Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Conformance test report of an

AIS system

Equipment under test: **Jotron**

Type: **TR-2500**

Applying test standards: IEC 61993-2 (2001) Sections 14, 16-21

Test Report No.: 734.2/0053-1/2003/S3220

Applicant: Jotron Electronics AS

PO Box 54
3280 Tjodalyng
Norway

Hamburg, 15. April. 2004
Federal Maritime and
Hydrographic Agency

by order

Bartels
Test engineer

by order

Preuss
head of
laboratory

nach DIN EN 45001
akkreditiertes Prüflaboratorium

Deutscher Akkreditierungs Rat
DAR
DAT-P-086/98-10

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Translation

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The **German Accreditation Body Technology (DATech) e.V.** confirms that the Testing Laboratory

Bundesamtes für Seeschifffahrt und Hydrographie (BSH)
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is competent under the terms of DIN EN ISO/IEC 17025 to carry out testing in the fields

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Frankfurt/Main, December 23th, 2003

Dipl.-Ing. (FH) R. Egner
Head of the Accreditation Body

Member in EA, ILAC, IAF

Translation for information purposes only. The German Accreditation Certificate is authoritative. See notes overleaf

General

Applicant:	Jotron Electronics AS PO Box 54, 3280 Tjodalyng, Norway
Equipment under test:	
Type:	TR-2500
Manufacturer:	Jotron Electronics AS PO Box 54, 3280 Tjodalyng, Norway
Place of test:	BSH test laboratory Hamburg, Room 916
Start of test:	28. November, 2003
End of test:	01. April, 2004

Test standards[1]:

IEC 61993-2 (2001)
Maritime navigation and radiocommunication equipment and systems-
Automatic Identification Systems
Part 2: Class A shipborne equipment of the Universal Automatic Identification System (AIS) – Operational and performance requirements, Methods of testing and required test results
IEC 61162-1/ -2
Maritime navigation and radiocommunication equipment and systems Digital Interfaces
Part 1: single talker and multiple listeners (2000)
Part 2: single talker and multiple listeners, high speed transmission (1998)

Summary

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
2	IEC 61993-2	14 Operational tests	Passed
3	IEC 61993-2	15 Physical tests	Not included
4	IEC 61993-2	16 Specific tests of link layer	Passed
5	IEC 61993-2	17 Specific tests of network layer	Passed
6	IEC 61993-2	18 Specific tests of transport layer	Passed
7	IEC 61993-2	19 Specific presentation interface tests	Passed
8	IEC 61993-2	20 DSC functionality tests	Passed
9	IEC 61993-2	21 Long range functionality tests	Passed

[1] Numbers listed in the titles of the test sections of this report refer to the respective sections of IEC 61993-2 if not stated otherwise.

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1 General

1.1 Equipment history

For each Transponder unit under test an numbered entry is provided here. For the two test environment it is recorded which EUT system is under test in that environment

1.1.1 EUT system no 1

Back to Jotron: 15.01.2004

Transponder				
Type	TR 2500		Part No.:	80401
Delivery date	06.11.2003		Serial number	No serial number
HW Version:	Delivery date	06.11.2003	Version no	
	Installation date	06.11.2003		
SW Version:	Delivery date	26.11.2003	Version no	AIS: 01.00.02 EC: 01.00.02 MMI: 01.00.02 LINK: 02.00.02 RF: 02.00.07
	Installation date	26.11.2003		
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

GPS antenna				
Type			Part No.:	
Delivery date			Serial number	
HW Version:	Delivery date		Version no	
	Installation date			

1.1.2 EUT system no 2

Back to Jotron: 15.01.2004

Transponder				
Type	TR 2500		Part No.:	80401
Delivery date	06.11.2003		Serial number	100AA00109
HW Version:	Delivery date	06.11.2003	Version no	
	Installation date	06.11.2003		
SW Version:	Delivery date	27.11.2003	Version no	AIS: 01.00.02 EC: 01.00.02 MMI: 01.00.02 LINK: 02.00.02 RF: 02.00.07
	Installation date			
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

GPS antenna				
Type	Procom GSP-4		Part No.:	-----
Delivery date	06.11.2003		Serial number	300 90 30 21
HW Version:	Delivery date	06.11.2003	Version no	Ver 8
	Installation date	06.11.2003		

1.1.3 EUT system no 3

Transponder				
Type	TR 2500		Part No.:	80401
Delivery date	15.01.2004		Serial number	100AA00114
HW Version:	Delivery date	15.01.2004	Version no	AA
	Installation date	15.01.2004		
SW Version:	Delivery date	15.01.2004	Version no	AIS: 01.00.03 EC: 01.00.03 MMI: 01.00.06 LINK: 02.00.05 RF: 02.00.05
	Installation date	15.01.2004		
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

Connection Box			
Type	Junction box for Tron UAIS	Part No.:	80 560
Delivery date	15.01.2004	Serial number	100AA00036

GPS antenna				
Type	Procom GSP-4		Part No.:	-----
Delivery date	06.11.2003		Serial number	300 90 30 21
HW Version:	Delivery date	06.11.2003	Version no	Ver 8
	Installation date	06.11.2003		

1.1.4 EUT system no 4

Transponder				
Type	TR 2500	Part No.:	80401	
Delivery date	15.01.2004	Serial number	100AA00115	
HW Version:	Delivery date	15.01.2004	Version no	AA
	Installation date	15.01.2004		
SW Version:	Delivery date	15.01.2004	Version no	AIS: 01.00.03 EC: 01.00.03 MMI: 01.00.06 LINK: 02.00.05 RF: 02.00.05
	Installation date	15.01.2004		
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

Connection Box			
Type	Junction box for Tron UAIS	Part No.:	80 560
Delivery date	15.01.2004	Serial number	100AA00005

GPS antenna				
Type	Procom GSP-4	Part No.:	-----	
Delivery date	06.11.2003	Serial number	300 90 30 21	
HW Version:	Delivery date	06.11.2003	Version no	Ver 8
	Installation date	06.11.2003		

1.1.5 EUT system no 5

Transponder				
Type	TR 2500	Part No.:	80401	
Delivery date	09.02.2004	Serial number	100AA00118	
HW Version:	Delivery date	09.02.2004	Version no	AA
	Installation date	09.02.2004		
SW Version:	Delivery date	09.02.2004	Version no	AIS: 01.00.03 EC: 01.00.04 MMI: 01.00.07 LINK: 02.00.06 RF: 02.00.06
	Installation date	09.02.2004		
SW Version:	Delivery date	12.02.2004	Version no	AIS: 01.00.03 **EC: 01.00.05** MMI: 01.00.07 LINK: 02.00.06 RF: 02.00.06
	Installation date	12.02.2004		
SW Version:	Delivery date	24.02.2004	Version no	AIS: 01.00.03 EC: 01.00.05 **MMI: 01.00.08** **LINK: 02.00.08** RF: 02.00.06
	Installation date	24.02.2004		
SW Version:	Delivery date	11.03.2004	Version no	AIS: 01.00.03 **EC: 01.00.09** **MMI: 01.00.09** **LINK: 02.00.09** RF: 02.00.06
	Installation date	11.03.2004		
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

Connection Box			
Type	Junction box for Tron UAIS	Part No.:	80 560
Delivery date	15.01.2004	Serial number	100AA00005

GPS antenna				
Type	Procom GSP-4	Part No.:	-----	
Delivery date	06.11.2003	Serial number	300 90 30 21	
HW Version:	Delivery date	06.11.2003	Version no	Ver 8
	Installation date	06.11.2003		

1.1.6 EUT system no 6

Transponder				
Type	TR 2500	Part No.:	80401	
Delivery date	09.02.2004	Serial number	100AA00120	
HW Version:	Delivery date	09.03.2004	Version no	BB
	Installation date	09.03.2004		
SW Version:	Delivery date	09.03.2004	Version no	**AIS: 01.00.05** **EC: 01.00.07** **MMI: 01.00.08** LINK: 02.00.08 RF: 02.00.06
	Installation date	09.03.2004		
SW Version:	Delivery date	10.03.2004	Version no	AIS: 01.00.05 **EC: 01.00.08** **MMI: 01.00.09** **LINK: 02.00.09** **RF: 02.00.08**
	Installation date	10.03.2004		
SW Version:	Delivery date	11.03.2004	Version no	AIS: 01.00.05 **EC: 01.00.09** **MMI: 01.00.09** LINK: 02.00.09 RF: 02.00.08
	Installation date	11.03.2004		
SW Version:	Delivery date	01.04.2004	Version no	AIS: 01.00.05 **EC: 01.00.10** MMI: 01.00.09 LINK: 02.00.09 RF: 02.00.08
	Installation date	01.04.2004		
SW Version:	Delivery date		Version no	
	Installation date			

MKD			
Type	Internal	Part No.:	
Delivery date		Serial number	

Connection Box			
Type	Junction box for Tron UAIS	Part No.:	80 560
Delivery date	15.01.2004	Serial number	100AA00005

GPS antenna				
Type	Procom GSP-4	Part No.:	-----	
Delivery date	06.11.2003	Serial number	300 90 30 21	
HW Version:	Delivery date	06.11.2003	Version no	Ver 8
	Installation date	06.11.2003		

1.2 Test environment

Here it is intended to record for which time which EUT system is under test.

1.2.1 Test environment no 1

This Test environment is completely equipped as described in Annex A. Normally mainly VDL related tests and DSC tests are done in this environment

Room	BSH Room 916 (9th floor)
Test engineer	H. Bartels
Location	9° 59,103 E 53° 32,822 N

Equipment no	Start of test	End of test	Test engineer
1	17.11.03	21.11.03	Bartels
2	28.11.03	05.12.03	Bartels
3	15.01.04	23.01.04	Bartels
5	09.02.04	16.02.04	Bartels
5	24.02.04	02.03.04	Bartels
6	09.03.04	11.03.04	Bartels
6	01.04.04	01.04.04	Bartels

1.2.2 Test environment no 2

This Test environment is completely equipped as described in Annex A except the DSC testbox. Mainly operational and interface related tests are done in this environment

Room	BSH Room 632 (6th floor)
Test engineer	K.H. Warnstedt
Location	9° 59,103 E 53° 32,822 N

Equipment no	Start of test	End of test	Test engineer
1	30.11.03	7.12.03	Warnstedt , on “GAUSS”
3	24.01.04	30.01.04	Warnstedt
5	12.02.04	12.02.04	Warnstedt

1.3 Composition

Minimum Keyboard and display (MKD)

X Internal ☐ Remote ☐ external

internal GNSS

☐ sync only **X** backup pos. sensor

1.4 Remarks

Result marking:

Ok	Item is ok, test was successful No colour marking
Dev	slight deviation, no change required No colour marking
Nok	Test of a required item was not successful, change required Colour marking: yellow
Rec	It is recommended to make a change. Colour marking: green
???	temporarily, has to be clarified or discussed Colour marking: yellow

Not yet tested items are marked with a blue background.

This table is a templete for more general remarks fo som test items and should be copied if required

Date	Result	Status

Issue of this template: 17.11.2003

1.5 Test notes

Here are some effects noted which are observed during the normal test but independend of the actual test items.

1.5.1 General problems

Here are general problems found in the operation of the EUT, not specific to the actual test point.

	General problems		
Date	Item	Remark	Result
19.11.03	Alarm relay	If the alarm relay is activated by an alarm it is never switched off again even if all alarms are acknowledged and no alarm is active. At start it is switched off. Retest 15.01.04 Ba Alarm relay is switched off if alarm is removed or acknowledged	Ok
19.11.03	ACA output	The ACA output with 85 characters exceeds the limit of 82 characters (incl. Cr lf) as defined in 61162 §5.3 The resolution of lat and lon is output with 1/100 min. A resolution of 1/10 min is sufficient because the definition e.g. in msg 22is also 1/10 min. Retest 15.01.04 Ba ACA length is Ok	Ok
02.12.03	Rx near Tx slots	During slot reuse test we found that - 2...3 slots before an own transmission are not received - The last slot before own transmission is received (Ok) - 2...3 slot immediately following an own transmission are not received. Example: ...RRR---RT---RRRR.... (See commented PI port log) In ITU-R M1371 §2.12.4 “Switching time” it is required that “it should be possible to receive a message from the slot directly after or before own transmission”, and of course also from the other slots. Retest 15.01.04 Ba Problem still exists Retest 09.02.04 Ba Now all targets are received (except the target of the own Tx slot).	Ok
03.12.03	Rx alarm	There is often an active Rx1 or Rx2 alarm for a short time, mainly when there is a high channel load Retest 22.01.04 Ba: In a test with 80% channel load for about 50 min there was no Rx malfunction alarm	Ok

05.12.03	Channel use	After switching off and on again the MKD shows that an area setting is in use (Position is inside this area) but the AIS default channels are used on VDL. EUT started in “at anchor” state Retest 22.01.04 Ba: Problem could not be reproduced	k
08.12.03	TXT/ALR output	The Text of TXT/ALR output messages is very short, it is to short to be used by external equipment. A longer Text should be output text, so that an operator can recognize what happend. The text of Table 3 of IEC 61993-2 may be a good choice. We expect that most external units do not generate own texts according to the text message number but display the text of the TXT/ALR sentence directly Retest 22.01.04 Ba: The text message from IEC 61993 are used for the TXT messages	Ok
15.01.04	Startup problems	If the new connection box is connected to the transponder unit it does not finish the boot procedure. The EUT boots without connection box, and after end of boot procedure the connection box can be connected to be able to do testing. Retest 22.01.04 Ba: Startup problem was caused by open Linux terminal input. After termination by short circut of data input to ground the startup was Ok. For production version a practicable solution has to be found. Retest 01.03.04 Ba: Start problems have been solved.	Ok
19.01.04	Sync mode 1	After a test in sync mode 1 (sync jitter) the unit did not switch back to sync mode 0 after reconnection of GPS antenna. The sync source (other transponder) was switched off, so the EUT remained in sync mode 3. MKD showed correct position of internal GPS, and mode was displayed “SPS 3D. GPS diagnostics showed good conditions. After stop of external sensor data the internal position was not used for VDL messages and VDO output, the last sensor data were used further on. Checked for more than 10 minutes. After restart it was Ok again. Retest 16.06.04 Ba EUT switched back to sync mode 0 and used the internal position correctly.	Ok
19.01.04	90% load tests	After Test 19.7 “High speed output interface performance” the EUT stopped own transmissions including VDO outputs. Rx and VDM output was ok	

		Retest 09.02.04 Ba: EUT continues TX under high load conditions	Ok
01.03.04	No DSC rx	No DSC call was received, neither MMSI addressed nor area addressed. Therefore all DSC related test items could not be retested Retest 10.03.04 Ba: DSC receiving is ok now	Ok

1.6 4.3 Manuals

1.6.1 Operating and Installation

60945) Adequate information shall be provided to enable the equipment to be properly operated and maintained by suitable qualified members of a ship's crew:

(60945) Moreover adequate information shall be provided to allow equipment to be installed so that it operates in accordance with the requirements of the relevant equipment standard, taking into account limitations imposed by the operation of other equipment also required to be installed on the bridge.

(61993-2) In addition to the requirements of IEC 60945 clause 14, the manuals shall include:

- *The type of external connector required for connection of the external display as referred to in 7.6.3.2*
- *The needed information for correct siting of the antennas; and*
- *The requirements for external illumination, as appropriate*

It is checked that the required documentation items are available.

05.01.04 Ba	Test details – General documentation		
Test item	Check	Remark	Result
Composition of customer documentation	Check the composition of customer documentation.	The documentation consists of: • Installation Manual • Operators Manual • Technical Manual • Detailed Technical Manual	
Description of AIS	Check that an general function description of AIS as a new system is included. This is not required but recommended in the introduction phase of a new system.	In the Operators Manual	Ok
Operating information	Check that an operating manual is included		Ok
Technical information	Check that an technical manual is included	Technical Manual and Detailed Technical Manual	Ok
Installation information	Check that an installation manual is included		Ok
Language	Check that the documentation is written in English		Ok
Some details of installation information			
System overview	Check that an AIS system overview diagram is available		Ok
Mechanical dimensions	Check that mechanical dimension drawings of transponder are available	The over all dimensions are defined in the Technical Manual, Specifications. In the Installation Manual there is the size of panel cutout and drilling dimensions of the holder	Acc
	Check that mechanical dimension drawings of MKD are available	Not applicable, internal MKD	Ok
	Check that mechanical dimension drawings of a Connection box available	The over all dimensions are defined in the Technical Manual, Specifications. In the Installation Manual there are the drilling dimensions for the mounting holes	Acc
	Check that mechanical dimension drawings of GPS antenna are available	Antenna Height is available, diameter is not available	acc
	Check that mechanical dimension drawings of VHF antenna are available		Ok

05.01.04 Ba	Test details – Requirements of IEC 61993-2		
Test item	Check	Remark	Result
Connector of external display	Check that type of connector of external Display is included	External display is connected by connection box	Ok
Siting of antennas	Check that information about siting the GPS antenna is included		Ok
	Check that information about siting the VHF antenna is included		Ok
RF cable requirements	Check that information about cable requirements for GPS antenna is included		Ok
	Check that information about cable requirements for the VHF antenna is included		Ok
Illumination	Check that information about external illumination is included if required	No external illumination required	Ok

1.6.2 Interface documentation

(61993-2) The manufacturer shall provide sufficient technical documentation of the EUT and its interfaces in particular (see 7.219.2 Check of the manufacturer's documentation")

(61162-1; -2) Operator manuals or other appropriate literature provided for equipment that is intended to meet the requirements of this standard shall contain the following information:

a) identification of the A and B signal lines

b) the output drive capability as a talker

c) a list of approved sentences, noting unused fields, proprietary sentences transmitted as a talker and transmission interval for each sentence

d) the load requirements as a listener

e) a list of sentences and associated data fields that are required as a listener

f) the current software and hardware revision if this is relevant to the interface

g) an electrical description of schematic of the listener/talker input/output circuits citing actual components and devices used, including connector type and part number

h) the version number and data of update of the standard for which compliance is sought.

