



Radio Test report 99368530

based on:
EN 61993-2

AIS Shipborne Class A Transponder System
SAAB
R4

laboratory

certification

approvals



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USED TEST EQUIPMENT MODULE



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This report comprises of five modules. The total number of pages is: 61



Main module

1 Introduction

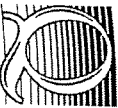
This report contains the result of tests performed by:

Telefication bv
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:1999. 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	:	Danphone
Address	:	Fabriksvej 4
Zipcode	:	9490
City/town	:	Pandrup
Country	:	Denmark
Date of order	:	4 November 2002



2 Product

A sample of the following product was submitted for testing:

Product category	:	Universal Automatic Identification System Class A
Manufacturer	:	Danphone
Trade mark	:	SAAB
Type designation	:	R4
Hardware version	:	152.2013.002
Software version	:	680.0025.003
Serial number	:	001000; 001007

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
- Securicor Wireless Technology, Midsomer Norton

Tests were carried out between:

- 27 June 2002 and 14 August 2002
- 5 November 2002 and 6 November 2002

4 Product documentation

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

Description	Identification	Date
Navigation System Operator's Manual	Doc. P/N 725616	13 December 01
Navigation System Installation Manual	P/N 3508 102 70060	May 2002
R4 AIS Transponder System Installation Manual	Doc. 7000 100-027 P1B	Not dated
Technical Doc. (schematics; BOM; pcb-layout)	--	--

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

5 Observations and comments

Primarily, on instigation by the applicant a test plan provided by the applicant has been used as reference for the AIS transmitter and receiver tests to be performed by Telefication; however, it became obvious that a MED-certificate based on a test report according to this test plan could not be issued.

Therefore, Telefication carried out a comparison between the test plan and EN 61993-2 to pinpoint those items, which would need retesting and/or additional testing.

Secondly, verification tests, re-tests and additional tests have taken place at the R&D department of Securicor Wireless Technology (SWT) in Midsummer Norton by a Telefication engineer in order to successfully conclude the testing according to EN 61993-2, chapter 15.

Verification tests were necessary because firstly component changes were effected after non-compliances were observed during the first tests and secondly the sample used at SWT was a different sample than the sample tested at Telefication.

For TDMA receiver measurements, the GMSK 25 kHz BT-product has been 0.4 and the 12.5 kHz BT-product has been 0.3.

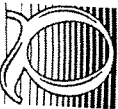
6 Summary

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

Universal Automatic Identification System

The sample was tested according to the following specifications:

IEC 61993-2: (2001-12), Chapter 15 Physical tests



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BY STERILAB
Regam L021

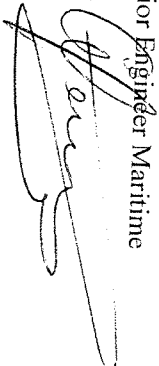
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7 Conclusions


The sample of the product showed **NO NON-COMPLIANCES** to the specification stated in chapter 6 "Summary" 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 bv 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.

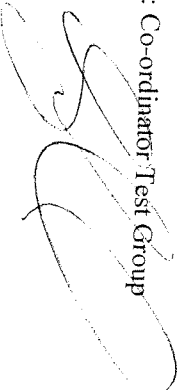
All tests are performed by:

name : M.W. Jansen
function : Senior Engineer Maritime
signature : 

Review of test methods and report by:

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

The above conclusions have been verified by the following signatory:

date : 18 November 2002
name : J.P. van de Poll
function : Co-ordinator Test Group
signature : 

Test results module

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Test results module

1 Summary

LIST OF VERIFICATION

The list of measured or checked parameters called for in EN 61993-2 Clause 15 is given below.

