB relative to rated PEP)*



Used equipment:

Equipment used (refers to item numbers in section "used test equipment")	1, 9, 10, 11, 13, 20, 21
--	--------------------------

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 00343	Bird	8329
10	RF attenuator	TE 00172	Tenuline	8343-200
11	Power supply	TE 11130	Delta	SM35-45
12	Power meter	TE 00377	Bird	4381
13	Digital multimeter	TE 00210	Fluke	87
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	Coaxial termination	TE 00070	Termaline	8080
19	Pre-amplifier 0.01 – 30 MHz	TE 00036	Telefication	--
20	Multifunction synthesiser	TE 00176	HP	8904A
21	Decade attenuator	TE 00060	Danbridge	DA3HS/D
22	Spectrum analyzer	TE 11125	HP	FSP