05.01.04 Ba	Test details – Requirements of Interface documentation		
Test item	Check	Remark	Result
a) A and B signal lines	Check that identification of A and B signal lines is included		Ok
	Check that the identification of A and B lines is correct (not reversed)	A and B lines are reversed See note) Retest 02.03.04 Ba: A and B lines are corrected	Ok
b) Output driver	Check that the output drive capability is included		Ok
c) Talker sentences of PI ports	Check that list of sentences is included		Ok
	Check that unused fields are noted		Ok
c) Talker sentences of long range port	Check that list of sentences is included		Ok
	Check that unused fields are noted		Ok
d) Input load	Check that the input load is included	190 Ohm with terminator and 940 Ohm without terminatior	Ok
e) Input sentences of PI ports	Check that list of sentences is included		Ok
	Check that required and unused fields are noted		Ok
e) Input sentences of long range port	Check that list of sentences is included		Ok
	Check that required and unused fields are noted		Ok
e) Input sentences of sensor inputs	Check that list of sentences is included		Ok
	Check that a list is included for each sensor input if different for the ports	All sensor inputs have the same functionality	Ok
	Check that required and unused fields are noted	There is a detailed description of sensor sentences, and generally the unused fields are marked. In case of VBW there are no fields marked with “Not used”, but most of the fields cannot be used for AIS transmissions Retest 02.03.04 Ba: The fields of VBW sentence are now correctly marked with “used” and “not used”	Ok Ok
Proprietary sentences	Check that proprietary sentences are listed and described	There are not proprietary sentences used	Ok
f) Software version	Check that the relevant software	There is no information for	acc

	version is included	which software version the manuels are valid	
f) Hardware version	Check that the relevant hardware version is included	There is no information for which hardware version the manuels are valid	acc
g) Hardware input/output circuit	Check that information about hardware interface components is included		Ok
h) Standards	Check that the version number and date of update of the relevant standard is included		Ok

Note)
There is a remark in the installation manual (6.2 Description of Junction Box connector at TR-2500):
“Port 1 to 7 are RS422 with A=+ and B=-“

This is incorrect and very confusing for the installer:
According to IEC 61162 §3.5.1 Signal state definitions and according to V.11 §5.2.1 Table 1/V11 it is defined that in the idle, logical1 or stop bit state the signal line A is negative with respect to line B.

Because this state is the normal state when no data are transferred the remark should be: “A = -, B = +” , and the A and B lines in the manual and in the connection box have the reversed function.

2 14 Operational tests

2.1 14.1 Operating modes / Capability

(4.2)

2.1.1 14.1.1 Autonomous mode

(4.2.1, M.1371 A2/3.3.5)

2.1.2 14.1.1 Autonomous mode

(4.2.1, M.1371 A2/3.3.5)

2.1.2.1 14.1.1.1 Transmit Position reports

Method of measurement

Set up a test environment of at least 5 test targets. Record the VDL communication and check for messages of the EUT.

Required results

Confirm that the EUT transmits continuously and that the transmitted data complies with sensor inputs.

This is a first more general check that the EUT is continuously transmitting a position report. Special tests regarding

- Reporting rate
- Message contents
- Slot use

are done in special test items.

2.12.03 wa	Test details – Transmission of Position reports		
Test item	Check	Remark	Result
Navigation status is set to 0 (travelling using engine) Internal GNSS is in use			
MMSI	Check MMSI		Ok
Transmission rate	Check that the message 1 is transmitted continuously		Ok
Position	Check the values of lat and lon		Ok
Speed	Check the values of SOG and COG		Ok
Heading/ROT	Check that the values of heading and ROT are default		Ok

2.1.2.2 14.1.1.2 Receive Position reports

Method of measurement

Set up a test environment of at least 5 test targets.

a) Switch on Test targets, then start operation of the EUT

b) Start operation of the EUT, then switch on Test targets

Check the VDL communication and Presentation Interface outputs of the EUT.

Required results

Confirm that EUT receives continuously under conditions a) and b) and outputs the received messages via the PI.

2.12.03 wa	Test details a)– Receive Position reports, Target first started		
Test item	Check	Remark	Result
Switch on Test targets, then start operation of the EUT Check the following items on VDM output at PI compared with the transmitted values			
MMSI	Check MMSI		Ok
Transmission rate	Check that the message 1 is received continuously		Ok
Position	Check the values of lat and lon		Ok
Speed	Check the values of SOG and COG		Ok
Heading/ROT	Check the values of heading and ROT		Ok

3.12.03 wa	Test details b)– Receive Position reports, EUT first started		
Test item	Check	Remark	Result
Start operation of the EUT, then switch on Test targets Check the following items on VDM output at PI compared with the transmitted values			
MMSI	Check MMSI		Ok
Transmission rate	Check that the message 1 is received continuously		Ok
Position	Check the values of lat and lon		Ok
Speed	Check the values of SOG and COG		Ok
Heading/ROT	Check the values of heading and ROT		Ok

2.1.3 14.1.2 Assigned mode

(4.2.1 M.1371A2/3.3.6)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command msg 16 to the EUT with:

a) Slot offset and increment

b) Designated reporting rate.

Record transmitted messages..

Required results

Confirm that the EUT transmits position reports msg 2 according to defined parameters and reverts to SOTDMA msg 1 with standard reporting rate after 4 to 8 min.

This is a test on operational basis. The details of slot allocation are checked in a special test on link layer (see 4.6.4 16.6.4 Assigned operation). A record of this test can be used for evaluation of this slot allocation test point.

A test if the assigned reporting rate depends on course, speed and navigation status is done in 2.4.1 14.4.1 Speed and course change

This test is completely covered by test 4.6.4 16.6.4 Assigned operation.

2.1.4 14.1.3 Polled mode

(4.2.1 M.1371A2/3.3.2)

2.1.4.1 14.1.3.1 Transmit an interrogation

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of an interrogation message (msg 15) by the EUT addressing 1 or 2 destinations according to message table (M.1371 table 13) requesting the following responses:

- *msg 3, msg 5 from mobile stations*
- *msg 4, msg 20, msg 22. from base stations*

Record transmitted messages.

Required results

Check that EUT transmits the interrogation message (msg 15) as appropriate.

08.12.03 Ba	Test details - Interrogation of msg 3		
Test item	Check	Remark	Result
Transmit an interrogation message 15 by sending an ACA sentence to the PI. Interrogation sentence: File AIAIR_5.sst: $AIAIR,00000xxxx,3,,,,,, Change type from 5 to 3 A response is automatically transmitted by the addressed transponder			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok
RX of request	Check that message is received by addressed transponder (VDM)		Ok
Received by VDL Analyser	Check request on VDL analyser		Ok
TX of response (VDO)	Check that response is transmitted by addressed transponder (VDO)		Ok
RX of response (VDM)	Check that the response message 3 is received by EUT (VDM)		Ok

08.12.03 Ba	Test details - Interrogation of msg 5		
Test item	Check	Remark	Result
Transmit an interrogation message 15 by sending an ACA sentence to the PI. Interrogation sentence: File AIAIR_5.sst: $AIAIR,00000xxxx,5,,,,,, A response is automatically transmitted by the addressed transponder			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok
RX of request	Check that message is received by addressed transponder (VDM)		Ok
Received by VDL Analyser	Check request on VDL analyser		Ok
TX of response (VDO)	Check that response is transmitted by addressed transponder (VDO)		Ok
RX of response (VDM)	Check that the response message 5 is received by EUT (VDM)		Ok

08.12.03 Ba	Test details - Interrogation of msg from base stations		
Test item	Check	Remark	Result
Transmit an interrogation message 15 by sending an ACA sentence to the PI. Interrogation sentence: File AIAIR_5.sst: $AIAIR,00000xxxx,4/20/22,,,,,, Change type to 4, 20, 22 The response from the base station is not checked			
Request msg 4	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok
Request msg 20	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok
Request msg 22	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok

08.12.03 Ba	Test details - Interrogation with 2 requests		
Test item	Check	Remark	Result
Transmit an interrogation message 15 by sending an ACA sentence to the PI. Interrogation sentence: File AIAIR_35_5.sst: $AIAIR,00000xxxx,3,,5,,000007001,5,, A response is automatically transmitted by one of the addressed transponder			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgement	$AIABK,001193046,B,15,,3	Ok
RX of request	Check that message is received by one of the addressed transponders (VDM)		Ok
Received by VDL Analyser	Check request on VDL analyser		Ok
TX of response (VDO)	Check that response is transmitted by addressed transponder (VDO)		Ok
RX of response (VDM)	Check that the response message 5 is received by EUT (VDM)		Ok

2.1.4.2 14.1.3.2 Interrogation response

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (msg 15; EUT as destination) to the VDL according to message table (M.1371 table13) for responses with msg 3, msg 5 and slot offset set to defined value.

Record transmitted messages and frame structure.

Required results

Check that the EUT transmits the appropriate interrogation response message as requested after defined slot offset. Confirm that the EUT transmits the response on the same channel as where interrogation was received.

The requests with offset > 0 have to be made by the VDL generator, because a mobile transponder cannot generate requests with slot offset.

08.12.03 Ba	Test details - Interrogation of msg 5		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 5, slot offset = 0 (auto select) A response shall automatically be transmitted by the EUT			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser, note slot offset		Ok
Response channel	Check that the response is transmitted on the request channel		Ok

08.12.03 Ba	Test details - Interrogation of msg 3		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 3 with given slot offset = 100 A response shall automatically be transmitted by the EUT			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset defined in the request is used		Ok

More detailed interrogation tests are made in 6.3 “18.2 (M.1371 A1/5.3) Interrogation responses”

2.1.5 14.1.4 Addressed operation

(6.1 M1371 A2/3.3.8)

2.1.6 14.1.4 Addressed operation

(6.1 M1371 A2/3.3.8)

2.1.6.1 14.1.4.1 Transmit an addressed message

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of an addressed binary message (msg 6; EUT as source) according to message table (M.1371 table 13) by the EUT.

Record the transmitted messages.

Required results

Check that the EUT transmits the msg 6 as appropriate. Repeat test with the addressed safety related message (msg 12).

More detailed tests of addressed message including channel use and transmission retry are made in 6.1.

The field contents of this test should be checked in 4.7.2”

3.12.03 wa	Test details - Addressed binary message 6		
Test item	Check	Remark	Result
Transmit an addressed binary message 6 by sending an ABM sentence to the PI or alternatively using the MKD PI sentence: File AIABM_bin.sst: !AIABM,1,1,2,00000xxxx,1,6,06P0test,0 A response is automatically transmitted by the addressed transponder .			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx channel		Ok
Message sequence number	Check that sequence number in VDL msg = Sequential message identifier of ABM sentence		Ok
RX of request	Check that message is received by addressed transponder (VDM)	Transmitting problems Retest 28.01.04 Wa	Ok
Received by VDL Analyser	Check msg on VDL analyser		Ok
TX of ackn. msg 7 (VDO)	Check that ackn msg 7 is transmitted by addressed transponder (VDO)	Transmitting problems Retest 28.01.04 Wa	Ok
Use of Appl. ID	Check for proper use of DAC and FI for text messages when using MKD		Ok
RX of msg 7 (VDM)	Check that the ackn. msg 7 is received by EUT (VDM)	Transmitting problems Retest 28.01.04 Wa	Ok

AIABK acknowledgement	Check AIABK or MKD for corresponding pos. and neg. ack.	AIABK,000001007,B,6,2,1*2D Always channel B in ABK even if A is selected Retest 28.01.04 wa AIABK,000001007,A,7,2,0* Channel is ok but the field 'message ID' indicate the ack-message and not as expected the ID of the sent msg. In general an external aplication can handle only an ABK with a msg ID that is identical to the ID to the request. Retest 12.02.04 wa	Ok
Add invalid character to encapsulated data, e.g. x,y,z			
Transmission	Check that message is not transmitted		Ok
ABK sentence	Check that ABK message with ackn. type 2 (could not be broadcast) is output on PI		Ok

3.12.03 wa	Test details - Addressed safety related message 12		
Test item	Check	Remark	Result
Transmit an addressed safety related message 12 by sending an ABM sentence to the PI or alternatively using the MKD . PI sentence: File AIABM_safety.sst: !AIABM,1,1,2,00000xxxx,1,12,D5CD,0 (D5CD = „TEST“). A response is automatically transmitted by the addressed transponder .			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx on channel A		Ok
Message sequence number	Check that sequence number in VDL msg = Sequential message identifier of ABM sentence		Ok
Received by VDL Analyser	Check msg on VDL analyser	Transmitting problems Retest 12.02.04 wa	Ok
RX of msg 13 (VDM)	Check that the ackn. msg 13 is received by EUT (VDM)	Transmitting problems Retest 12.02.04 wa	Ok
acknowledgement	Check AIABK or MKD for corresponding pos. and neg. ack.	AIABK,000001007,B,12,2,1*2D Always channel B in ABK even if A is selected Retest 28.01.04 wa AIABK,000001007,A,13,2,0* Channel is ok but the field ‘message ID’ indicate the ack-message and not as expected the ID of the sent msg. In general an external aplication can handle only an ABK with a msg ID that is identical to the ID to the request. Retest 12.02.04 wa	Ok

2.1.6.2 14.1.4.2 Receive addressed message

(4.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Apply an addressed binary message (msg 6; EUT as destination) to the VDL.

b) Apply an addressed binary message (msg 6; other station as destination) to the VDL.

Record transmitted messages and frame structure.

Required results

Check that EUT transmits the appropriate acknowledgement message. Confirm that

a) EUT outputs the received message via the Presentation Interface.

b) EUT does not output the received message via the Presentation Interface.

Further tests of received addressed messages including acknowledgement see 6.1.2 .

08.12.03 Ba	Test details - Addressed binary message 6		
Test item	Check	Remark	Result
Transmit an addressed binary message by VDL generator or other Transponder verified by VDL analyser			
Addressed to EUT	Check that VDM output on PI of EUT		Ok
	Check DAC		Ok
	Check FI		Ok
	Check binary data		Ok
Addressed to other AIS transponder	Check that no VDM output on PI or on display of EUT		Ok

08.12.03 Ba	Test details - Addressed safety related message 12		
Test item	Check	Remark	Result
transmit an addressed safety related message by VDL generator or other Transponder verified by VDL analyser			
Addressed to EUT	Check that VDM output on PI of EUT		Ok
	Check message text		Ok
Addressed to other AIS transponder	Check that no VDM output on PI or on display of EUT		Ok

2.2 14.2 Multiple slot messages

(4.2 M.1371 A2/5.2.1)

2.2.1 14.2.1 5 slot messages

(M.1371 A2 / 5.2.1)

Method of measurement

Apply a BBM sentence to the PI of EUT with a max. of 121 data bytes of binary data in order to initiate transmission of a binary message (msg 8).

Required results

Check that the message is transmitted in up to 5 slots accordingly.

Single slot binary and safety related messages broadcast messages are tested in 6.4 18.3 Broadcast messages

3.12.03 wa	Test details - Binary broadcast message 8		
Test item	Check	Remark	Result
Transmit a binary broadcast messages 8 with 121 data bytes of binary data by sending 4 BBM sentences to the PI. PI sentence: File AIBBM_multi_bin.sst: AIS channel for broadcast is 1: (ch A) The file contains 4 BBM sentences with in total 121 data bytes or 162 characters			
VDO output of EUT	Check the VDO output on PI	Second VDO is too long , see above retest 28.01.04 wa	Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	!AIABK,,B,8,6,3*13	Ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
Message on VDL	Check the broadcast message on VDL analyser	No VDL output found Retest 12.02.04 wa Same problem Retest 16.06.04 Ba Msg is received by VDL analyser, but always with CRC error, and the second half of the received content is incorrect. Same message from other AIS transponder is received correctly Retest 01.03.04 Ba: No response on 5 slot BBM command, restart of unit after succeeding single slot BBM command. Retest 09.03.04 Ba: All 5 slot messages have been transmitted and received by the VDL analyser	Ok

Rx on other transponder (VDM)	Check the VDM output of an other transponder	Transmitting problems Retest 16.06.04 Ba Msg is sometimes received correctly from other transponder, sometimes not received (e.g by CRC error) Retest 09.03.04 Ba: All 5 slot messages have received by the other transponder	Ok

3.12.03 wa	Test details - Safety related broadcast message 14		
Test item	Check	Remark	Result
Transmit a safety related broadcast messages 14 with 120 data bytes of binary data by sending 4 BBM sentences to the PI. PI sentence: File AIBBM_multi_safety.sst: AIS channel for broadcast is 2: (ch B) The file contains 4 BBM sentences with in total 120 data bytes or 160 characters			
VDO output of EUT	Check the VDO output on PI	Second VDO is to long , see above retest 28.01.04 wa	Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	!AIABK,,B,14,6,3*2E	Ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
Message on VDL	Check the broadcast message on VDL analyser	Retest 16.06.04 Ba Same problem as with binary message Retest 09.03.04 Ba: All 5 slot messages have been transmitted and received by the VDL analyser	Ok
Rx on other transponder (VDM)	Check the VDM output of an other transponder	Transmitting problems Retest 16.06.04 Ba Same problem as with binary message Retest 09.03.04 Ba: All 5 slot messages have received by other transponder	Ok

2.2.2 14.2.2 Longer messages

(M.1371 A2 / 5.2.1)

Method of measurement

Apply a BBM sentence to the PI of the EUT Presentation Interface with an information content not fitting in 5 slots (i.e. more than 121 data bytes of binary data containing only binary 1's).

Required results

Check that the message is not transmitted. Check that a negative acknowledgement is given on the presentation interface.

3.12.03 wa	Test details - Binary broadcast message 8		
Test item	Check	Remark	Result
Transmit a binary broadcast messages 8 with 122 data bytes of binary data, all bits "1", by sending 4 BBM sentences to the PI. PI sentence: File AIBBM_multi_bin_1.sst: AIS channel for broadcast is 1: (ch A) The file contains 4 BBM sentences with in total 121 data bytes or 162 characters			
VDO output of EUT	Check that no VDO is output on PI		Ok
Message on VDL	Check that no message is received by VDL analyser	Retest 16.06.04 Ba Not received by VDL analysor	Ok
AIABK acknowledgement	Record the AIABK output, check that type = 2 (could not be broadcast)	!AIABK,,B,8,1,2*15 Channel B instead of A Retest 28.01.04 wa	 Ok

This test evaluates if the transponder takes into account the actually required amount of bit stuffing and can so transmit longer messages in 5 slots. This is not required.

16.06.04 Ba	Test details - Binary broadcast message 8		
Test item	Check	Remark	Result
Transmit a binary broadcast messages 8 with 123 databytes of binary data, not all "1", by sending 4 BBM sentences to the PI. PI sentence: File AIBBM_multi_bin_long.sst: AIS channel for broadcast is 1: (ch A) The file contains 4 BBM sentences with in total 123 data bytes or 164 characters			
VDO output of EUT	Check the VDO output on PI	No VDO output	Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements, type should be 3	$AIABK,,B,8,2 indicating, that message is not transmitted	Ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence	Not applicable	---
Message on VDL	Check the broadcast message on VDL analyser	Not applicable	---
Rx on other transponder (VDM)	Check the VDM output of an other transponder	Not applicable	---

2.3 14.3 Information content

(6.5.1 M.1371 A2/3.3.8)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

Apply all static, dynamic and voyage related data to the EUT.