IEC 61993-2 Clause	GENERAL REQUIREMENTS	Performed verification (yes/no/n.a)
15 Physical Tests		
15.1 TDMA Transmitter		
15.1.1	Frequency Error	yes
15.1.2	Carrier Power	yes
15.1.3	Modulation Spectrum 25 kHz channel mode	yes
15.1.4	Modulation Spectrum 12.5 kHz channel mode	yes
15.1.5	Transmitter Attack Time	yes
15.1.6	Transmitter Release Time	yes
15.2 DSC Transmissions		
15.2.1	Frequency error of the DSC Signal	yes
15.2.2	Modulation Rate	yes
15.3 TDMA Receivers		
15.3.1	Sensitivity - 25 kHz Operation	yes
15.3.2	Sensitivity - 12.5 kHz Operation	yes
15.3.3	Error Behaviour at High Input Levels	yes
15.3.4	Co-Channel Rejection - 25 kHz Operation	yes
15.3.5	Co-Channel Rejection - 12.5 kHz Operation	yes
15.3.6	Adjacent Channel selectivity - 25 kHz Operation	yes
15.3.7	Adjacent Channel selectivity - 12.5 kHz Operation	yes
15.3.8	Spurious Response Rejection	yes
15.3.9	Intermodulation response rejection and blocking	yes
15.3.10	Transmit to receive switching time	yes
15.4 DSC Receiver		
15.4.1	Maximum sensitivity	yes
15.4.2	Error Behaviour at High Input Levels	yes
15.4.3	Co-Channel Rejection	yes
15.4.4	Adjacent Channel selectivity	yes
15.4.5	Spurious Response Rejection	yes
15.4.6	Intermodulation response Rejection	yes
15.4.7	Blocking or Desensitisation	yes
15.5 Conducted Spurious Emissions conveyed to the antenna		
15.5.1	Spurious Emissions from the Receiver	yes
15.5.2	Spurious Emissions from the Transmitter	yes

2 Test results

2.1 4.1.4 Transmitter shutdown

Transmitter shutdown	Result
Shutdown within 1 second of end transmission slot	Pass

2.2 4.4 Marking & identification

Marking and identification	Result
Information power supply and battery replacement	Pass

2.3 14.8 Transceiver protection

Transceiver protection	Result
Open and short circuit VHF-antenna terminal 60 seconds	Pass

Test results module

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2.4 15.1 TDMA Transmitter

2.4.1 15.1.1 Frequency Error

TEST CONDITIONS		FREQUENCY ERROR (Hz)			
Temperature	Voltage	156.025 MHz	157.4125 MHz	160.6375 MHz	162.025 MHz
T_{nom} (+20 °C)	V_{nom} (24.0 V)	- 3	- 3	- 3	- 3
T_{min} (-15 °C)	V_{min} (21.6 V)	+ 128	+ 126	+ 124	+ 123
T_{max} (+55 °C)	V_{max} (31.2 V)	- 25	- 26	- 24	- 25
Measurement uncertainty		±1 Hz			
Limits		$\leq \pm 0.5$ kHz under normal conditions, $\leq \pm 1$ kHz under extreme conditions.			

Test equipment used: (Item numbers)	12, 21, 22, 25, 31, 32, 33
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2.4.2 15.1.2 Carrier Power

Rated output carrier power: H.P. : 12.5 W
L.P. : 2.0 W

TEST CONDITIONS		CARRIER POWER (W)							
		156.025 MHz	157.4125 MHz	160.6375 MHz	162.025 MHz				
Temperature	Voltage	H.P.	L.P.	H.P.	L.P.	H.P.	L.P.	H.P.	L.P.
<i>T_{nom}</i> (+20 °C)	<i>V_{nom}</i> (24.0 V)	11.5	1.95	11.5	1.95	11.3	1.97	11.3	1.97
<i>T_{min}</i> (-15 °C)	<i>V_{min}</i> (21.6 V)	12.0	2.0	12.0	2.0	16.6	1.9	16.6	1.9
<i>T_{max}</i> (+55 °C)	<i>V_{max}</i> (31.2 V)	17.8	2.4	17.8	2.4	19.5	2.3	19.5	2.3
Measurement uncertainty		+ 0.59/- 0.61 dB							
Limits		<u>Normal test conditions:</u> => H.P.: - between 8.8 and 17.7 W => L.P.: - between 1.4 and 2.8 W - within ± 1.5 dB of the rated carrier power <u>Extreme test conditions:</u> => H.P.: - between 6.3 and 19.8 W => L.P.: - between 1.0 and 3.2 W - within +2.0 & -3.0 dB of the rated carrier power							

H.P. = Output carrier power set at its nominal High: 12.5 W
L.P. = Output carrier power set at its nominal Low: 2 W