Record all messages on VDL and check the contents of position report msg 1 and static data report msg 5.

Required results

Confirm that data transmitted by the EUT complies with manual and sensor inputs.

2.3.1 Information content of msg 1

The dynamic information content of msg 1,2,3 provided by external sensors is checked in detail in 7.5 "19.5 Test of sensor input" depending on the content and status of the different sensor input sentences. **Fehler! Verweisquelle konnte nicht gefunden werden.**

Information content provided by internal GNSS receiver – if used as backup position source – and manual MKD inputs are tested here.

3.12.03 wa	Test details – content of msg 1		
Test item	Check	Remark	Result
Internal GNSS is in use, no external sensor inputs			
MMSI	Check MMSI and compare with MKD display	Not available on Display because the CONFIG / SHIP DATA menu is not active Retest 28.01.04 wa	Ok
Navigational status	See below		Ok
Position	Check the values of lat and lon and compare with MKD display		Ok
Speed	Check the values of SOG and COG and compare with MKD display		Ok
Heading/ROT	Check that the values of heading and ROT are default		Ok
Position accuracy flag	Check flag with and without differential corrections by msg 17		Ok
Time stamp	Check time stamp		Ok
Comm state	Check for availability, detailed test in 5		Ok
Default values	Check that default values for LAT, LON, SOG, COG are transmitted if internal GNSS is unavailable		Ok

3.12.03 wa	Test details – Navigational status		
Test item	Check	Remark	Result
Test of navigational status on VDL message. Check some different navigational status values. Change the navigational status using MKD or VSD input			
Status = 0 (under way using engine)	Check Status in VDL message 1		Ok
Status = 1 (at anchor)	Check Status in VDL message 1		Ok
Status = 7 (fisching)	Check Status in VDL message 1		Ok
Status = 15 (undefined)	Check Status in VDL message 1		Ok
Other status values	Check some other values		Ok

2.3.2 Information content of msg 5

3.12.03 wa	Test details – Content of msg 5		
Test item	Check	Remark	Result
Check of the contents of msg 5 (static and voyage related data) Data can be changed using MKD or VSD/SSD input at PI			
MMSI	Check value in msg 5	CONFIG / SHIP DATA menu not available Retest 29.01.04 wa	Ok
AIS version indicator	Check that version is 0		Ok
IMO number	Check value in msg 5	See above Retest 29.01.04 wa	Ok
Call sign	Check value in msg 5	See above Retest 29.01.04 wa	Ok
Name of ship	Check value in msg 5	See above Retest 29.01.04 wa	Ok
Type of ship and cargo type	Check value in msg 5		Ok
Reference point for internal GPS			
Reference point A	Check value in msg 5		OK
Reference point B	Check value in msg 5		OK
Reference point C	Check value in msg 5		OK
Reference point D	Check value in msg 5		OK
Reference point for EPFS			
Reference point A	Check value in msg 5		OK
Reference point B	Check value in msg 5		OK
Reference point C	Check value in msg 5		OK
Reference point D	Check value in msg 5		OK
Tx of msg 5	Check if msg 5 is transmitted at change of position source		OK
Voyage related data			
ETA	Check value in msg 5	Input of 30th Feb possible Retest 29.01.04 wa	Ok
Maximum present static draught	Check value in msg 5		Ok
Destination	Check value in msg 5		Ok
DTE flag can be checked in connection with 14.9.2.5 Remote MKD disconnection, when so configured". Check the flag during that test and enter result her			
DTE on	Check that DTE flag = 0	ALWAYS 1 Retest 29.01.04 wa	Ok
DTE off	Check that DTE flag = 1		
Type of EPFS			
Apply simulated GLL,VTG, GDT and ROT sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst. Change talker according to test item			
Talker = GP	Check type of EPFS = 1		Ok
Talker = GL	Check type of EPFS = 2		Ok
Talker = GN	Check type of EPFS = 3		Ok

Talker = LC	Check type of EPFS = 4		Ok
Talker = IN	Check type of EPFS = 6		Ok
Talker = other	Check type of EPFS = 0		Ok

2.4 14.4 Reporting rates

(6.5.2)

2.4.1 14.4.1 Speed and course change

(6.5.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) start with own speed of 10kn; record all messages on VDL for 10min and evaluate reporting rate for position report of EUT by calculating average slot offset over test period.

b) Increase speed and change course (ROT > 10°/min, derived from heading) in accordance with 6.5.2 Table 1 and ITU-R M.1371 A2/4.3.

c) Reduce speed and rotation rate to values below those given in Table 1.

d) Make speed and/or heading sensor unavailable.

For b), c), d) record all messages on VDL and check slot offset between two consecutive transmissions.

Required results

a) Reporting rate shall comply to Table 1 (10sec ±10%).

b) Confirm that the new reporting rate has been established (after 2 transmissions ±20%.)

c) Confirm that the reporting rate is reduced after 4min (speed reduction) or 20sec (ROT reduction).

d) Check that with unavailable sensors the reporting rate reverts to default values (10sec if no sensor connected).

Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data.

05.12.03 Ba	Test details – Change of reporting rate by speed		
Test item	Check	Remark	Result
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data. Change speed according to the test items and record VDL data. After each change wait until new reporting rate is clearly established. Lines are related to Excel table reprate_speed.xls			
Speed = 10 kn	Check that reporting rate is 10 s		Ok
Speed = 15 kn	Check slot allocation using msg 3 for new reporting rate		Ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions	Starts with the next transmission	Ok
	Check that new rate is established within 1 minute		Ok
	Check that new reporting rate is 6 s		Ok
Speed = 25 kn	Check slot allocation using msg 3 for new reporting rate		Ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions	Starts with the next transmission after change of speed	Ok
	Check that new rate is established within 1 minute		Ok
	Check that new reporting rate is 2 s		Ok
Reduction of speed to Speed = 15 kn	Check slot allocation by deallocation of slots, Msg 3 not required for new reporting rate		Ok
	Check that new rate starts after 3 min and is established within 4 minutes		Ok
	Check that new reporting rate is 6 s		Ok
Reduction of speed to Speed = 10 kn	Check slot allocation using msg 3 for new reporting rate		Ok
	Check that new rate starts after 3 min and is established within 4 minutes		Ok
	Check that new reporting rate is 10 s		Ok

05.12.03 Ba	Test details – Change of reporting rate by heading		
Test item	Check	Remark	Result
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data. Change speed according to the test items and record VDL data. After each change wait until new reporting rate is clearly established. Lines are related to Excel table reprate_speed.xls			
Change of heading from 359° to 0°	Check that the reporting rate is not increased	Reporting rate is increased Retest 15.01.04 Ba Reporting rate is not increased	Ok
Change of heading from 0 ° to 359°	Check that the reporting rate is not increased	Reporting rate is increased Retest 15.01.04 Ba Reporting rate is not increased	Ok
Speed = 10 kn Heading = 0	Check that reporting rate is 10 s		Ok
Speed = 10 kn Increase heading by 10 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate		Ok
	Check that new rate is established immediately		Ok
	Check that new reporting rate is 3 1/3 s		Ok
Speed = 10 kn Stop Increasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)		Ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change		Ok
	Check that new reporting rate is 10 s again		Ok
Speed = 15 kn	Wait until speed is 6 s with msg type 1		
Speed = 15 kn Decrease heading by 10 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate		Ok
	Check that new rate is established immediately		Ok
	Check that new reporting rate is 2 s		Ok
Speed = 15 kn Stop decreasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)		Ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change		Ok

	Check that new reporting rate is 6 s again		Ok
Speed = 25 kn	Wait until speed is 2 s with msg type 1		
Speed = 25 kn Increase heading by 10 degr. steps sometimes	Check that no change		Ok
Speed = 25 kn Stop Increasing heading	Check that no change		Ok

05.12.03 Ba	Test details – Reporting rate - Sensor unavailable		
Test item	Check	Remark	Result
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Change speed according to the test items and record VDL data.			
Speed = 10 kn	Check that reporting rate is 10 s		Ok
Speed = 15 kn	Check that reporting rate is 6 s		Ok
Speed sensor unavailable (internal source made inavailable)	Record time from stopping speed input to reverting report rate	After 3 min starts decreasing reporting rate to 10 s	Ok
	Check that new reporting rate is 10 s		Ok

Note: 61993 differs to 1371 clarifications with regard to behaviour when speed sensor unavailable

2.4.2 14.4.2 Change of navigational status

(6.5.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Change Navigational status by applying voyage data message to the Presentation Interface of the EUT.

a) set NavStatus to "at anchor" and speed <3 kn

b) set NavStatus to "at anchor" and speed >3 kn

c) set NavStatus to other values

Record all messages on VDL and evaluate reporting rate of position report of EUT.

Required results

a) Reporting rate shall be 3 min.

b) Reporting rate shall be 10 s.

c) Reporting rate shall be adjusted according to speed and course (see 14.4.1)

05.12.03 Ba	Test details – Reporting rate		
Test item	Check	Remark	Result
Apply simulated sensor data to the sensor input. File name is ais01_gll_vtg_hdt_rot.sst Change Navigation status and speed according to test items			
Navigation status = 0 (under way using engine Speed = 2 kn	Check that reporting rate is 10 s		Ok
Nav. status = 1 (at anchor) Speed = 2 kn	Check that reporting rate is 3 min		Ok
	Check that the position report is interleaved with the msg 5 (see ITU-R M1371 §4.3.1.3)	Is not interleaved with msg 5: Tx of msg 5 is continued in the old 6 min rate, timing of msg 3 starts at change of nav status Retest 23.01.04 Ba: Interleaving of msg 3 and 5 is ok	Ok
Nav. status = 1 Speed = 4 kn	Check that reporting rate is 10 s		Ok
Nav. status = 5 (moored) Speed = 2 kn	Check that reporting rate is 3 min		Ok
Nav. status = 2 (not under command) Speed = 2 kn	Check that reporting rate is 3 min	Reporting rate is 10 s See note)	Acc
Nav. status = 6 (Aground) Speed = 2 kn	Check that reporting rate is 3 min	Reporting rate is 10 s See note)	Acc
Nav. status = 3 or other Speed = 2 kn	Check that reporting rate is 10 s		Ok

Note) According to ITU-R M1371 §4.3.1.3 “When the vessel is at anchor, moored, not under command or aground, which is indicatred by the navigational status, ...Message 3 should be used with a reporting rate of 3 minutes.”
On the other hand in table 1 of IEC 6193-2 only “at anchor” and “Moored” is mentioned for a reporting rate of 3 min.
Therefore we accept both reporting rates (3 min and 10 s) for the navigational states “not under command” and “aground”.

05.12.03 Ba	Test details – Check of slot handling		
Test item	Check	Remark	Result
Apply simulated sensor data to the sensor input. File name is ais01_gll_vtg_hdt_rot.sst Change Navigation status according to test items			
Navigation status = 0 (under way using engine Speed = 2 kn	Check that reporting rate is 10 s		Ok
Change Nav status to “at anchor”	Check that the used slots are release by time-out 0 and slot offset = 0k		Ok
	Record if the slots are forced to time-out 0 or if they are released after count down to 0		
	Check that the position reports are transmitted in RATDMA mode using msg 3		Ok
Change Nav status back to 0	Check that a procedure like network entry is performed		Ok

2.4.3 14.4.3 Assigned reporting rates

(6.5.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command msg 16 to the EUT with:

a) initial slot offset and increment;

b) designated reporting rate.

Change course, speed and NavStatus. Record transmitted messages.

Required results

Confirm that the EUT transmits position reports msg 2 according to the parameters defined by msg 16; the reporting rate shall not be affected by course, speed or NavStatus. The EUT shall revert to msg 1 or 3 in autonomous mode with standard reporting rate after 4 to 8 min.

If the autonomous mode requires a higher reporting rate than that directed by Message 16, the Class A shipborne mobile AIS station should use the autonomous mode.

More detailed tests are made in 4.6.4 16.6.4 Assigned operation

In this test it is only checked if the assigned reporting rate depends on course, speed and navigation status.

Only if the speed or course change requires an higher report rate the EUT has the revert to autonomous mode and obtain the higher report rate.

05.12.03 Ba	Test details a) – Slot offset and increment		
Test item	Check	Remark	Result
Send an assignment message 16 with offset A = 40 (offset to first assigned slot = 40) and slot increment parameter = 3 (increment = 225 = 6 s)			
NavStatus = 0 (under way using engine), Speed = 2 kn • Send assignment cmd	Check that slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
In assigned mode • change NavStatus to 1 (at anchor)	Check that Navstatus has no effect: EUT maintains assigned mode		Ok
In autonomous mode: NavStatus = 1 (at anchor), speed = 2 kn • Send assignment cmd	Check that the assignment command is accepted		Ok
Nav Status = 0, speed = 10 kn • Send assignment	Check that assignment command is executed		Ok
• Increase speed to 15 kn	Check that EUT maintains assignment mode		Ok
• Increase speed to 25 kn	Check that EUT increases reporting rate to 2 s and		Ok
	Check if msg type = 1 or msg type 2 is used (rescheduling with msg 3)	Msg type is changed to 1	acc
NavStatus = 0, Speed = 15 kn: • Send assignment cmd	Check that EUT changes to assigned mode		Ok
In assigned mode: • Change heading	Check that reporting rate is increased to 2 s		Ok
	Check the methode of increasing the reporting rate (msg 3 inserted between msg 1 or 2)	The assigned mode is continued and additional msg 3 are inserted, similar to autonomous mode. After end of heading change assigned mode with msg 2 is continued	Ok

05.12.03 Ba	Test details b) – Rate assignment		
Test item	Check	Remark	Result
Send an assignment message 16 with offset = 100 (reporting rate = 100 msg/10 min), increment=0			
NavStatus = 0 (under way using engine), Speed = 10 kn • Send assignment cmd	Check that slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
In assigned mode • change NavStatus to 1 (at anchor)	Check that Navstatus has no effect: EUT maintains assigned mode		Ok
In autonomous mode: NavStatus = 1 (at anchor), speed = 2 kn • Send assignment cmd	Check that the assignment command is accepted		Ok
Nav Status = 0, speed = 10 kn • Send assignment	Check that assignment command is executed		Ok
• Increase speed to 15 kn	Check that EUT maintains assignment mode		Ok
• Increase speed to 25 kn	Check that EUT increases reporting rate to 2 s and		Ok
	Check if msg type = 1 or msg type 2 is used (rescheduling with msg 3)	Msg type is changed to 1	acc
NavStatus = 0, Speed = 15 kn: • Send assignment cmd	Check that EUT changes to assigned mode	Continues using the slots of autonomours mode	Ok
In assigned mode: • Change heading	Check that reporting rate is increased to 2 s		Ok
	Check the methode of increasing the reporting rate (msg 3 inserted between msg 1 or 2)	The assigned mode is continued and additional msg 3 are inserted, similar to autonomous mode. After end of heading change assigned mode with msg 2 is continued	Ok

2.4.4 14.4.4 Static data reporting rates

(6.5.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Record the transmitted messages and check for static and voyage related data (msg 5).

b) Change static and/or voyage related station data. Record the transmitted messages and check for static and voyage related data (msg 5).

Required results

a) Confirm that the EUT transmits msg 5 with a reporting rate of 6 min.

b) Confirm that the EUT transmits msg 5 within 1 min reverting to a reporting rate of 6 min.

05.12.03 Ba	Test details - Static data reporting rates		
Test item	Check	Remark	Result
Record msg 5 and check repetition rate			
a) Default update rate	Check that update rate is 6 min		Ok
b) Change static data using SSD sentence short time after regular msg 5	Check that msg 5 is transmitted within 1 min	A message 5 is transmitted also if no data are changed. We recommend not to transmit msg 5 if no data are changed by msg 5. See note)	Ok Rec
Wait for next msg 5	Record if the next msg 5 is transmitted: • 6 min after regular msg 5 or • 6 min after additional msg 5	The next msg 5 is transmitted 6t min after additional msg 5	
Change voyage related data using VSD sentence	Check that msg 5 is transmitted within 1 min		Ok
Change static data using MKD	Check that msg 5 is transmitted within 1 min		Ok
Change position source with different ref. point data (see 61993 6.10.3.4)	Check that msg 5 with ref point of new source is transmitted before next transmission of pos. report	If this is not done before next transmition of position report there will be a position jump on the display system of near targets.	Ok

Note) Experience from the actually equipped ships shows that there is external equipment (e.g. ECDIS) which outputs the static data regularly (e.g. every 10 s or even 2 s) to the AIS transponder. This would result in an msg 5 transmission rate of e.g. 2s or 10 s) which produces an unacceptable channel load.
Therefore we recommend not to transmit msg 5 if no data are changed by msg 5.

2.5 14.5 Security

(6.6)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Switch the EUT off for more than 15 min and on again at least ten times. Recover and readout recorded data.

Required results

Confirm that the EUT records and displays times and events correctly.

3.12.03 wa	Test details - Security		
Test item	Check	Remark	
Switch EUT off for 16 minutes and on again			
Read out means	Check that there are means to readout recorded data		Ok
Read out recorded data	Check that all switch off times > 15min are correctly recorded		Ok
If the EUT supplies a "silent mode" (no transmission)	Check that all silent mode times > 15min are correctly recorded	Not found Retest 12.02.04 Wa Fuction implemented but no Indication in History window to separate shutdown from silent logs Retest 01.03.04 Ba Silent mode times are logged We recommend an indication if the unit was switched of or in silent mode (e.g. replace "off" by "sil" in history lists)	Ok rec

2.6 14.6 Initialisation period

(6.7 M.1371 A2/3.3.3)

Method of measurement

Set up standard test environment with all sensors available.

a) Switch on EUT with EUT operating in autonomous mode.

b) Switch off EUT for approx. 0.5 s. Record transmitted messages.

Required results

Confirm that the EUT starts transmissions within 2 min after switch on.

3.12.03 wa	Test details - Initialisation period		
Test item	Check	Remark	Result
Set up standard test environment with all sensors available			
a) Switch on of EUT	Check that EUT starts transmission within 2 min		Ok
b) Switch off EUT for approx. 0.5 s	Check that EUT starts transmission within 2 min		Ok

2.7 14.7 Channel selection

(6.9)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Switch the EUT to different channels randomly selected from the maritime mobile band as specified by ITU-R M.1084-4, Annex 4 using both 25kHz and 12.5kHz channel spacing (incl. 12.5kHz emission on a 25kHz channel):

a) manually,

b) by transmission of channel management message (msg 22) broadcast and addressed to EUT,

c) by application of ACA sentence to the presentation interface.

d) By transmission of DSC telecommand to EUT

Record the VDL messages.

Required results

Confirm that the EUT switches to Channel / bandwidth and duplex / simplex channels accordingly.

Confirm that the EUT delivers a TXT-sentence with ID 036, followed by the ACA-sentences needed to inform of changes in the AIS use of regional operating settings.

10.02.04 Ba	Test details - Channel selection		
Test item	Check	Remark	Result
Select channels and bandwidth according to the test items in a regional area around the actual position so that is in use. The VDL analyser has to be switched to the selected channels			
a) Enter manually: 2 simplex channels 25 kHz spacing 25 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok
	Check ACA output at PI	In use flag = 0, but area is in use Retest 13.02.04 Ba: In use flag still 0 Retest 01.03.04 Ba In use flag is set to 1	Ok
b) Enter by using msg 22: 1 duplex channel 25 kHz spacing 25 kHz bandwidth	Check that channels are used	Regional setting is not changed Retest 10.02.04 Ba: Not changed Retest 13.02.04 Ba: Addressing by MMSI not ok, Addressing without trailling 5 “00000” bits also doesn’t work (did work in previous version) Retest 01.03.04 Ba Channels are changed	Ok
	Check bandwidth		Ok
	Check TXT output at PI	No TXT output	Ok
	Check ACA output at PI	No ACA output	Ok
c) Enter by ACA sentence: 1 duplex channel 25 kHz spacing 12.5 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok
	Check ACA output at PI	In use flag = 0, but area is in use Retest 13.02.04 Ba: In use flag still 0 Retest 01.03.04 Ba In use flag is set to 1	Ok
d) Enter by DSC 2 simplex channels 12.5 kHz spacing 12.5 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok

	Check ACA output at PI	In use flag = 0, but area is in use Remark 01.03.04 Ba: Could not be retested because DSC calls are not received, but I expect that it is ok Retest 10.03.04 Ba In use flag is set to 1	Ok

2.8 14.8 Transceiver protection

(6.9 ; M.1371 A2/2.14, 2.15)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Open circuit and short circuit VHF-antenna terminals of the EUT for at least 60 s each.

Required results

The EUT shall be operative again within 2 min after refitting the antenna without damage to the transceiver.

This test should be done as the last test to be able to do all other tests in case of transmitter damage.

16.02.04 Ba	Test details - Transceiver protection		
Test item	Check	Remark	Result
Open circuit of VHF antenna terminal	Check that EUT starts transmission within 2 min after refitting the antenna		Ok
Short circuit of VHF antenna terminal	Check that EUT starts transmission within 2 min after refitting the antenna		Ok

2.9 14.9 Alarms and indicators, fall-back arrangements

(6.10)

3.12.03 wa	Test details - General alarm tests		
Test item	Check	Remark	Result
No alarm pending			
Alarm output repetition	Check that ALR sentences are not output with a repetition rate < 1 min	1.5 min	Ok

2.9.1 14.9.1 Loss of power supply

(6.10.1.2)

Method of measurement

Disconnect power supplies of the EUT.

Required result

Verify that the relay output is "active" when the power is "off".

3.12.03 wa	Test details - Loss of power supply		
Test item	Check	Remark	Result
Switch off power supply	Check that alarm relay output is active.		Ok

2.9.2 14.9.2 Monitoring of functions and integrity

(6.10.2)

2.9.2.1 14.9.2.1 Tx malfunction

Method of measurement

Disable the transmitter by disconnecting the antenna.

Required result

Verify that an alarm sentence ALR with alarm ID 001 is sent and the relay output signals the failure state.

Verify that relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

Alternatively an ALR 001 when TX active between TX-slots is accepted; disconnecting antenna is also alarmed by ALR 002.

4.12.03 wa	Test details - Tx malfunction		
Test item	Check	Remark	Result
Disconnect VHF antenna or: make TX active between scheduled slots (e.g. CW carrier)			
Stop of transmission	Check if transmission is stopped	Not stopped	Acc.
ALR output	Check that ALR sentence ID 001 is output at PI	AlarmID 002 is also indicated	Acc
ALR output repetition	Check that the ALR sentence is repeated with a rate of 30 s	Tx is repeated with 10sec vswr is repeated with 30 sec Retest 29.01.04 wa EUT detect VSWR alarm but is switching between alarm active and inactive in a appr. 8-10 sec interval. Retest 12.02.04 wa	Ok
Alarm relay	Check that alarm relay is activated		Ok
MKD display	Check that the alarm is displayed on the MKD		Ok
Send an ACK sentence	Check that alarm relay deactivated	Still active Retest 12.02.04 wa	Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated	Still same indication Retets 12.02.04 wa	Ok
Reconnect VHF antenna	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated	Still same indication Retest 12.02.04 wa	Ok

2.9.2.2 14.9.2.2 Antenna VSWR

Method of measurement

Prevent the EUT from radiating with full power by mismatching the antenna for a VSWR of 3:1. During the mismatch the output power is not required to be at the rated output power.

Required result

Verify that the EUT continues transmitting. Verify that an alarm sentence ALR with alarm ID 002 is sent and the relay output signals the failure state.

Verify that relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

4.12.03 wa	Test details - Antenna VSWR		
Test item	Check	Remark	Result
Connect a mismatched dummy load with a VSWR of 3:1 to the VHF antenna terminal			
Continuation of Tx	Check that transmission continues		Ok
ALR output	Check that ALR sentence ID 002 is output at PI		Ok
MKD display	Check that the alarm is displayed on the MKD		Ok
Alarm relay	Check that alarm relay is activated		Ok
Send an ACK sentence	Check that alarm relay deactivated		Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated		Ok
Generate a new alarm by connection the VHF antenna and again connect the mismatched dummy load			
Acknowledge the alarm on MKD (applies to all alarms) note: NEW	Check that alarm relay deactivated		Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated (the alarm indication is cleared)		Ok
Connect VHF antenna	Check that ALR sentence is updated		Ok

2.9.2.3 14.9.2.3 Rx malfunction

Manufactures shall provide documentation describing how the AIS detects Rx malfunction and that an ALR sentence with alarm ID as appropriate is sent.

02.03.04 Ba	Test details - Rx malfunction		
Test item	Check	Remark	Result
Check the documentation			
Detection of RX malfunction	Check that documentation describes how the AIS detects Rx malfunction		Ok
ALR output	Check that documentation describes that an ALR sentence with ID 003 (RX1), ID 004 (RX2) and ID 005 (DSC) is sent.		Ok

2.9.2.4 14.9.2.4 Loss of UTC

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Disconnect the GNSS antenna (UTC clock lost).

Required result

Verify that the system continues to operate but changes to indirect synchronisation and that an TXT-sentence with ID 007 is sent and the relay output is not activated.

4.12.03 wa	Test details - UTC clock lost		
Test item	Check	Remark	Result
Disconnect GNSS antenna			
Continuation of operation	Check that transmission of position report continues		Ok
Synchronisation	Check that EUT switches to indirect synchronisation		Ok
TXT output	Check that a TXT sentence with ID 007 is output at PI		Ok
Alarm relay	Check that the alarm relay output is not activated		Ok
MKD display	Check that the status display of the MKD is updated		Ok

2.9.2.5 14.9.2.5 Remote MKD disconnection, when so configured

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Disconnect the connection to the remote MKD.

b) Provide an alarm acknowledgement, ACK sentence with ID 008, to the PI.

Required result

a) Verify that an alarm sentence, alarm ID 008, is sent and the relay output signals the failure. Verify that the AIS continues operation, with the DTE value "1" in msg 5.

b) Verify that the relay deactivates when the EUT receives an ACK and that the status field in the ALR sentence is updated.

08.12.03 Ba	Test details - Remote MKD disconnection		
Test item	Check	Remark	Result
Disconnect the connection to the remote MKD.			
Continuation of Tx	Check that transmission continues	Not applicable, internal MKD	Ok
DTE flag	Check that the DTE flag in msg 5 is set to 1		
ALR output	Check that ALR sentence ID 008 is output at PI		
Alarm relay	Check that alarm relay is activated		
MKD display	Check that loss of connection to the transponder is displayed on the MKD		
Send an ACK sentence	Check that alarm relay deactivated		
	Check that ALR sentence is updated		
Reconnect MKD	Check that ALR sentence is updated		
MKD display	Check that the MKD display is updated		

2.9.3 14.9.3 Monitoring of sensor data

(6.10.3)

2.9.3.1 14.9.3.1 Priority of position sensors

(6.1.1.3, 6.10.3)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Verify the manufacturer's documentation to ascertain the configuration implemented on the EUT for position sensors (see 6.2).

Apply position sensor data in a way that the EUT operates in the states defined below :

a) external DGNSS in use (corrected)

b) internal DGNSS in use (corrected; msg 17) if implemented

c) internal DGNSS in use (corrected; beacon) if implemented

d) external EPFS in use (uncorrected)

e) internal GNSS in use (uncorrected) if implemented

f) no sensor position in use

Check the ALR sentence and the position accuracy flag in the VDL msg 1.

Required result

Verify that the use of position source, position accuracy flag, RAIM flag and position information complies to Table 4.

Verify that when the status is changed, an ALR (025, 026, 029, 030), or TXT (021, 022, 023, 024, 025, 027, 028) sentence is sent according to table 2 or table 3 respectively.

Verify that the status is changed after 5 s when switching downwards and 30 s when switching upwards.

19.11.03 Ba	Test details - Position priority – Basic test without internal DGNSS		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01g_gll_vtg_gbs_hdt_rot.sst Internal GPS: no RAIM, external: RAIM active.			
No sensor data: Changing upwards			
f) Start with: • No external GNSS input • No Internal GNSS	Check that default position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 0		Ok
	Check that ALR message with ID 026 (No sensor position) is output on PI every 30 s		Ok
e) Change from f: • No external GNSS input • Activate internal GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is according to internal sensor (= 0)		Ok
	Check that msg 5 is output with new (internal) ref. point		Ok
	Check that ALR message with ID 026 is updated		Ok
	Check that TXT sentence with ID 025 (position) and ID 028 (SOG/COG) is output on PI		Ok
	Check that the alarm on MKD according to ALR ID 026 is updated		Ok
	Check that status display of MKD is updated according to TXT ID 025 and ID 028		Ok

d) Change from e: • Internal GNSS is available • Apply external GNSS input	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is according external sensor (=1)		Ok
	Check that msg 5 is output with new (external) ref. point		Ok
	Check that ALR message with ID 025 is updated		Ok
	Check that TXT sentence with ID 022 (position) and ID 027 (SOG/COG) is output on PI		Ok
	Check that the alarm on MKD according to ALR ID 025 is updated		Ok
	Check that status display of MKD is updated according to TXT ID 022 and ID 027		Ok
a) Change from d: • Internal GNSS • Change external mode to DGNSS	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 021 is output on PI		Ok
	Check that status display of MKD is updated according to TXT ID 021		Ok
Status change time	Check that status has been changed after 30 s		Ok
Highest Level: Changing downwards			
d) Change from a: • Internal GNSS available • Change external sensor mode to GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that TXT sentence with ID 022 is output on PI		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
e) Change from d: • Internal GNSS available • Remove external GNSS input	Check that internal position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is set according to documentation of internal GPS (=0)		Ok
	Check that msg 5 is output with new ref. point		Ok
	Check that ALR message with ID 025 (external EPFS lost) is output on PI		Ok
	Check that TXT sentence with ID 025 (position) and ID 028 (SOG/COG) is output on PI		Ok
	Check that an alarm according to ALR message is displayed on MKD		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
f) Change from e: • No external GNSS input • Disable internal GNSS	Check that default position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 0		Ok

	Check that ALR message with ID 026 (No sensor position) is output on PI		Ok
	Check that an alarm according to ALR message is displayed on MKD		Ok
Status change time	Check that status has been changed after 5 s		Ok

Date	Result	Status
19.11.03 Ba	Msg 17 is received but unit switch only accasionally for a few seconds to differential mode . So the following test could not be performed Details in PI log file. Retest 15.01.04 Ba: Differential mode with message 17 is now stable	Ok
15.01.04 Ba	Differential mode using beacon input did not work <u>Retest 22.01.04 Ba:</u> Differential mode using beacon input is working. A and B lines were reversed Labelling of connection board has to be changed to indicate A and B correctly We do not need a new hardware to check this. It is ok if we get a confirmation that this labelling has been changed. <u>Retest 11.03.04 Ba:</u> The board of the connection board has been changed by turning 2 resistors. This change is confirmed by a copy (PDF) of change note EM4164	Ok Ok

15.01.04 Ba	Test details - Position priority –DGNSS test Msg 17		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01g_gll_vtg_gbs_hdt_rot.sst Internal GPS: no RAIM, external: RAIM active.			
No correction data: Changing upwards			
d) Start with: • Internal GNSS is available • External GNSS input	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 1		Ok
b) Change from d: • External mode is GNSS • Apply correction data by msg 17	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to internal GNSS (=0)		Ok
	Check that msg 5 is output with new (internal) ref. point		Ok

	Check that TXT sentence with ID 024 (position) and ID 028 (SOG/COG) is output on PI	The ID of number 24 is ok but the text is the text of ID 23 (Internal DGNSS in use (beacon) instead of (message 17) TXT 28 is ok Retest 12.02.04 Ba: Text of TXT ID 24 is ok	Ok
	Check that status display of MKD is updated according to TXT ID 024 and 028		Ok
a) Change from b: • Change external mode to DGNSS • Internal DGNSS (msg 17)	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to external GNSS (=1)		Ok
	Check that msg 5 is output with new (external) ref. point		Ok
	Check that TXT sentence with ID 021 (position) and ID 027 (SOG/COG) is output on PI		Ok
	Check that status display of MKD is updated according to TXT ID 021 and ID 027		Ok
Status change time	Check that status is changed after 30 s	Time to change after start of msg 17 is 80 s, in another test 40 s The other cases are ok Retest 12.02.04 Ba: Time of status change after start of msg 17 is 30 s	Ok Ok
Highest Level: Changing downwards			
c) Change from a: • Internal DGNSS by msg 17 • Change external sensor mode to GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 024 (position) and ID 028 (SOG/COG) is output on PI	The ID of number 24 is ok but the text is the text of ID 23 (Internal DGNSS in use (beacon) instead of (message 17) TXT 28 is ok Retest 12.02.04 Ba: Text of TXT ID 24 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT sentences		Ok
d) Change from c: • External GNSS input • Remove msg 17 (correction data for Internal GNSS)	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is set according to external sensor input data		Ok
	Check that msg 5 is output with new ref. point		Ok

	Check that TXT sentence with ID 022 (position) and ID 027 (SOG/COG) is output on PI	About 20 s after last msg 17 the TXT ID 23 with the (incorrect) text “Internal DGNSS in use msg 17” is output. No TXT should be output here. The TXT output when changing to external source is correct <u>Retest 12.02.04 Ba:</u> No incorrect TXT ID 23 output after end of msg 17 found	Ok Ok
	Check that status display of MKD is updated according to TXT sentence	For some time “Internal DGNSS Beacon” is displayed After that time the display is correct <u>Retest 12.02.04 Ba:</u> Display is correct now, no display of “Internal DGNSS Beacon”	Ok
Status change time	Check that status is changed after 5 s		Ok

22.01.04 Ba	Test details - Position priority –DGNSS test beacon		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01g_gll_vtg_gbs_hdt_rot.sst Internal GPS: no RAIM, external: RAIM active.			
No correction data: Changing upwards			
d) Start with: • Internal GNSS is available • Exxternal GNSS input	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 1		Ok
c) Change from d: • External mode is GNSS • Apply correction data for DGNSS by beacon	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (internal) ref. point		Ok
	Check that TXT sentence with ID 023 (position) and ID 028 (SOG/COG) is output on PI	Output of TXT ID is ok, but text of ID 023 is incorrect: text is “Internal DGNSS in use msg 17” Retest 13.02.04 Ba: Text of TXT ID 23 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT ID 023 and 028		Ok
a) Change from C: • Change external mode to DGNSS • Internal DGNSS (beacon)	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (external) ref. point		Ok
	Check that TXT sentence with ID 021 (position) and ID 028 (SOG/COG) is output on PI		Ok
	Check that status display of MKD is updated according to TXT ID 021		Ok
Status change time	Check that status is changed after 30 s		Ok
Highest Level: Changing downwards			
c) Change from a: • Internal DGNSS by beacon • Change external sensor mode to GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 023 (position) and ID 028 (SOG/COG) is output on PI	Output of TXT ID is ok, but text of ID 023 is incorrect: text is “Internal DGNSS in use msg 17” Retest 13.02.04 Ba: Text of TXT ID 23 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
d) Change from c: • External GNSS input • Remove beacon correction data for Internal GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok

	Check that RAIM flag is set according to sensor input data		Ok
	Check that msg 5 is output with new ref. point		Ok
	Check that TXT sentence with ID 022 (position) and ID 027 (SOG/COG) is output on PI		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
Status change time	Check that status is changed after 5 s	At end of beacon data time is 50s (5s + max age of correction data)	Ok

22.01.04 Ba	Test details - Position priority –DGNSS test beacon + Msg 17		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01g_gll_vtg_gbs_hdt_rot.sst Internal GPS: no RAIM, external: RAIM active.			
No correction data: Changing upwards			
d) Start with: • Internal GNSS is available • Exxternal GNSS input	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 1		Ok
c) Change from d: • External mode is GNSS • Apply correction data for DGNSS by beacon	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (internal) ref. point		Ok
	Check that TXT sentence with ID 023 (position) and ID 028 (SOG/COG) is output on PI	Output of TXT ID is ok, but text of ID 023 is incorrect: text is “Internal DGNSS in use msg 17” Retest 13.02.04 Ba: Text of TXT ID 23 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT ID 023		Ok
b) Change from c: • External mode is GNSS • Correction data for DGNSS by beacon • Apply msg 17 with correction data	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 024 is output on PI	Output of TXT ID is ok, but text of ID 024 is incorrect: text is “Internal DGNSS in use beacon” Retest 13.02.04 Ba: Text of TXT ID 24 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT ID 023		Ok
a) Change from b: • Change external mode to DGNSS • Internal DGNSS (beacon+msg17)	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (external) ref. point		Ok
	Check that TXT sentence with ID 021 (position) and ID 027 (SOG/COG) is output on PI		Ok
	Check that status display of MKD is updated according to TXT ID 021		Ok

Status change time	Check that status is changed after 30 s	When msg 17 is applied the EUT switches immediately (< 5s) to msg 17 mode. There should be a check for 30 s that msg 17 is stable received before switching over to msg 17 mode. <u>Retest 13.02.04 Ba:</u> EUT switches after 30 s to msg 17 mode Other status change times are ok.	 Ok Ok

Highest Level: Changing downwards			
b) Change from a: • Msg 17 for internal DGNSS • Internal DGNSS by beacon • Change external sensor mode to GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 024 (position) and ID 028 (SOG/COG) is output on PI	Output of TXT ID is ok, but text of ID 024 is incorrect: text is “Internal DGNSS in use beacon” Retest 13.02.04 Ba: Text of TXT ID 24 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
c) Change from b: • External sensor mode is GNSS • Internal DGNSS by beacon • Stop msg 17	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 023 is output on PI	Output of TXT ID is ok, but text of ID 023 is incorrect: text is “Internal DGNSS in use msg 17” Retest 13.02.04 Ba: Text of TXT ID 23 is ok	Ok Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
d) Change from c: • External GNSS input • Remove beacon correction data for internal GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is set according to sensor input data		Ok
	Check that msg 5 is output with new ref. point		Ok
	Check that TXT sentence with ID 022 (position) and ID 027 (SOG/COG) is output on PI		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
Status change time	Check that status is changed after 5 s		Ok

2.9.4 14.9.4 Heading sensor

(6.10.3.1)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Disconnect the inputs for HDG and ROT or set their data to invalid (e.g. by wrong checksum, "valid/invalid" flag).

b) Reconnect the inputs for HDG and ROT

c) Disconnect the input for ROT or set the data to invalid (e.g. by wrong checksum, "valid/invalid" flag). Establish a rate of heading change that is greater than 5 degrees in 30 seconds

d) Reconnect the ROT input

Required Result

a) Check that an alarm sentence ALR with alarm ID 032 for invalid HDG and an alarm sentence ID 035 for invalid ROT are sent to the PI and the "default" data is sent in VDL msg 1,2 or 3.

b) Check that an alarm sentence ALR with alarm ID 031 for valid HDG and ID 033 for valid ROT is sent to the PI . Verify that, in the alarm sentences, the alarm condition flag is set to "V" and that the relay output is not activated. Check that TXT-sentences with ID 031 for valid HDG and ID 033 for ROT indicator in use are sent to the PI

c) Check that TXT-sentence with ID 034 for "other ROT source in use" is sent to the PI and that the contents of the message's ROT field is the correct "direction of turn" (table 5 "ROT sensor fallback conditions," Priority 2).

d) Check that a TXT-sentence with ID 033 for ROT indicator in use is sent to the PI.