Test equipment used: (Item numbers)	1, 21 22, 25, 31, 32, 33, 34, 35
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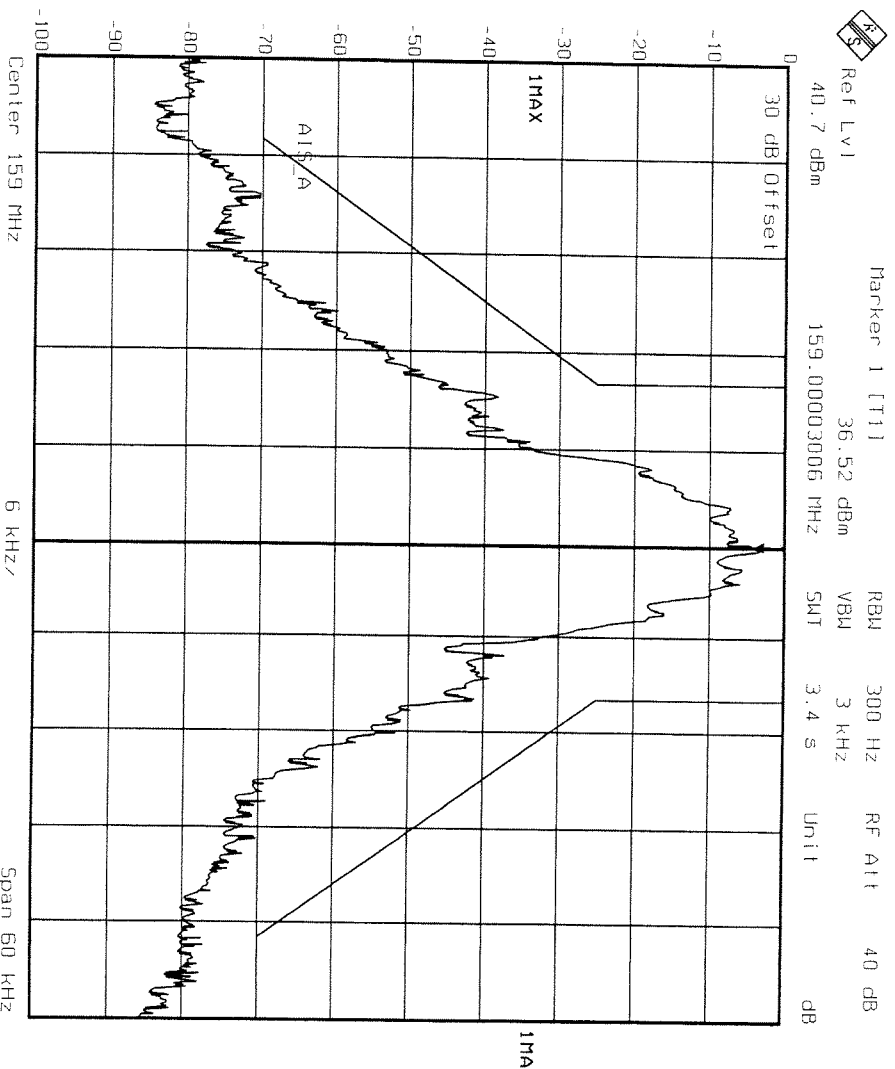
Test results module

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2.4.3 15.1.3 Modulation Spectrum 25 kHz channel mode

TX freq.: 159.000 MHz; Carrier power: H. P.

Spectrum obtained during TDMA bursts: modulation: pseudo-random sequence



Test equipment used: (Item numbers)

10, 25

Test results module

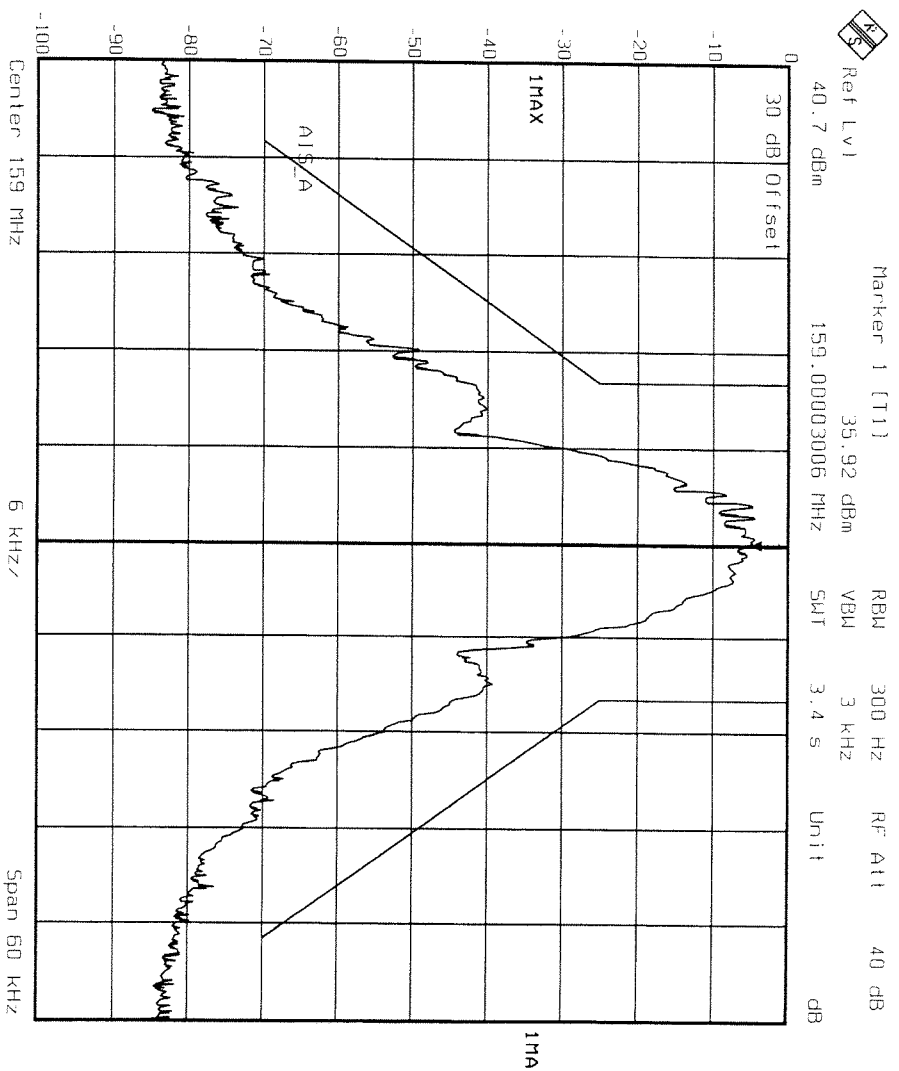
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Modulation Spectrum 25 kHz channel mode