4.12.03 wa	Test details - Heading and ROT		
Test item	Check	Remark	Result
Connect Heading and ROT input according to test items			
Start with: • Valid heading • Valid ROT	Check that heading and ROT are used in VDL message		Ok
	Check that alarm relay is inactive		Ok
	Check that no ALR output is active		Ok
a) Disconnect heading and ROT • No heading • No ROT	Check that heading in VDL = default		Ok
	Check that ROT in VDL = default		Ok
	Check that ALR message with ID 032 (heading invalid) is output on PI		Ok
	Check that ALR message with ID 035 (ROT invalid) is output on PI		Ok
	Check that alarm relay is active		Ok
	Check that an alarm according to ID 032 is displayed on MKD	Alarm is popped up and displayed in "diagnostics/alarm"	Ok
	Check that an alarm according to ID 035 is displayed on MKD	Alarm is popped up and displayed in "diagnostics/alarm"	Ok
b) Reconnect heading and ROT • Valid heading • Valid ROT	Check that heading in VDL ok		Ok

	Check that ROT in VDL ok		Ok
	Check that ALR message with ID 032 (heading valid) and status V is output on PI		Ok
	Check that ALR message with ID 035 (ROT valid) and status V is output on PI		Ok
	Check that TXT message with ID 031 (Heading valid) is output on PI		Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI		Ok
	Check that alarm relay is inactive	Relay remains active 16.02.04 Ba: Relay is inactivated	Ok
	Check that the alarm display on MKD is updated		Ok
	Check that the status display on MKD is updated (heading and ROT valid)		Ok
c) Change ROT talker • Valid heading • ROT, talker not TI	Check that ROT in VDL is + 127 for ROT > 10 °/min, turning right	ROT from other talker is not used. ROT is derived from heading	acc
	Check that ROT in VDL is + 127 for ROT < -10 °/min, turning left	ROT from other talker is not used. ROT is derived from heading	acc
	Check that TXT message with ID 034 (other ROT in use) is output on PI		Ok
	Check that the status display on MKD is updated (other ROT)		Ok
d) Change ROT talker to TI • Valid heading • ROT, talker TI	Check that ROT in VDL ok		Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI		Ok
	Check that the status display on MKD is updated (ROT in use)		Ok
a) Disconnect ROT • Valid heading • No ROT Change heading > 5 °/30s	Check that ROT in VDL is + 127 for increasing heading		Ok
	Check that ROT in VDL is - 127 for decreasing heading		Ok
	Check that TXT message with ID 034 (other ROT in use) is output on PI		Ok
b) Reconnect ROT • Valid heading • Valid ROT from TI	Check that ROT in VDL ok		Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI		Ok

2.9.4.1 14.9.5 Speed sensors

(6.10.3.3)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Verify the manufacturer's documentation to ascertain the configuration implemented on the EUT for position sensors (see 6.10).

a) apply valid external DGNSS position and external speed data.

b) disconnect external DGNSS position, disconnect the inputs for SOG, COG or set their data to invalid (e.g. by wrong checksum, "valid/invalid" flag) .

NOTE: Test b) is applicable only if the internal GNSS is used as position source.

Required Result

a) Check that an alarm sentence ALR with alarm ID 027 is sent to the PI and the external data for SOG / COG is sent in VDL msg 1, 2 or 3. Verify that the system continues to operate and that the relay output is not activated.

b) Check that an alarm sentence ALR with alarm ID 028 is sent to the PI and the internal data for SOG / COG is sent in VDL msg 1, 2 or 3. Verify that the system continues to operate and that the relay output is not activated.

4.12.03 wa	Test details - Speed sensor		
Test item	Check	Remark	Result
Connect external speed sensor input according to test items. Internal GPS is available			
No sensor data: Changing upwards			
a) Start with • No external Position • No external speed • No internal Position • No internal speed	Check that SOG = default		Ok
	Check that COG = default		Ok
	Check that alarm relay is active		Ok
	Check that the status according to ALR msg ID 029/30 is displayed on MKD		Ok
b) Activate internal GPS • Internal position • Internal speed	Check that SOG from internal GPS is used in VDL message 1,2,3		Ok
	Check that COG from internal GPS is used in VDL message 1,2,3		Ok
	Check that TXT message with ID 028 (internal speed in use) is output on PI	Not found Retest 29.01.04 wa Same problem Retest 12.02.04 wa	Ok
	Check that ALR message with ID 29 and 30 (No valid SOG/COG information) with status V is output on PI		Ok
	Check that alarm relay is inactive	Still active Retest 29.01.04 wa	Ok

	Check that the status according to TXT 28 is updated on MKD (internal SOG/COG in use		Ok
	Check that the alarm ID 29/30 is deleted from MKD		Ok
c) Connect external speed • No external Position • External speed	Check that SOG from internal Sensor is used in VDL message 1,2,3		Ok
	Check that COG from internal Sensor is used in VDL message 1,2,3		Ok
d) Connect position (and speed) • External Position • External speed	Check that SOG from external Sensor is used in VDL message 1,2,3		Ok
	Check that COG from external Sensor is used in VDL message 1,2,3		Ok
	Check that TXT message with ID 027 (external COG/SOG in use) is output on PI		Ok
	Check that the status according to TXT msg ID 027 is displayed on MKD (external COG/SOG in use)		Ok
Changing downwards			
c) Disconnect external position • No external Position • External speed	Check that SOG from internal GPS is used in VDL message 1,2,3		Ok
	Check that COG from internal GPS is used in VDL message 1,2,3		Ok
	Check that TXT message with ID 028 (internal speed in use) is output on PI		Ok
	Check that the status according to TXT msg ID 028 is displayed on MKD (internal COG/SOG in use)		Ok
b) Disconnect external speed • No external Position • No external speed	Check that SOG from internal GPS is used in VDL message 1,2,3		Ok
	Check that COG from internal GPS is used in VDL message 1,2,3		Ok
a) Disable internal GPS • No external Position • No external speed • No internal Position • No internal speed	Check that SOG = default		Ok
	Check that COG = default		Ok
	Check that ALR message with ID 029 (No valid SOG information) is output on PI		Ok
	Check that ALR message with ID 030 (No valid COG information) is output on PI		Ok
	Check that alarm relay is active		Ok
	Check that the status according to ALR msg ID 029/30 is displayed on MKD		Ok

2.10 14.10 Display and control

(6.11)

2.10.1 14.10.1 Data input/output facilities

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Check size of minimum display

b) Record received messages and check contents of minimum display.

c) Input static and voyage related data via the minimum display

Required results

a) The minimum display shall contain at least three lines of data, with no horizontal scrolling of the range and bearing data display..

b) Confirm that all messages including binary and safety related and Long Range messages received can be displayed and that means to select messages and data fields to be displayed are available.

c) Confirm that all necessary data can be input.

At least bearing, range and name of ship shall be displayed without horizontal scrolling

4.12.03 wa	Test details a) - MKD size of display		
Test item	Check	Remark	Result
a) Size of display	Check that at minimum 3 lines of data are available		Ok
	Check that range and bearing of AIS targets can be displayed without horizontal scrolling		Ok

05.12.03 Ba	Test details b) - MKD display of received messages		
Test item	Check	Remark	Result
Receive messages and check display of data			
MSG 1,2,3 Display of dynamic ship data - required -	Check that received target is displayed		Ok
	MMSI	Recommended	Ok
	Position (RNG, BRG); Detailed check of values in next table	required	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	---
	PA (Position accuracy) flag	Not required	---
	SOG and COG	Recommended	Ok
	True heading	Recommended	Ok
	Navigational status	Recommended	Ok
	RAIM flag	Not required	---
MSG 5 Display of static and voyage related ship data - required -	MMSI	recommended	Ok
	IMO number	Not required	---
	Call sign	Recommended	Ok
	Name of ship	Required	Ok
	Type of ship and cargo	Recommended	Ok
	Dimension/Reference for position	Length recommended, Length and beam is indicated, but value is wrong: Msg5: A=100, B=80, C=20, D=10: Length indicated = 396, beam indicated = 45 Retest 14.01.04 Ba: Display of length is still not ok Retests 11.02.04 Ba: Length is ok	Ok
	Type of EPFD	Not required	----
	Estimated time of arrival	Not required	Ok
	Maximum present static draught	Not required Value is incorrect, 9.0 instead of 9.5 If it is rounded then only 9 should be displayed, not 9.0 Retest 20.01.04 Ba: Display of draught is ok	Ok
	Destination	Not required	Ok
	DTE flag	Not required	----

MSG 4 Base station report - Recommended -	MMSI	Recommended Base stations are not displayed	Rec
	Position (Lat,Lon)	recommended	---
	Position (RNG, BRG); Check values	recommended	---
	Time	Not required	---
	PA flag	Not required	---
	RAIM flag	Not required	---
MSG 9 SAR aircraft position report - optional -	MMSI	Recommended	Ok
	Position (RNG, BRG); Check values	Recommended	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	---
	PA flag	Not required	---
	SOG and COG	Recommended COG is ok SOG is displayed in units of 1/10 kn, should be displayed in units of 1 kn, e.g. 20 kn is displayed insted of 200 kn Retest 20.01.04 Ba: Display of speed value is correct	
	RAIM flag	Not required	---
	DTE flag	Not required	---
	Indication of SAR aircraft	There is no indication that it is not a ship but a SAR aircraft. This could e.g. displayed in the type of ship field	rec
MSG 12/14 Safety related text message - Required -	MMSI	Required	Ok
	Text content	Required	Ok
	Broadcast or selective	Recommended (A) for addressed and (B) for broadcast is displayed	Ok
MSG 18,19 Class B position report - required -	MMSI	Required	Ok
	Position (RNG, BRG); Check values	required	Ok
	Position (Lat,Lon)	recommended	Ok
	Time	Not required	---
	PA flag	Not required	---
	SOG and COG	Recommended	Ok
	True heading	Recommended	Ok
	RAIM flag	Not required	---

	Name	Recommended, Not displayed Retest 20.01.04 Ba: Name is correctly displayed	Ok
	Type of ship and cargo	Recommended 0 is displayed, should be "---" if not displayed, or the correct value Retest 20.01.04 Ba: Type of ship if not available is displayed as "---"	Ok
	Dimension/Reference for position	Length recommended Not displayed Retest 20.01.04 Ba: Length and beam is displayed, but values are incorrect, seems to be the same failure as with msg 5 A,B,C,D=40,30,20,10 are displayed as: Length=38, beam=30 Retests 11.02.04 Ba: Length is ok	Ok
	Type of EPFD	Not required	---
	DTE flag	Not required	---
MSG 21 Aids to navigation report - recommended -	MMSI	Recommended Not displayed	Rec
	Type of Aids to navigation	Recommended	---
	Name of Aids to navigation	Recommended	---
	Position (RNG, BRG); Check values	Recommended	---
	Position (Lat,Lon)	Recommended	---
	PA flag	Not required	---
	RAIM flag	Not required	---
	Virtual/Pseudo AtoN flag	Recommended	---
	Dimension/Reference for position	Length recommended	---
	Type of EPFD	Not required	---
	Off position indicator	Recommended	---
	SOG, COG are not displayed or show default values		---
Means to select messages	Check that means to select received messages are available		Ok
Means to select data fields	Check that means to select data fields are available		Ok

4.12.03 wa	Test details – Range and bearing values		
Test item	Check	Remark	Result
Receive position report from special positions and check displayed range and bearing data			
Own ship position on standard position in NE quadrant			
Target in NE direction	Check range		Ok
	Check bearing		Ok
Target in N direction	Check range		Ok
	Check bearing	EUT shows --- ° Retest 29.01.04 wa Same problem Retests 11.02.04 Ba: Bearing of 0 is displayed	Ok
Target in NW direction	Check range		Ok
	Check bearing		Ok
Target in W direction	Check range		Ok
	Check bearing		Ok
Target in SW direction	Check range		Ok
	Check bearing		Ok
Target in S direction	Check range		Ok
	Check bearing		Ok
Target in SE direction	Check range		Ok
	Check bearing		Ok
Target in E direction	Check range		Ok
	Check bearing		Ok
Own ship position on a position near Lon. of 180°			
Target on same side of 180 °	Check range		Ok
	Check bearing		Ok
Target on the other side of 180°	Check range		Ok
	Check bearing		Ok
Own ship position on a position near Lat of 0°			
Target on same side of 0 °	Check range		Ok
	Check bearing		Ok
Target on the other side of 0°	Check range		Ok
	Check bearing		Ok

4.12.03 wa	Test details – Display of own ship position		
Test item	Check	Remark	Result
Internal Position	Check that the own ship position is displayed continously		Ok
	Describe how it is displayed (in which menu/screen) and how this screen is activated	MENU / CURRENT SENSORS Or MENU / INTERNAL GPS	Ok
	Check that the actual source is indicated (external/internal)	Not found Retest 29.01.04 wa	Ok
External Position	Check that the own ship position is displayed continously		Ok
	Check that the actual source is indicated (external/internal)	Not found Retest 29.01.04 wa	Ok

5.12.03 wa	Test details d) – Input of data		
Test item	Check	Remark	Result
MMSI number	Check that number can be input	CONFIG / SHIP DATA not active Retest 29.01.04 wa	Ok
	Check that input is protected		Ok
IMO number	Check that number can be input	See above Retest 29.01.04 wa	Ok
	Check that input is protected		Ok
Call sign	Check that Call sign can be input	See above Retest 29.01.04 wa	Ok
	Check that input is protected		Ok
Name of ship	Check that name can be input	See above Retest 29.01.04 wa	Ok
	Check that input is protected		
Navigational status	Check that data can be input		Ok
	Check if input by number or by selection of items	By items	Ok
Type of ship and cargo	Check that data can be input		Ok
	Check if input by number or by selection of items	By number	Ok
Dimension/Reference for position	Check that data for internal GPS antenna position can be input		Ok
	Check that data for external EPFSD position can be input		Ok
Maximum static draught	Check that data can be input		Ok
Destination	Check that name of destination can be input		Ok
	Check that estimated time of arrival can be input	Date check required 30th Feb possible retest 29.01.04 wa	Ok

2.10.2 14.10.2 Initiate message transmission

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of non scheduled messages and interrogations as provided by the EUT.

Required results

Confirm that at least the transmission of safety related addressed and broadcast messages (msg 12 and msg 14) can be initiated by means of the minimum display. Confirm that transmission of messages 4, 16, 17, 18, 19, 20, 21, 22 is not possible.

NOTE: Use of messages 4, 16, 17, 18,19, 20, 21, 22 is restricted to base stations or class B AIS.

5.12.03 wa	Test details) – Message transmission		
Test item	Check	Remark	Result
Transmission of safety related broadcast message	Check selection between broadcast and addressed message	Input of MMSI should be disabled for Broadcast msg Retest 29.01.04 wa MMSI input disabled 'Send MSG' input is protected Retest 11.02.04 Ba: Is still protected Retest 01.03.04 Ba: Protected with password 2 (operational password)	Ok Ok
	Check selection of TX channel		Ok
	Check data input		Ok
	Check if prepared text blocks are available	Not available	Ok
	Check if input of invalid characters (e.g. lower case letters) are inhibited		Ok
	Check display of transmission status (indication that message is transmitted)		Ok
Transmission of addressed safety related message	Check selection of TX channel		Ok
	Check data input		Ok
	Check input of MMSI		Ok
	Check if selection of MMSI from received message (e.g. position report) is possible	Is possible	Ok
	Check display of transmission status (indication that message is transmitted and acknowledged)		Ok
Repetition	Check if repetition of transmission is possible without entering the data again.		Ok
Transmission of other messages	Check for a sample of msg 4, 16, 17, 18, 19, 20, 21, 22 that a transmission is not possible.	Not possible	Ok

2.10.3 14.10.3 System control

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Perform system control / configuration commands as specified. Check indication of system status / alarms.

Required results

At least initiation of channel switching shall be possible with the minimum display. Output power may not be switched manually. Confirm that the configuration level and other functions, not intended for use by the operator, are protected by password or adequate means.