TX freq.: 159.000 MHz

Carrier power: H. P.

Spectrum obtained during continuous transmission; modulation: pseudo-random sequence



Test equipment used: (Item numbers)

10, 25

Test results module

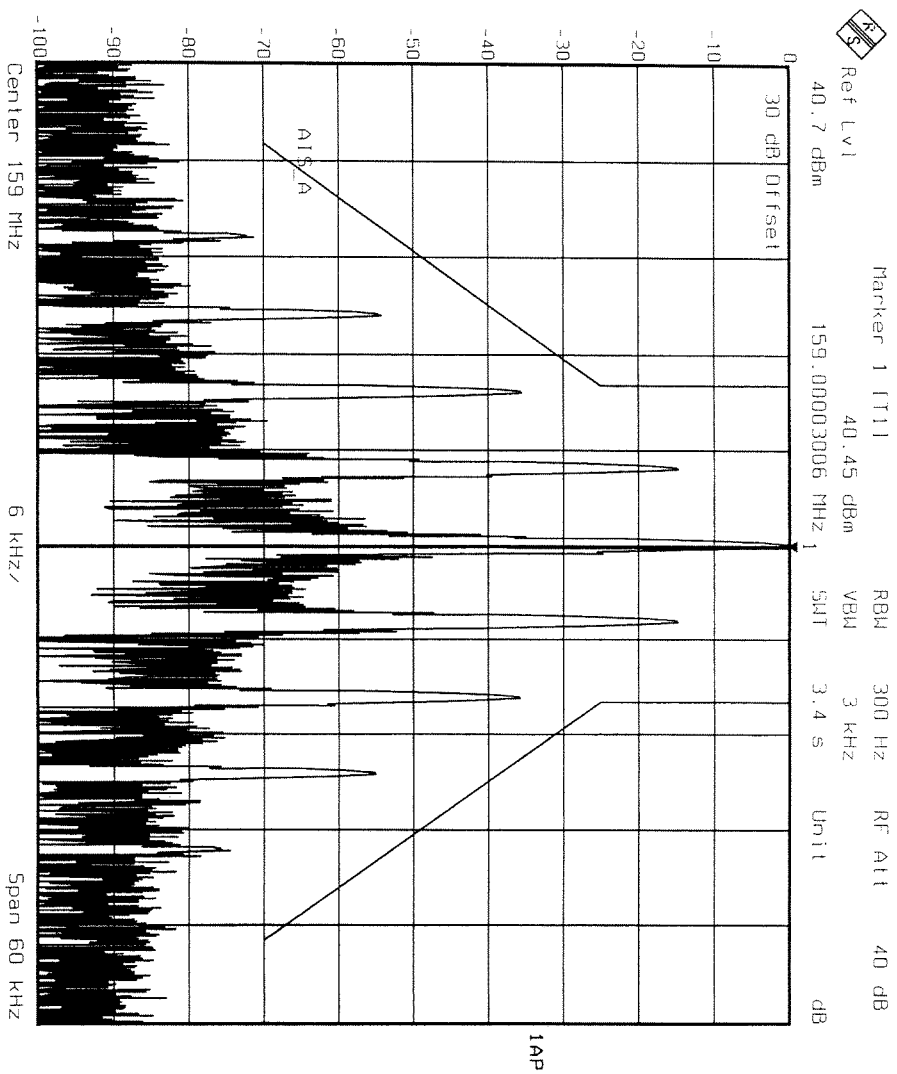
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Modulation Spectrum 25 kHz channel mode

TX freq.: 159.000 MHz

Carrier power: H. P.

Spectrum obtained during continuous transmission; modulation: 101010 - sequence



Test equipment used: (Item numbers)

10, 25

Test results module

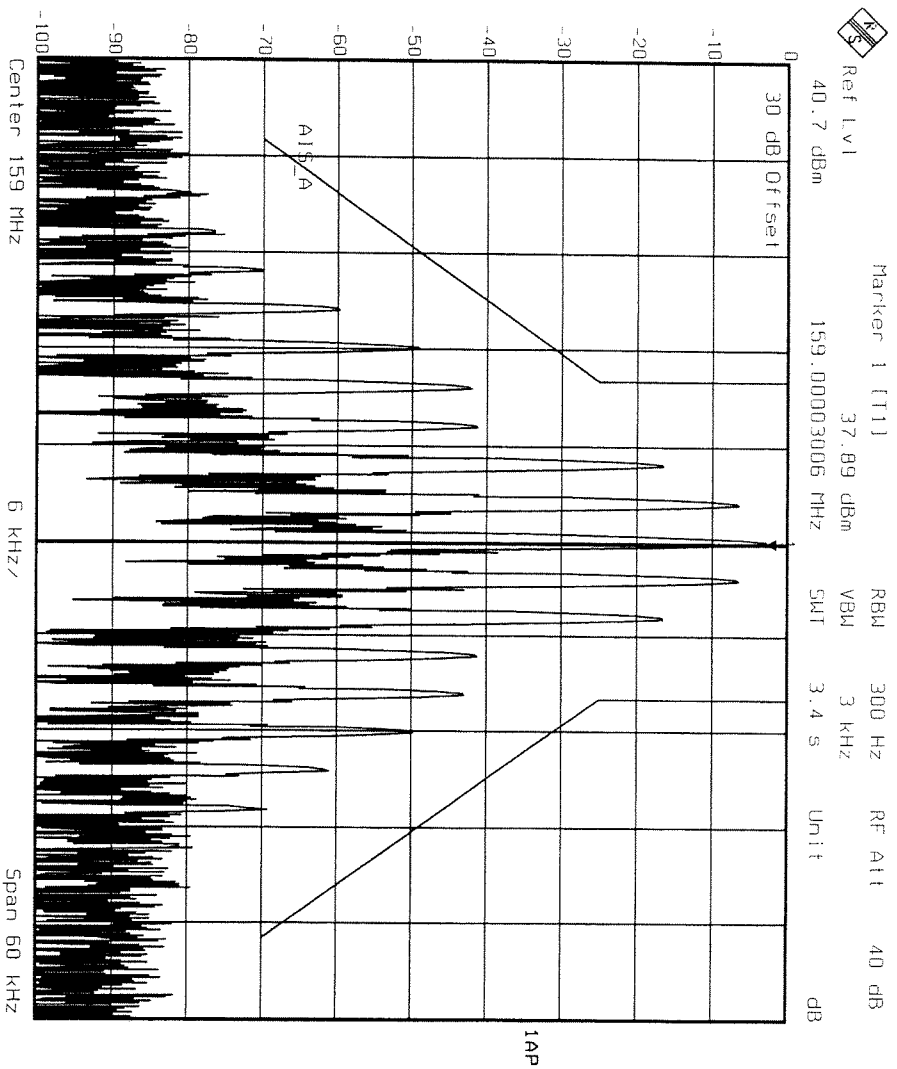
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Modulation Spectrum 25 kHz channel mode

TX freq.: 159.000 MHz

Carrier power: H. P.