22.01.04 Ba	Test details - Regional area entry		
Test item	Check	Remark	Result
Presentation of the existing areas	Check that the 8 existing areas can be selected and displayed		Ok
	Check display of Channel A and B		Ok
	Check display of RX/TX mode		Ok
	Check display transmission power		Ok
	Check display of bandwidth		Ok
	Check display of NE point of area		Ok
	Check display of SW point of area		Ok
	Check display of transitional zone		Ok
Entry of a new area	Check selection between changing an existing area and creating a new regional area entry	Only a new area can be added. Changing an area has to be done by adding a new area which may overwrite the old one if it is overlapping	acc
	Check input of Channel A and B		Ok
	Check input of RX/TX mode		Ok
	Check input transmission power		Ok
	Check input of NE point of area		Ok
	Check input of SW point of area		Ok
	Check input of transitional zone		Ok
	Check that the user has to confirm a second time that the new data shall be stored	There was no confirmation requested, but the new area was also not stored. Retests 11.02.04 Ba: Areas is stored and confirmation required. Default for confirmation is "No"	Ok
Enter invalid channel	Check that entry is refused	Invalid channels are refused with an explanation of the error Channel 70 and channel 16 are accepted We recommend to refuse	Ok rec

		these channels also because they should never used for AIS	
Enter too small area (<20 nm)	Check that entry is refused		Ok
Enter too large area (> 200 nm)	Check that entry is refused		Ok
Enter a region according to M.1371-1 A2/4.1 figure 4.1.5A (4 adjacent areas)	Check that entry is refused	3 regions with adjacent corners are accepted, 4 regions with adjacent corners are not accepted	acc
Changing an existing area	Check that existing area for changes can be selected	An existing area can not be selected for editing and cannot be changed. The only way to change an existing area is to add a new one which overlaps the area to change. This new area is based on the data of the current active area. <u>Retests 11.02.04 Ba:</u> Each stored area can be selected and changed.	Ok
	Check change of Channel A and B		Ok
	Check change of RX/TX mode		Ok
	Check change transmission power		Ok
	Check change of NE point of area		Ok
	Check change of SW point of area		Ok
	Check change of transitional zone		Ok
	Check that the user has to confirm a second time that the new data shall be stored		Ok
Changing of default values	Check change of Channel A and B	Cannot be changed	Ok
	Check change of RX/TX mode	Cannot be changed	Ok
	Check change transmission power	Cannot be changed	Ok

Remark:
If only 1 password is used, no data which may be change during normal operation should be protected by this password.

If 2 password are used (installation, administrator or level 1 password and operation, user or level 2 password), data which may be change during normal operation should be protected by the level 1 password

01.03.04 Ba	Test details - Password protection			
Input item	Level one requirement	Level 2 Recommendation	Implemented type of protection	Result
Static data				
MMSI	Required	---	Level 1	Ok
IMO-Number	Required	---	Level 1	Ok
Call sign	Recommended	Recommended if not level 1	Level 1	Ok
Name	Recommended	Recommended if not level 1	Level 1	Ok
Dimension/Reference for position	Required	---	Level 1	Ok
Type of ship	Recommended		Not protected, as part of voyage datta, together with type of carg	Ok
Default channel setting	Required, if function available	---	Level 1	Ok
Tx off switching	Required, if function available	---	Level 1	Ok
Voyage data				
Navigational status	Not allowed	Not recommended	Not protected	Ok
Type of cargo	Not allowed	Not recommended	Not protected Together with type of ship	Ok
Destination	Not allowed	Not recommended	Not protected	Ok
ETA	Not allowed	Not recommended	Not protected	Ok
Maximum static draught	Not allowed	Not recommended	Not protected	Ok
Persons on board	Not allowed	Not recommended	Not protected	Ok
Other operational data				
Area settings	Not allowed	Recommended	Level 2	Ok
Message transmission	Not allowed	Recommended	Level 2	Ok
Long range confirmation	Not allowed	Not recommended	No protectin	Ok
Configuration data				
Serial port settings (Baudrate, ...)	Required	---	Level 1	Ok
Long range autoackn.	Not required	Recommended	Level 2	Ok

16.02.04 Ba	Test details - Alarms and status display			
ID	Test item	Check	Remark	Result
001	Tx malfunction	Check is done in 14.9.2.1 Tx malfunction		Ok
002	Antenna VSWR exceeds limit	Check is done in 14.9.2.2 Antenna VSWR		Ok
003	Rx cannel 1 malfunction	Check documentation		Ok
004	Rx cannel 2 malfunction	Check documentation		Ok
005	Rx cannel 70 malfunction	Check documentation		Ok
006	General AIS failure	Check documentation		Ok
008	MKD connection lost	Check is done in 14.9.2.5 Remote MKD disconnection, when so configured	Not applicable, internal MKD	Ok
025	External EPFS lost	Check is done in 2.9.3.1		Ok
029	No valid SOG information	Check is done in 14.9.5 Speed sensors		Ok
030	No valid COG information	Check is done in 14.9.5 Speed sensors		Ok
032	Heading lost/invalid	Check is done in 14.9.4 Heading sensor		Ok
035	No valid ROT information	Check is done in 14.9.4 Heading sensor		Ok

26.02.04 Ba	Test details - Status display			
ID	Test item	Check	Remark	Result
007	UTC clock lost			Ok
021	External DGNSS in use	Check is done in 2.9.3.1		Ok
022	External GNSS in use	Check is done in 2.9.3.1		Ok
023	Internal DGNSS in use (beacon)	Check is done in 2.9.3.1		Ok
024	Internal DGNSS in use (msg 17)	Check is done in 2.9.3.1		Ok
025	internal GNSS in use	Check is done in 2.9.3.1		Ok
027	External SOG/COG in use	Check is done in 14.9.5 Speed sensors		Ok
028	Internal SOG/COG in use	Check is done in 14.9.5 Speed sensors		Ok
031	Heading valid	Check is done in 14.9.4 Heading sensor		Ok
033	Rate of Turn indicator in use	Check is done in 14.9.4 Heading sensor		Ok
034	Other ROT source in use	Check is done in 14.9.4 Heading sensor		Ok
036	Channel management parameters changed	Check that status change is displayed if channel management parameters are changed.		Ok

2.10.4 Ergonomic aspects

This are some ergonomic aspects from user view (Recommendation).

Topic	Description
15.04.04	A clear and easy to use user interface

3 15 Physical tests

Physical test are not part of this test document.

Physical tests are done in a separate test.

4 16 Specific tests of Link Layer

(7.3)

4.1 16.1 TDMA Synchronisation

(M.1371 A1/3.1.1)

4.1.1 16.1.1 Synchronisation test using UTC

(M.1371 A1/3.1.3.4.1)

Method of measurement

Set up standard test environment; chose test conditions in a way that the EUT operates in following synchronisation modes:

- *UTC direct*
- *UTC indirect (internal GNSS receiver disabled; at least one other station UTC direct synchronised)*
- *BASE direct (internal GNSS disabled; base station with UTC direct synchronisation within range)*

Check CommState Parameter SyncState in position Report and reporting rate

Required result

Transmitted Communication state shall fit the Synchronisation mode

17.11.03 Ba	Test details - TDMA Syncronisation		
Test item	Check	Remark	Result
Operate the EUT in an environment according to the test items and check the synchronisation state. Speed = 10 kn			
• Operate with GPS	Check that sync state is 0 (UTD direct)		Ok
	Check that report rate is 10 s		Ok
• Disable GPS by disconnection of GPS antenna, • at least one other AIS transponder with UTC direct	Check that sync state is 1 (UTC indirect		Ok
	Check that report rate is 10 s		Ok
• GPS disabled • Remove other AIS	Check that sync state is 3 (no UTC source)		Ok
• GPS disabled, • One base station with UTC direct within range	Check that sync state is 1 (UTC indirect)		Ok
	Check that report rate is 10 s		Ok
• GPS disabled • Remove Base station	Check that sync state is 3 (no UTC source)		Ok

4.1.2 16.1.2 Synchronisation test without UTC, semaphore

(M.1371 A1/3.1.1.4)

Method of measurement

Set up standard test environment without UTC available. Let EUT operate as a sync source (semaphore) for other stations. Check CommState Parameter SyncState in position Report and reporting rate.

Required results

Transmitted CommState shall fit the Synchronisation mode.

The EUT shall increase reporting rate to 2 s when acting as a semaphore.

17.11.03 Ba	Test details - TDMA Syncronisation		
Test item	Check	Remark	Result
Operate the EUT in an environment according to the test items and check the synchronisation state. Speed = 10 kn			
• Operate without GPS	Check that sync state is 3		Ok
• Other Transponders all without GPS, • Semaphore 1)	Check that report rate is 2 s		Ok

Note 1) An AIS transponder becomes semaphore, if it has the highest number of received stations. If there are more than one station with the highest number of received stations the transponder with the lowest MMSI number becomes semaphore.

4.1.3 16.1.3 Synchronisation test without UTC

(M.1371 A1/3.1.1)

Method of measurement

Set up standard test environment; chose test conditions in a way that EUT operates in following sync modes:

a) BASE indirect (internal GNSS disabled; no station with UTC direct synchronisation or Base station within range,)

b) Mobile indirect (internal GNSS disabled; other station with UTC direct synchronisation or Base station without range,)

c) Enable internal GNSS in synchronisation modes other than UTC direct

Check CommState Parameter SyncState in position Report and reporting rate.

Required results

a) Transmitted Communication state shall fit the Synchronisation mod

b) Transmitted Communication state shall fit the Synchronisation mod

d) Synchronisation mode shall revert to UTC direct

17.11.03 Ba	Test details - TDMA Syncronisation		
Test item	Check	Remark	Result
Operate the EUT in an environment according to the test items and check the synchronisation state. Speed = 10 kn			
• Disable GPS, • One base station without GPS within range	Check that sync state is 2 (Base station indirect)		Ok
	Check that report rate is 10 s		Ok
• GPS disabled • Remove Base station	Check that sync state is 3 (no UTC source)		Ok
• Operate without GPS • Other Transponders all without GPS, • Not semaphore 1)	Check that sync state is 3		Ok
	Check that report rate is 10 s		Ok
• Enable GPS	Check that sync state is 0		Ok
• Other Transponders all without GPS,	Check that report rate is 10 s		Ok

4.2 16.2 Time division (Frame format)

(M.1371 A1/3.1.2)

Method of measurement

Set the EUT to max reporting rate of 2 sec by applying a speed of >23kn and a ROT of >20°/sec. Record VDL messages and check for used slots. Check parameter slot number in CommState of position report. Check slot length (transmission time)

Required results

Slot number used and slot number indicated in CommState shall match. Slot number shall not exceed 2249. Slot length shall not exceed 26,67msec.

17.11.03 Ba	Test details - TDMA Syncronisation		
Test item	Check	Remark	Result
Check the data recorded in 16.6.1 Network entry according to the test items. Check the frames with 2 s reporting rate			
Slot number	Check that slot number used and slot number indicated in CommState match		Ok
Slot count	Check that Slot number does not exceed 2249		Ok
Slot length	Check that Slot length does not exceed 26,67 ms	The end flag is in the range of 24.5 to 24.7 ms	Ok

4.3 16.3 Synchronisation jitter

(M.1371 A1/3.2.2.8.4)

Definition

Synchronisation jitter (transmission timing error) is the time between nominal slot start as determined by the UTC synchronisation source and the initiation of the "transmitter on" function (T_o see figure 3.2.2.10 in Rec. ITU-R M.1371-1).

Method of measurement

Set-up standard test environment. Set the EUT to 25 kHz bandwidth, max reporting rate of 2 sec and using

a) UTC direct synchronisation

b) UTC indirect synchronisation by disconnecting the GNSS antenna of the EUT.

Record VDL messages and measure the time between the nominal beginning of the slot interval and the initiation of the "transmitter on" function. Alternative methods, e.g. by evaluating the start flag and calculating back to T_o are allowed.

Repeat the test for 12.5 kHz bandwidth.

Required results

The synchronisation jitter shall not exceed

a) ±104 µs using UTC direct synchronisation

b) ±312 µs using UTC indirect synchronisation .

17.11.03 Ba	Test details - Synchronisation jitter		
Test item	Check	Remark	Result
Operate device at 25 kHz bandwidth at a reporting rate of 2 s (speed = 25 kn). C heck the slot start time T2 using the VDL analyser.			
UTC direct	Check that T2 is in the range of 3.328 ms +/- 0.108 ms The measured value of the VDL analyser (in units of 10 µs) should be in the range of 330 ... 360 (RMS, inc. Tolerance of VDL analyser)	T2 is about 24 ms instead of 3.3 ms Retest 01.12.03 Ba: Sync jitter is ok now, Values are in the range of 3.328 ms +/- 0.060 ms	Ok
UTC indirect	Check that T2 is in the range of +/- 0.312 ms compared to the T2 value of the sync source The measured value of the VDL analyser (in units of 10 µs) should be in the range of +/- 31 of the measured values of the sync source	T2 is about 24 ms instead of 3.3 ms Retest 01.12.03 Ba: Slot timing is about 200 us delayed compared to the AIS it is synchronized to. In case the other AIS is at the limit of 100us than the limit of 300 us is exceeded. Therefore this delay should be adjusted Retest 19.01.04 Ba: Sync jitter value is up to 400 us and therefore exceed the limit of 300 us. Retest 11.02.04 Ba: In this test the sync jitter was within the limits but changing very abruptly at the frame borders. Some kind of averaging or low pass filtering should be used. Retest 01.03.04 Ba: In the first frame after end of UTC sync there is a big offset of 20 ms, and the slot number has an offset of 1. After 1 frame the sync jitter is ok (see attached diagram) In 2 repetition of removing GPS this did not happen, the sync jitter was ok from beginning of sync state 1 Retest 10.03.04 Ba: Sync jitter is ok now, no jump at the beginning and very low jitter, even within the limits of sync mode 0	Ok

4.4 16.4 Data encoding (bit stuffing)

Method of measuremen*t

Setup standard test environment.

- *apply a binary broadcast message (msg 8) to the VDL containing the HEX-values "7E 3B 3C 3E 7E" in the data portion and check Presentation Interface output of EUT*
- *apply a BBM message to the EUT initiating the transmission of msg 8 containing the HEX-values as above in the data portion and check the VDL*

Required results

Confirm that

- *Data output on the presentation interface conforms to transmitted data*
- *transmitted VDL message conforms to data input on the Presentation Interface*

The data sequence 7E 3B 3C 3E 7E is appended to an application identifier of 16 bit with the value 00 68 h (DAC = 001, FI=40). So the complete sequence is:

Data in Hex	7E 3B 3C 3E 7E
Data in 6 bit ASCII text (Table 14 of 1371)	_#,<O'
Hex including DAC/FI	00 68 7E 3B 3C 3E 7E
Coded in 6 bit ASCII (Table B-1)	06Qv>khvOP,4
Content of VDO/VDM (incl. 40 bit header)	80003sh0J7ps?3qv,0

17.11.03 Ba	Test details - Data encoding (bit stuffing)		
Test item	Check	Remark	Result
File name for BBM sentence is AIBBM_bin_stuffing.sst			
RX of BBM message Transmit msg 8 from VDL generator	Check that VDM is according transmitted data		Ok
TX of BBM message Apply BBM sentence to the PI	Check that VDO output of PI is according to BBM sentence		Ok
	Check with VDL analyser that VDL message is according to BBM	Could not be tested because of TX problem Test 01.12.03 Ba:	Ok
	Check that VDM sentence of RX is according to VDO of TX	Test 01.12.03 Ba:	Ok

4.5 16.5 Frame check sequence

(M.1371 A1/3.2.3)

Method of measurement

Apply a simulated position report message with wrong CRC bit sequence to the VDL.

Required results

Confirm that this message is not forwarded to the PI by the EUT.

01.12.03 Ba	Test details - Frame check sequence		
Test item	Check	Remark	Result
Transmit position report message from VDL generator			
Set CRC bit sequence to ok	Check that position report is received from EUT (VDO output)		Ok
Set CRC bit sequence to false	Check that position report is not received from EUT (VDO output)		Ok

4.6 16.6 Slot allocation (Channel access protocols)

(M.1371 A1/3.3.1)

4.6.1 16.6.1 Network entry

Method of measurement

Set up standard test environment; switch on EUT. Record transmitted scheduled position reports for the first 3 frames after initialisation period. Check CommState for channel access mode

Required results

EUT shall start autonomous transmissions of msg 3 (position report) with ITDMA CommState with KeepFlag set true for first frame and msg 1 with SOTDMA CommState for consecutive frames.

Record the VDL data of the first 12 frames after switching on the EUT, 3 frames for this test and 8 frames for test 4.6.2. Generate a table and diagram from that data and check the following test items using the recorded data.

27.11.03 Ba	Test details – Channel access protocol		
Test item	Check	Remark	Result
Switch on EUT and record data with VDL analyser. Note the switch on time in UTC			
Transmission time	Check that first transmission of position report is within 2 min after switch on	Transmission starts 1 min 13 s after switching on.	Ok
Initial message type	Check that the network entry is done with msg 3		Ok
Keep flag	Check that the keep flag is set in msg 3		Ok
Slot offsets	Check that the slot offsets of msg 3 are in the range 750 +/- 75= 675 ... 825		Ok
Slot use	Check that the allocated slots are used in the next frame		Ok
Message type	Check that the message type is changed to 1 after initial frame		Ok
Timeout	Check that the time-out in the 2nd frame is between 2 and 6 (decremented from initial 3..7)	Between 3 and 6	Ok

01.12.03 Ba	Test details – Channel access at increased reporting rate		
Test item	Check	Remark	Result
Supply external speed data of 15 kn Switch on EUT and record data with VDL analyser.			
Initial reporting rate	Check that the EUT performs network entry with a reporting rate of 6s	The network entry is done with a reporting rate of 10 s. After finishing the network entry a new rescheduling is done to 6 s reporting rate. We recommend to start immediately with the reporting rate according to the speed.	Rec
Slot offsets	Check that the slot offsets of msg 3 are in the range 450 +/- 45 = 405....495	When rescheduling to 6 s reporting rate.	Ok
Supply external speed data of 25 kn Switch on EUT and record data with VDL analyser.			
Initial reporting rate	Check that the EUT performs network entry with a reporting rate of 2 s	The network entry is done with a reporting rate of 10 s. See above test with 15 kn	Rec
Slot offsets	Check that the slot offsets of msg 3 are in the range 150 +/- 15 = 135...165		Ok

4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)

(M.1371 A1/3.3.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Record transmitted scheduled position reports msg 1 and check frame structure. Check CommState of transmitted messages for channel access mode and parameters slot timeout, slot number and slot offset

Required results

Check that nominal reporting rate is achieved ±20% (allocating slots in selection interval SI). Confirm that the EUT allocates new slots NTS within SI after 3 to 8min. Check that slot offset indicated in CommState matches slots used for transmission.

27.11.03 Ba	Test details – Autonomous scheduled transmissions (SOTDMA)		
Test item	Check	Remark	Result
Record the VDL data of 8 frames operating with autonomously scheduled transmissions. Generate a table and diagram from that data and check the following test items using the recorded data. Set the condition so that the reporting rate is 10 s.			
Reporting rate	Check that the reporting rate is 10 s, 6 msg per frame		Ok
Nominal increment and selection interval	Check that the allocated slots match the nominal and selection interval of 10 s reporting rate		Ok
Slot interval	Check that the slot intervals are in the range 375 +/- 75 = 300 ... 450		Ok
Timeout	Check that the time-out is counting from 3...7 to 0		Ok
Slots used	Check that the slots indicated in CommState match the slots used		Ok
Slots allocated at time-out 0	Check that the slots are used in the next frame		Ok
	Check the slot offset is 2250 +/- Selection Interval (2175...2325)		Ok
CommState sub message	Check that for time-out 3,5,7 the number of received stations is indicated		Ok
	Check that for time-out 2,4,6 the slot number is indicated		Ok
	Check that for time-out 1 the correct value of UTC is indicated		Ok
	Check that for time-out 0 the slot increment is indicated		Ok

Alternating channels	Check that the position reports are transmitted on alternating channels		Ok
Msg 5	Check that the channel alternating of position report is not impaired by msg 5		Ok
Others	Check the recorded data for other possibly incorrect items	No other problems found	Ok

4.6.3 16.6.3 Single message transmission (RATDMA)

(M.1371 A1/3.3.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode.

a) Apply a 1 slot Binary Broadcast message (msg 8) to the PI of the EUT. Record transmitted messages.

b) Apply combinations of Binary Broadcast message (msg 8), Addressed Binary message(msg 14), Broadcast Safety Related message (msg 6) and Addressed Safety Related message(msg12) to the PI of the EUT. Record transmitted messages and output of the PI of the EUT.

Required results

a) Confirm that EUT transmits this msg 8 within max. 4sec. Retry with 90% channel load.

b) Confirm that maximum 20 slots can be used per frame for unannounced messages using RATDMA access scheme and that messages using the twenty first slot and above are rejected. Confirm that message ABK is sent with acknowledge type 2 (Message could not be broadcast) when the message is rejected.

01.12.03 Ba	Test details – RATDMA transmission		
Test item	Check	Remark	Result
Apply an binary broadcast message 8 to the PI port of the EUT. File name is: AIBBM_bin.sst			
Standard test environment	Check that msg 8 is transmitted within 4 s		Ok

90 % channel load Generate channel load as described below 1).	Check that msg 8 is transmitted within 4 s	In the first frame msg 8 was transmitted but in the following frames (when slot table was filled) there was no transmission, ABK with type 1 (No acknowledgement), this is not a valid type for broadcast messages, only for addressed messages) Retest 19.01.04 Ba: The ABK type is now 2 (could not be broadcast), which is correct when the message is not transmitted. The message is still not transmitted. See note) Retest 12.02.04 Ba: The message is still not transmitted. Retest 01.03.04 Ba: The message is transmitted within 4 s	Ok Ok

Note) This seems not to be a problem of the processor load. It is also not transmitted when the transmission of the targets is stopped (no channel load) but the targets are still in the slot table.
Even 14 min after end of target transmission there is no transmission of broadcast messages.Targets are already deleted from from MKD.

01.12.03 Ba	Test details – Multi RATDMA transmissions		
Test item	Check	Remark	Result
Apply more than 20 msg 6,8,12,14 to the PI port of the EUT within one frame. File name is: AIBBM_25.sst. Delay = 2 s			
Maximum transmissions per frame	Check that only 20 msg are transmitted in one frame. Msg 21 ... have to be rejected	All messages are transmitted, 30 msg per frame Retest 19.01.04 Ba: Only 20 transmissions in 1 frame	Ok
ABK output	Check that ABK sentence is output with acknowledgement type = 2 for the rejected sentences.	No rejected transmissions Retest 19.01.04 Ba: ABK type 2 is used for rejected transmissions	Ok

4.6.4 16.6.4 Assigned operation

(M.1371 A2/3.3.6)

A fast and simple test of assigned operation has been made in paragraph 14.1.2 Assigned mode).

A record of the complete operation from assignment message until end of switch back to SOTDMA should be made and evaluated.

4.6.4.1 16.6.4.1 Assigned mode using reporting rates

Method of measurement

Operate standard test environment and EUT in autonomous mode. Transmit an Assigned mode command msg 16 to the EUT with:

a) the number or reports per 10 min which is not a multiple of 20

b) the number or reports per 10 min which is higher than 600

Required results

a) Confirm that EUT transmits position reports message msg 2 at a report rate that corresponds to the next highest multiple of 20

b) Confirm that EUT transmits position reports message msg 2 at a report rate of one report per second.

01.12.03 Ba	Test details – Assigned Mode		
Test item	Check	Remark	Result
Send a msg 16 rate assignment with invalid offset values			
Offset value = 110 (not a multiple of 20)	Check that the reporting rate is 120/10min = 12/min = 5s		Ok
Offset value = 1000 (> 600 msg/10 min	Check that the reporting rate is 600/10min = 60/min = 1s	There are about 50 msg/min, 30 msg/min on channel A , about 20 msg/min in a time of 1/3 of the frame (see diagram) Retest 15.01.04 Ba: Reporting rate is 60/min = 1s	Ok
Send a msg 16 rate assignment with EUT as second transponder in the message			
Dest. A: rate = 600 msg/10min Dest. B: rate = 120 msg/10min	Check that the EUT does reschedule to the assigned reporting rate of 120 msg/10 min = 12 msg/min = 5s		Ok

4.6.4.2 16.6.4.2 Receiving test

Method of measurement

*Set-up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command (msg 16) to the EUT with:**

- *slot offset and increment*
- *designated reporting rate.*

Record transmitted messages.

Required results

Confirm that EUT transmits position report msg 2 according to defined parameters and reverts to SOTDMA msg 1 with standard reporting rate after 4 to 8 min (ITU-R M.1371 A2/3.3.8.2.12).

28.11.03 Ba	Test details a)– Slot offset and increment		
Test item	Check	Remark	Result
Send an assignment message 16 with offset A = offset to first assigned slot = 40 and slot increment parameter = 4 (increment = 125) Within the time-out time repeat the message 16 Record VDL messages and evaluate record			
VDM output	Check VDM output of msg 16		Ok
First message	Check that first message is sent after 40 slots		Ok
Message type	Check that message type of position report is 2		Ok
Initialisation phase	Check that EUT starts immediately (after offset slots) with message 2		Ok
Deallocation of previously used slots	Check that the slot used before assignment are deallocated using timeout value = 0 and slot offset = 0		Ok
Alternating channels	Check that position report is sent alternating on channel A and B		Ok
Increment	Check that the increment is 125 slots		Ok
Timeout	Check that all slots of the first msg2 frame have the same timeout		Ok
	Check that the timeout is between 3 and 7	Time-out in the test is 5	Ok
	Check that the timeout is decremented after 1 min		Ok
Comstate	Check that the ComState is like the ComState of msg 1		Ok
Switch back to autonomous mode	Check that the EUT deallocates all msg 2 slots with timeout 0		Ok
	Check that the EUT changes slots with timeout 0 on each channel to ITDMA slot msg 3 to start autonomous mode	Some of the assigned mode slots are kept. The time-out of these slots is not decremented to 0, but keeps the time-out of 1 for 1 frame and then assignes a new random timeout without changing the slot. A new network entry is not done. See note)	

	Check that EUT initialises autonomous mode like network entry		

Note) The slot assignment has to be always combined with a slot reservation of the slots used for the assignment by the base station. Therfore at end of the slot assigned mode the assigned slots have to be always released by the mobile station.

To achieve this a new network entry on free slots is required.

28.11.03 Ba	Test details b)– Rate assignment		
Test item	Check	Remark	Result
Send an assignment message 16 with offset=reporting rate of 300msg/10 min, increment=0 Within the timeout time repeat the message 16 Record VDL messages and evaluate record			
VDM output	Check VDM output of msg 16		Ok
Initialisation phase	Check that EUT starts immediately with rescheduling to the new reporting rate		Ok
Message type	Check that message type of position report is 2 instead of msg 1		Ok
Reporting rate	Check that the reporting is 300 msg/10 min = 30msg/frame = 2 s		Ok
Alternating channels	Check that position report is sent alternating on channel A and B		Ok
Initialisation	Check that the Initialisation is according to changing reporting rate using msg 3 to allocate new slots		Ok
Timeout	Check that the assigned timeout is between 2 and 6	All values between 2 and 6 are used	Ok
Assignment repetition	Check that the timeout is extended by repetition of msg 16: Switch back is between 3 and 7 minutes after last repetition	16:27:00 Tx + Rx of msg 16 16:29:00 Tx + Rx of msg 16 16:32:00 Tx + Rx of msg 16 16:34:00 Tx + Rx of msg 16 16:38:00 End of assigned mode	Ok
Switch back to autonomous mode	Check that the EUT reverts to normal reporting rate between 4 and 8 minutes after last msg 16	Assigned mode is finished 5 min after msg 16	Ok
Recommendation	To enable the base station to check the time-out used by the mobile station we recommend to use the same time-out for all slots and to use the same time-out for the end of the assigned mode, that means, when the time-out of the msg 2 reaches 0 the assigned mode is finished. This would allow the base station to check the time-out and update it by transmitting a new assignment command when required		Rec

4.6.4.3 16.6.4.3 Assignment selectivity

(M.1371 A1/3.3.6)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Check frame structure. Transmit an Assigned mode command (msg 16) to another AIS with a slot offset and increment pointing to a slot used by the EUT. Record transmitted messages.

Required results

Confirm that EUT does not allocate slots on a msg16 addressed to other stations.

01.12.03 Ba	Test details)– assignment selectivity		
Test item	Check	Remark	Result
Send a message to another MMSI			
VDM output	Check that there is no VDM output of msg 16		Ok
Wrong MMSI	Check that the EUT does not change the reporting rate		Ok

4.6.4.4 16.6.4.4 Slot assignment to FATDMA reserved slots

(M.1371 A1/3.3.6)

A test to check the combined operation of msg 16 assignment to slots reserved by msg 20.

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit a Data Link Management message (msg 20) to the EUT with slot offset and increment. Transmit an Assigned Mode Command (msg 16) to the EUT and command it to use one or more of those FATDMA allocated slots. Record transmitted messages.

Required results

Confirm that EUT uses the slots commanded by msg 16 for own transmissions.

02.12.03 Ba	Test details – Slot assignment to FATDMA reserved slots		
Test item	Check	Remark	Result
Send a message 20 from VDL Generator with slot offset and increment for slot reservation: Offset = 23, slots = 5, time-out = 7, incr. = 25 Send a message 16 from VDL Generator assigning one or more of these reserved slots Offset = 25, incr. = 5 (= 75 slots)			
Rx of msg 20	Check that msg 20 has been received by EUT (VDM output)		Ok
Slot use	Check that slots assigned by the msg 16 are used by the EUT		Ok

4.6.5 16.6.5 Fixed allocated transmissions (FATDMA)

(M.1371 A1/3.3.6)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit a Data Link Management message (msg 20) to the EUT with slot offset and increment. Record transmitted messages.

Required results

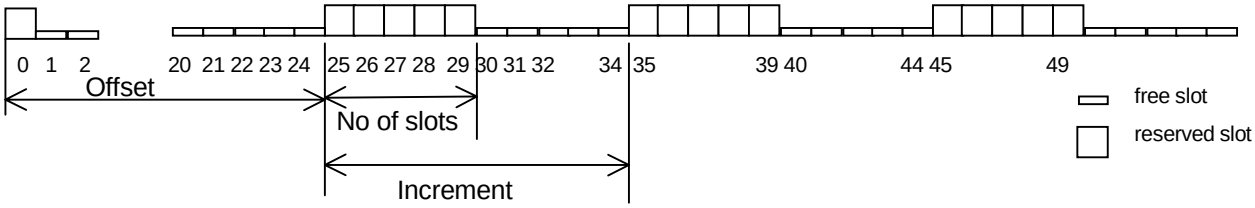
Confirm that EUT does not use slots allocated by msg 20 for own transmissions until timeout of 4 to 8 min.

02.12.03 Ba	Test details – Slot assignment to FATDMA reserved slots		
Test item	Check	Remark	Result
Send a message 20 from VDL Generator with slot offset and increment for slot reservation according to the description below. To get enough new slot allocations within time-out time set reporting rate to 2 s (speed > 25 kn)			
Record VDL messages	Check that the reserved slots are not used by the EUT within a time-out of 4-8 minutes		Ok
End of reservation	Check that after end of reservation all slots are used again.		Ok

Test scenario: Msg 20 transmission by test system.
Msg 20 reserves slots which should not be used by mobile stations.
Msg 20 parameters:

- Msg 20 is transmitted in slot 0 in each frame
- Offset number 1: 25
- Time out 1: 3
- Number of slots: 5
- Increment: 10

FATDMA reservation



4.7 16.7 Message Formats

(M.1371 A1/3.3.7)

4.7.1 16.7.1 Received messages

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Apply messages according to Table 7 to the VDL. Record messages output by the PI of EUT.

Required results

Confirm that EUT outputs corresponding message with correct field contents and format via the PI or responds as appropriate.

25.11.03 Ba	Test details – Content of msg 1,2,3 Position report		
Test item	Check	Remark	Result
Transmit a message 1,2 or 3 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Navigational status	Check the field content		Ok
Rate of Turn	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True heading	Check the field content		Ok

Time stamp	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state	Check the field content		
	The communication state is checked in 4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)		

25.11.03 Ba	Test details – Content of msg 4 Base station report		
Test item	Check	Remark	Result
Transmit a msg 4 from VDL generator. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state	Check the field content		
	The communication state is checked in 4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)		

25.11.03 Ba	Test details – Content of msg 5 Static data		
Test item	Check	Remark	Result
Transmit a message 5 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 2		Ok
Check sentence number	Check that value = 1,2		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Is always 1 Retest 15.01.04 Ba: Counting is correct	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok
Message ID	Check the field content		Ok
MMSI	Check the field content		Ok
AIS version indicator	Check the field content		Ok
IMO number	Check the field content		Ok
Call sign	Check the field content		Ok
Name of ship	Check the field content		Ok
Type of ship and cargo type	Check the field content		Ok
Reference point A,B,C,D	Check the field content		Ok
Type of EPFS	Check the field content		Ok
ETA	Check the field content		Ok
Maximum present static draught	Check the field content		Ok
Destination	Check the field content		Ok
DTE flag	Check the field content		Ok

25.11.03 Ba	Test details – Content of msg 6 Addressed binary message		
Test item	Check	Remark	Result
Transmit a message 6 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 112 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

25.11.03 Ba	Test details – Content of msg 7 Binary acknowledge		
Test item	Check	Remark	Result
Transmit a message 7 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Sequence number 2	Check the field content		Ok
Destination ID 3 (MMSI)	Check the field content		Ok
Sequence number 3	Check the field content		Ok
Destination ID 4 (MMSI)	Check the field content		Ok
Sequence number 4	Check the field content		Ok

25.11.03 Ba	Test details – Content of msg 8 Binary broadcast message		
Test item	Check	Remark	Result
Transmit a message 8 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 4 (msg length = 80 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 9 SAR aircraft position report		
Test item	Check	Remark	Result
Transmit a message 9 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Altitude	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
Time stamp	Check the field content		Ok
DTE flag	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state			
Sync state	Check the field content		Ok
Slot time-out	Check the field content		Ok
Submessage: received stations	Check the field content		Ok
Submessage: Slot number	Check the field content		Ok
Submessage: UTC	Check the field content		Ok
Submessage: Slot offset	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 10 UTC and data inquiry		
Test item	Check	Remark	Result
Transmit a message 10 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
			Ok
Msg11 response	Check for response with msg 11 if EUT is addressed		Ok
Msg11 response	No response if addressed to other station	No VDM output and no response	Ok

26.11.03 Ba	Test details – Content of msg 11 UTC date response		
Test item	Check	Remark	Result
Transmit a msg 11 from VDL generator Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 12 Addressed safety related message		
Test item	Check	Remark	Result
Transmit a message 12 from other AIS transponder or VDL generator addressed to EUT. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 138 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
Safety related text	Check the field content		Ok
Transmit a message 12 from other AIS transponder or VDL generator addressed to other AIS. Message shall not be on PI.			
Msg12 to other AIS	Check PI , no VDM		Ok