Spectrum obtained during continuous transmission; modulation: 10011 - sequence



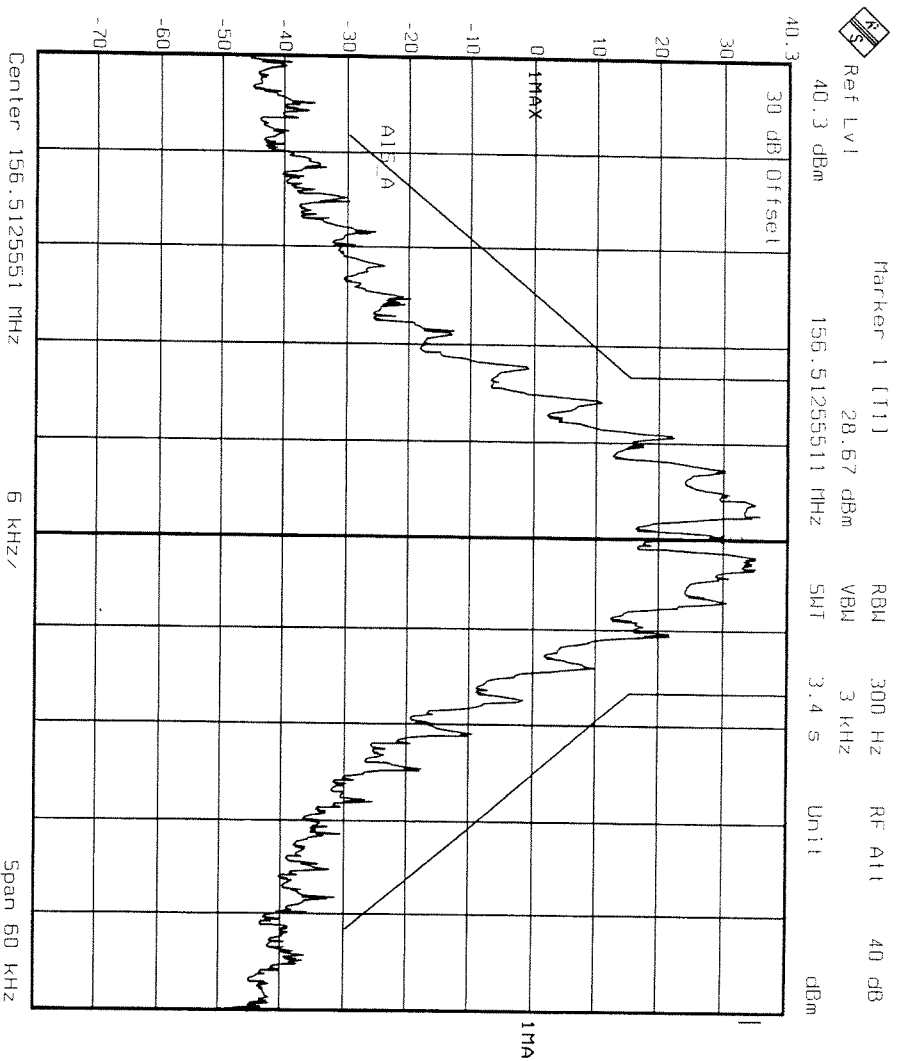
Test equipment used: (Item numbers)	10, 25
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Test results module

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Modulation Spectrum 25 kHz channel mode; DSC mode:

TX freq.: 156.5125 MHz Carrier power: H.P



Remark: DSC modulation with pre-emphasis: 1300 Hz: 2.47 kHz deviation; 2100 Hz: 4.04 kHz deviation.

Limit : within the mask specified in figure 4, Clause 15.1.3, IEC 61993-2.
(Emission mask):

- At ± 10 kHz removed from the carrier, the modulation sidebands is below -25 dBc.
- At ± 25 kHz removed from the carrier, the modulation sidebands is below -70 dBc, without any need to be below 0.25 μ W.

In the region between ± 10 kHz and ± 25 kHz removed from the carrier, the modulation sidebands is below a line specified between these two points.

Test equipment used: (Item numbers)

10, 25

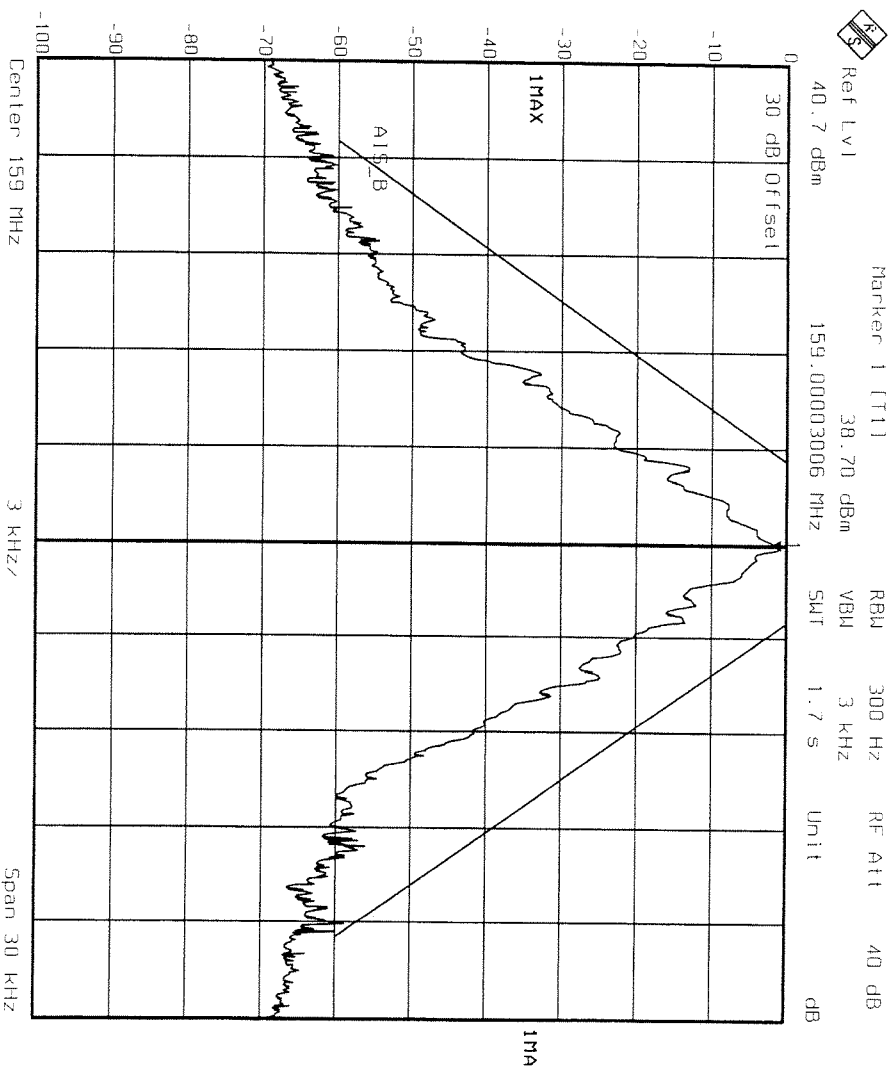
Test results module

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2.4.4 15.1.4 Modulation Spectrum 12.5 kHz channel mode

TX freq.: 159.000 MHz; Carrier power: H. P.

Spectrum obtained during TDMA bursts; modulation: pseudo-random sequence



Test equipment used: (Item numbers)

10, 25

Test results module

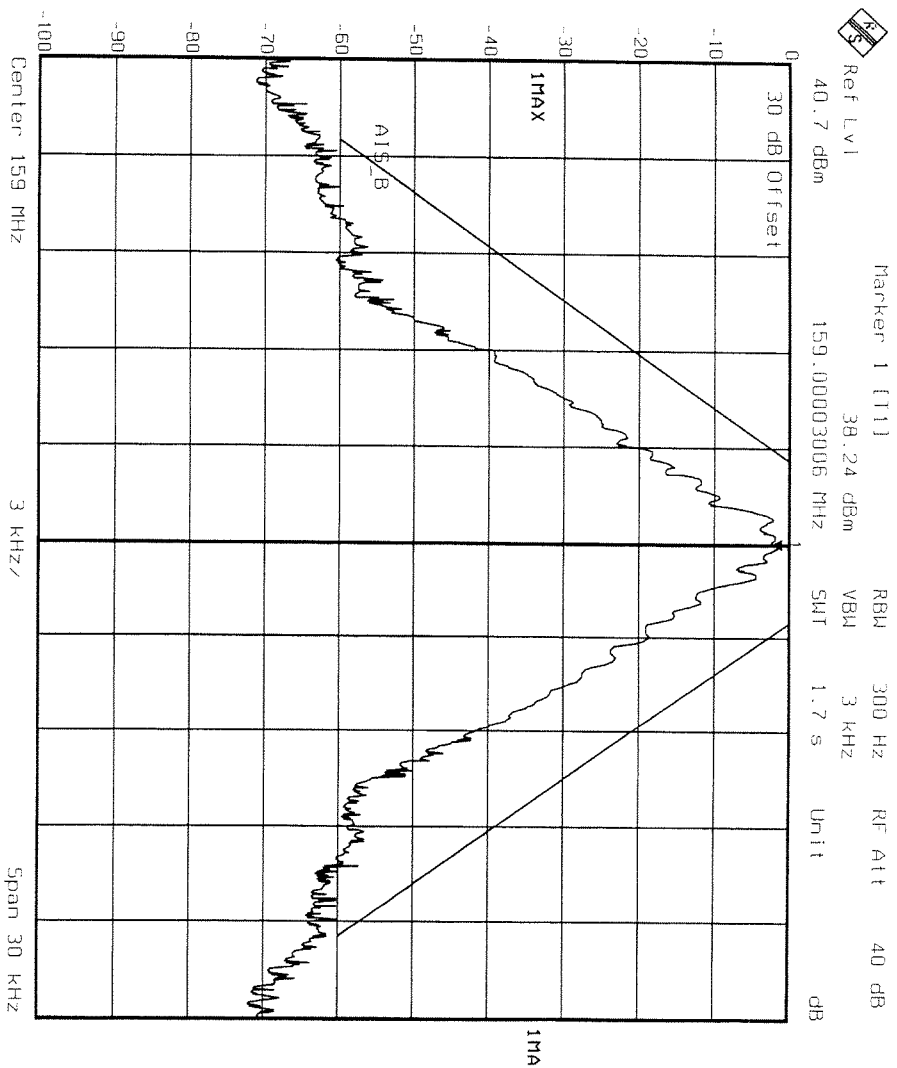
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Modulation Spectrum 12.5 kHz channel mode

TX freq.: 159.000 MHz

Carrier power: H.P.

Spectrum obtained during continuous transmission; modulation: pseudo-random – sequence



Test equipment used: (Item numbers)	10, 25
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Test results module

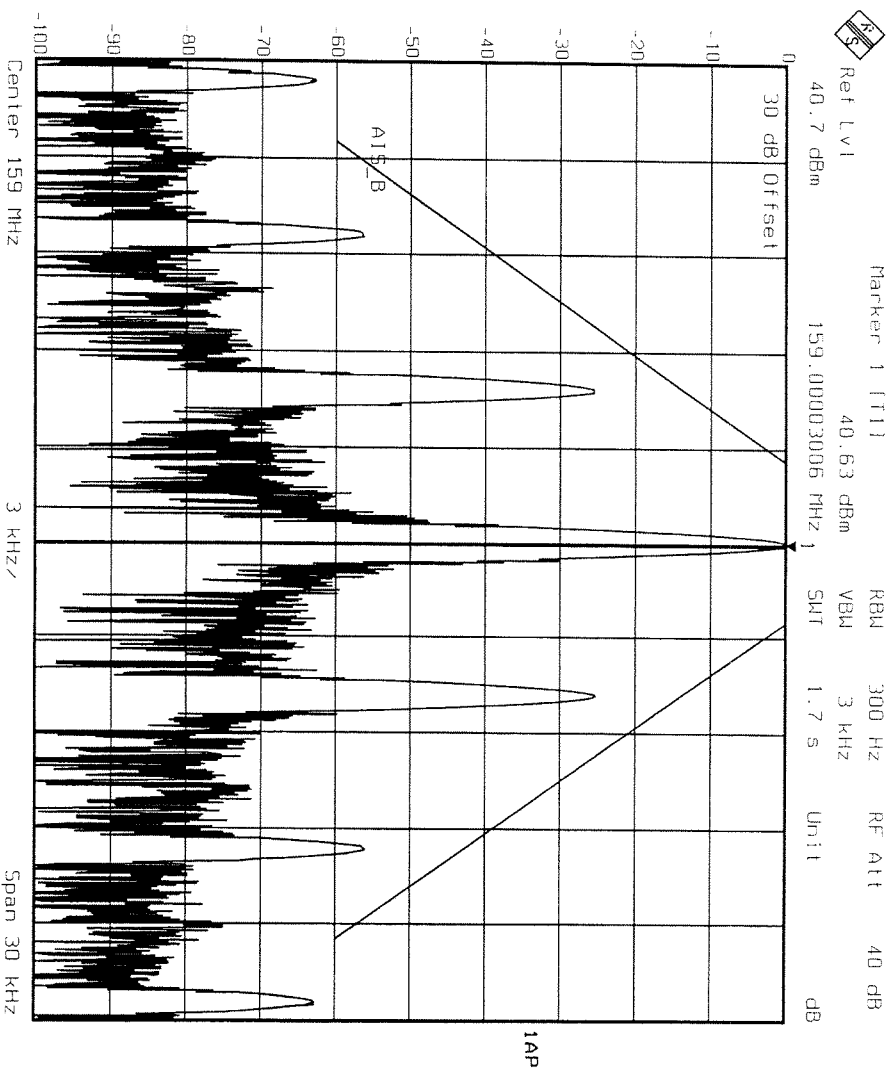
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Modulation Spectrum 12.5 kHz channel mode

TX freq.: 159,000 MHz

Carrier power: H. P.

Spectrum obtained during continuous transmission; modulation: 101010 – sequence



Test equipment used: (Item numbers)

10, 25