26.11.03 Ba	Test details – Content of msg 13 Safety related acknowledge		
Test item	Check	Remark	Result
Transmit a message 13 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Sequence number 2	Check the field content		Ok
Destination ID 3 (MMSI)	Check the field content		Ok
Sequence number 3	Check the field content		Ok
Destination ID 4 (MMSI)	Check the field content		Ok
Sequence number 4	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 14 Safety related broadcast message		
Test item	Check	Remark	Result
Transmit a message 8 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (length = 144 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 15 Interrogation		
Test item	Check	Remark	Result
Transmit a message 15 from other AIS transponder or VDL generator . Response on this msg is tested under 6.3 18.2 (M.1371 A1/5.3) Interrogation responses			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Message ID 1.1	Check the field content		Ok
Slot offset 1.1	Check the field content		Ok
Message ID 1.2	Check the field content		Ok
Slot offset 1.2	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Message ID 2.1	Check the field content		Ok
Slot offset 2.1	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 16 Assigned mode command		
Test item	Check	Remark	Result
Transmit a message 16 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 96 bit (1 dest.)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID A (MMSI)	Check the field content		Ok
Offset A	Check the field content		Ok
Increment A	Check the field content		Ok
Destination ID B (MMSI)	Check the field content		Ok
Offset B	Check the field content		Ok
Increment B	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 17 GNSS binary broadcast message		
Test item	Check	Remark	Result
Transmit a msg 17 from VDL generator Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 192 bit)		Ok
Message id	Check the field content		Ok
Skource ID (MMSI)	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Message type	Check the field content		Ok
StationId	Check the field content		Ok
Zcount	Check the field content		Ok
Sequence number	Check the field content		Ok
N	Check the field content		Ok
Health	Check the field content		Ok
Correction data	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 18 Standard Class B position report		
Test item	Check	Remark	Result
Transmit a msg 18 from VDL generator. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True Heading	Check the field content		Ok
Time stamp	Check the field content		Ok
Assigned mode flag	Check the field content		Ok
RAIM flag	Check the field content		Ok
CommState selector	Check the field content		Ok
Communication state - Selector = 0 (SOTDMA)			
Sync state	Check the field content		Ok
Slot time-out	Check the field content		Ok
Submessage: received stations	Check the field content		Ok
Submessage: Slot number	Check the field content		Ok
Submessage: UTC	Check the field content		Ok
Submessage: Slot offset	Check the field content		Ok
Communication state - Selector = 1 (ITDMA)			
Sync state	Check the field content		Ok
Slot increment	Check the field content		Ok
Number of slots	Check the field content		Ok
Keep flag	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 19 Extended Class B position report		
Test item	Check	Remark	Result
Transmit a msg 19 from VDL generator. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True Heading	Check the field content		Ok
Time stamp	Check the field content		Ok
Name of ship	Check the field content		Ok
Type of ship and cargo	Check the field content		Ok
Dimension of ship/Refpoint A,B,C,D	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok
DTE flag	Check the field content		Ok
Assigned mode flag	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 20 Data link management message		
Test item	Check	Remark	Result
Transmit a message 20 from VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 160 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Offset number 1	Check the field content		Ok
Number of slots 1	Check the field content		Ok
Time-out 1	Check the field content		Ok
Increment 1	Check the field content		Ok
Offset number 2	Check the field content		Ok
Number of slots 2	Check the field content		Ok
Time-out 2	Check the field content		Ok
Increment 2	Check the field content		Ok
Offset number 3	Check the field content		Ok
Number of slots 3	Check the field content		Ok
Time-out 3	Check the field content		Ok
Increment 3	Check the field content		Ok
Offset number 4	Check the field content		Ok
Number of slots 4	Check the field content		Ok
Time-out 4	Check the field content		Ok
Increment 4	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 21 ATON report		
Test item	Check	Remark	Result
Transmit a msg 21 from VDL generator. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Type of aids to navigation	Check the field content		Ok
Name of aids to navigation	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Dimension of ship/Refpoint A,B,C,D	Check the field content		Ok
Type of EPFD	Check the field content		Ok
Time stamp	Check the field content		Ok
Off position indicator	Check the field content		Ok
RAIM flag	Check the field content		Ok
Virtual/Pseudo AtoN flag	Check the field content		Ok
Assigned mode flag	Check the field content		Ok
Name of AtoN extension	Check the field content		Ok

26.11.03 Ba	Test details – Content of msg 22 Channel management		
Test item	Check	Remark	Result
Transmit a msg 22 from VDL generator. Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Channel A	Check the field content		Ok
Channel B	Check the field content		Ok
Tx/Rx mode	Check the field content		Ok
Power flag	Check the field content		Ok
Area addressed			
Longitude of NE corner	Check the field content		Ok
Latitude of NE corner	Check the field content		Ok
Longitude of SW corner	Check the field content		Ok
Latitude of SW corner	Check the field content		Ok
Addressed or broadcast flag	Check that flag = 0		Ok
Selective addressed			
Station ID 1 (MMSI)	Check the field content		Ok
Station ID 2 (MMSI)	Check the field content		Ok
Addressed or broadcast flag	Check that flag = 1		Ok
Channel A bandwidth	Check the field content		Ok
Channel B bandwidth	Check the field content		Ok
Transitional zone	Check the field content		Ok

Message content result overview

The PI output results are an overview of the above tables of the various received messages. Response results can be derived from other tests as mentioned in the “response result” column

Message type	PI out Yes/no	PI output Result	Response required (in addition to PI output)	Response result
Msg1,2,3	Yes	Ok	No	
Msg 4	Yes	Ok	No	
Msg 5	Yes	Ok	No	
Msg 6	Yes	Ok	Tx of ackn. msg 7	(6.1.2)
Msg 7	Yes	Ok	ABK output, no further repetitions	(14.1.4.1 Transmit an addressed message)
Msg 8	Yes	Ok	No	
Msg 9	Yes	Ok	No	
Msg 10	Yes	Ok	Tx of msg 11 UTC/date response	Ok
Msg 11	Yes	Ok	No	
Msg 12	Yes	Ok	Tx of ackn. msg 13, Display on MKD	(6.2)
Msg 13	Yes	Ok	ABK output, no further repetitions	(14.1.4.1 Transmit an addressed message)
Msg 14	Yes	Ok	Display on MKD	(14.10.1 Data input/output facilities)
Msg 15	Yes	Ok	Tx of requested message 3, 5	(6.3)
Msg 16	Yes	Ok	Change of TDMA mode, position report using msg 2	(4.6.4)
Msg 17	Yes	Ok	Internal GNSS receiver shall switch to differential mode	Ok
Msg 18	Yes	Ok	No	
Msg 19	Yes	Ok	No	
Msg 20	Yes	Ok	Has to avoid using reserved slots	4.6.5
Msg 21	Yes	Ok	no	
Msg 22	Yes	Ok	Addition of new area to the regional area table	5.2

4.7.2 16.7.2 Transmitted messages

(M.1371 A1/3.3.7)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of messages relevant for a mobile station according to Table 7 by the EUT.

Record transmitted messages.

Required results

Confirm that EUT transmits messages with correct field contents and format or responses as appropriate. Confirm that messages 4, 9,16, 17, 18, 19, 20, 21, 22 are NOT being transmitted by the EUT.

The message contents are checked using the VDL analyser

02.12.03 Ba	Test details – Message 1,2,3 Position report		
Test item	Check	Remark	Result
The message content of message 1,2,3 is checked in Information content of msg 1			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
	Check that the channel field is empty (NULL) if not TX		Ok
Fill bits	Check that value = 0		Ok

02.12.03 Ba	Test details – Message 5 Static data		
Test item	Check	Remark	Result
The message content of message 5 is checked in Information content of msg 5.			
Number of sentences	Check that value = 2		Ok
Check sentence number	Check that value = 1,2		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Is always 1, not counting up Retest 15.01.04 Ba: Counting is correct	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok

02.12.03 Ba	Test details – Content of msg 6 Addressed binary message		
Test item	Check	Remark	Result
This test can be done in combination with test 14.1.4.1 Transmit an addressed message. Apply PI sentence: File AIABM_bin.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 112 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

02.12.03 Ba	Test details – Content of msg 7 Binary acknowledge		
Test item	Check	Remark	Result
This test can be done in combination with test 6.1.2 18.1.2 Acknowledgement Message 6 has to be transmitted by other AIS or VDL generator Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Omitted		
Sequence number 2	Omitted		
Destination ID 3 (MMSI)	Omitted		
Sequence number 3	Omitted		
Destination ID 4 (MMSI)	Omitted		
Sequence number 4	Omitted		

02.12.03 Ba	Test details – Content of msg 8 Binary broadcast message		
Test item	Check	Remark	Result
This test can be done in combination with 6.4 18.3 Broadcast messages Apply PI sentence: File AIBBM_bin.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 4 (msg length = 80 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

02.12.03 Ba	Test details – Content of msg 10 UTC and date inquiry		
Test item	Check	Remark	Result
activate transmission of msg 10 if implemented (not required)			
		Not implemented	---

02.12.03 Ba	Test details – Content of msg 11 UTC date response		
Test item	Check	Remark	Result
Transmit a msg 10 from VDL generator to request transmission of msg 11 by EUT Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok

02.12.03 Ba	Test details – Content of msg 12 Addressed safety related message		
Test item	Check	Remark	Result
This test can be done in combination with test 14.1.4.1 Transmit an addressed message Apply PI sentence: File AIABM_safety.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 96bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
Safety related text	Check the field content		Ok

02.12.03 Ba	Test details – Content of msg 13 Safety related acknowledge		
Test item	Check	Remark	Result
This test can be done in combination with test 6.1.2 18.1.2 Acknowledgement Send message 12 from other transponder or VDL generator Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Ommitted		
Sequence number 2	Ommitted		
Destination ID 3 (MMSI)	Ommitted		
Sequence number 3	Ommitted		
Destination ID 4 (MMSI)	Ommitted		
Sequence number 4	Ommitted		

02.12.03 Ba	Test details – Content of msg 14 Safety related broadcast message		
Test item	Check	Remark	Result
This test can be done in combination with 6.4 18.3 Broadcast messages Apply PI sentence: File AIBBM_safety..sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (length = 64 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check the field content		Ok

02.12.03 Ba	Test details – Content of msg 15 Interrogation		
Test item	Check	Remark	Result
This test can be done in combination with 6.3 18.2 (M.1371 A1/5.3) Interrogation responses Apply PI sentence: File AIAIR_35_5_bin.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 160 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Message ID 1.1	Check the field content		Ok
Slot offset 1.1	Check the field content = 0		Ok
Message ID 1.2	Check the field content		Ok
Slot offset 1.2	Check the field content = 0		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Message ID 2.1	Check the field content		Ok
Slot offset 2.1	Check the field content = 0		Ok

5 17 Specific tests of Network Layer

(7.4)

5.1 17.1 Dual channel operation

(M.1371 A1/4.1)

5.1.1 17.1.1 Alternate transmissions

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode on default channels AIS1, AIS2. Record transmitted scheduled position reports on both channels. Check CommState for slot allocation.

Required results

Confirm that EUT allocates slots in both channels alternating. Repeat check for data link access period.

02.12.03 Ba	Test details – Alternate transmissions		
Test item	Check	Remark	Result
Set-up EUT in autonomous mode, set report rate to 10sec with external sensor input. Record transmitted scheduled position reports on both channels. Check Comm State for slot allocation.			
Alternate transmissions	Check that the EUT transmission is alternating		Ok
Comm state	Check that the slots of each channel are allocated on the same channel		Ok
Same test on network entry (data link access period)			
Alternate transmissions	Check that the EUT transmission is alternating		Ok
Comm state	Check that the slots of each channel are allocated on the same channel		Ok

5.2 17.2 Regional area designation by VDL message

(M.1371 A1/4.1))

Method of measurement

Set-u p standard test environment and operate EUT in autonomous mode. Apply Channel management messages (msg 22) to the VDL defining two adjacent regional areas 1 and 2 with different channel assignments for both regions and a transitional zone extending 4nm either side of the regional boundary. At least one channel shall be 12.5kHz channel. Let the EUT approach region 1 from outside region 2 more than 5 nm away from region boundary transmitting on default channels. Record transmitted messages on all 6 channels.

Region	***Primary channel***	***Secondary channel***
Region 1	*CH A1*	*CH B1*
Region 2	*CH A2*	*CH B2*
Default region	*AIS 1*	*AIS 2*

Required results

Check that the EUT transmits and receives on the primary channels assigned for each region alternating channels and doubling reporting rate when passing through the transitional zones. EUT shall revert to default autonomous operation on the regional channels after leaving the transitional zones.

Item	***Area***	***Channels in use***
1	*default region*	*AIS1, AIS2*
2	*first transitional zone*	*AIS1, CH A 2*
3	*region 2*	*CH A 2, CH B 2*
4	*second transitional zone*	*CH A 2, CH A 1*
5	*region 1*	*CH A 1, CH B 1*

This Test is devided in 2 parts:

- The first part checks the general behaviour including check of ACA and TXT output, check of the borders of area an transitional zone, check of the correct frequency use.
- The second part concentrates on the slot allocation and use during a transition from one area (high sea) into another.

02.12.03 Ba	Test details part 1 – Channel management by VDL msg 22		
Test item	Check	Remark	Result
Set-up EUT in autonomous mode transmitting on channel AIS1/AIS2, send 2 Msg 22 by VDL generator, defining 2 adjacent areas with channels A1, B1 and A2, B2. Use external sensor input to simulate a voyage through both areas. Set transitional zone to 4nm. Set the position outside the areas. “TZ” is used for “transitional zone” Set the positions near the limits of the transitional zones to check the dimensions			
PI output	Check that the msg 22 are output on PI		Ok

Display of defined area	Check that the defined area is correctly stored (displayed on MKD)	The area is stored, but - Channel A = channel B of msg 22, Channel B ok - Transitional zone size = TZS of msg 22, should be TZS of msg 22 + 1 Retest 15.01.04 Ba: - Channels are ok - TZ size is ok	Ok
	Check ACA and TXT output on PI (not required but recommended.	No TXT output , but ACA output, ACA output is too long (see 7.3) Retest 15.01.04 Ba: Length of ACA output is ok	Rec Ok
	ACA: check in use flag and time of in use flag		Ok
Item 1: In high sea area	Check that channels AIS1 and AIS2 are in use	Remark 02.12.03: Because the area settings could not stored correctly by msg 22 the following test is done with setting stored by ACA input	Ok
Item 2: Move position into outer TZ of region 2	Check ACA and TXT output (No required)	TXT output ACA output	Ok
	If ACA output: check in use flags and time of in use flag	in use flag = 0	acc
	Check the limit of the TZ (5 nm = 8.8 minutes)	Limit seems to be 5 minutes, not 5 Nm Retest 15.01.04 Ba: TZ border is now 5 NM (8.8 min)	Ok
	Check that channel AIS 1 and A2 are used		Ok
	Check that reporting rate is doubled		Ok
Item 3: Move position into inner TZ of region 2 (crossing the area border)	Check ACA and TXT output (Required)		Ok
	ACA: check in use flag = 1		Ok
	ACA: check time of in use flag		Ok
	Check the border of area		Ok
Item 4: Move position into region 2 (out of TZ)	Check ACA and TXT output (not required)	TXT output ACA output	Ok
	Check the limit of the TZ (4 nm = 7 minutes)	Limit is 4 minutes, not 4 Nm Retest 15.01.04 Ba: TZ border is now 54NM (7 min)	Ok
	Check that channel A2 and B2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

Item 5: Move position into TZ between region 1 and 2, inside area 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 6: Move position into area 1 (inside the TZ) (crossing the area border)	Check ACA and TXT output (Required)		Ok
	Check the border of area		Ok
Item 7: Move position into region 1 (out of TZ)	Check that channels A1 and B1 are used		Ok
	Check the limit of the TZ (4 nm = 7 minutes)	Limit is 4 minutes, not 4 Nm Retest 15.01.04 Ba: TZ border is now 4NM (7 min)	Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 8: Move position into TZ of region 1 to high sea	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the TZ of region 1, into high sea	Check that channels AIS1 and AIS2 are used		Ok
	ACA: check in use flags and time of in use flag	ACA and TXT output when crossing the border of the area	Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

Because the VDL analyser can receive on 2 channels only the test is done 2 times,

- 1 test with receivers set to the old frequencies
- 1 test with receivers set to the new frequencies

The results are logged and shown in 2 diagrams for evaluation. Main scope of this test is the correct slot allocation and use on the different channels.

02.12.03 Ba	Test details part 2 – Channel management by VDL msg 22		
Test item	Check	Remark	Result
The same area and movement is used as in test part 1. Set the RX channels in the first test to the channels as indicated at the test items (run 1) Set the Rx channels in the second test to the channels as indicated at the test items (run 2) The test results should be evaluated from both recordings			
Item 1: In high sea area (run 2: channel A = AIS1, change channel B to A2)	Record 1 frame in run 1 and 2 frames in run 2 (1 on the old channels and 1 on the new channels)		
	Check that channels AIS1 and AIS2 are in use		Ok
Item 2: Move position into transitional area of region 2, first frame after transition	Check that EUT continues TX on AIS1 and AIS2 for 1 frame		Ok

	Check that EUT releases the slots on AIS2 by msg 1 with time-out 0 and no slot offset		Ok
	Check that channel AIS 1 and **A2** are used for **Rx**		Ok
Item 3: In outer transitional area of region 2, next frames after transition (run 1: channel A = AIS1, change channel B to A2)	Check allocation of additional slots on channel A (AIS1) using msg 3	Complete new allocation	Ok
	Check complete slot allocation on channel B (A2) using msg 3		Ok
	Check that channel AIS 1 and A2 are used for Tx		Ok
	Check that channel AIS 1 and A2 are used for Rx		Ok
	Check that reporting rate is doubled		Ok
	Check that msg on AIS1 are ouptput on PI (VDM/VDO) as channel A and A2 as channel B		Ok
Item 4: Move into inner transitional area of region 2, crossing the area border, (run 2: change channel A to A2 and channel B to B2)	Check that msg on AIS1 are ouptput on PI (VDM/VDO) as channel B and A2 as channel A (channels reverted)		Ok
Item 5: Move position into the area of region 2 (out of TZ), first frame after transition	Check that EUT continues TX on AIS1 and A2 for 1 frame		Ok
	Check that EUT releases all slots on AIS1 by msg 1 with time-out 0 and no slot offset		Ok
	Check that EUT releases every second slot on channel A2 by msg 1 with time-out 0 and no slot offset (for reverstion to normal reporting rate	All slots released	Ok
	Check that channel A2 and **B2** are used for **Rx**		Ok
Item 6: Inside area of region 2, next frames after transition (run 1: change channel A to A2 and channel B to B2)	Check allocation of Slots on channel B (B2) using msg 3		Ok
	Check that channels A2 and B2 are used for Tx		Ok
	Check that channel A2 and B2 are used for Rx		Ok
	Check that reporting rate is back to normal reporting rate		Ok
	Check that msg on A2 are ouptput on PI (VDM/VDO) as channel A and B2 as channel B		Ok

5.3 17.3 Regional area designation by serial message

(M.1371 A1/4.1.3)

Repeat test 17.2 using ACA serial message for channel assignment.

02.12.03 Ba	Test details – Channel management by ACA sentence on PI		
Test item	Check	Remark	Result
Set-up EUT in autonomous mode transmitting on channel AIS1/AIS2, send 2 ACA sentences to the PI , defining 2 adjacent areas with channels A1, B1 and A2, B2. Use external sensor input to simulate a voyage through both areas. Set transitional zone to 1nm. Set the position outside the areas. Areas are in SW quadrant. File name is AIACA_Region_17_3_SW.sst Set the positions near the limits of the transitional zones to check the dimensions			
Display of defined area	Check that the defined area is correctly stored (displayed on MKD)		Ok
	Check ACA and TXT output on PI (not required but recommended.	The ACA output sentence is to long. IEC 61162 limits the sentences to 82 characters (incl. Cr, lf). The resolution of the 4 lat and lon values should be reduced to 1/10 min according to the resolution of the area definition in msg 22. Then the sentence is not to long. <u>Retest 15.01.04 Ba:</u> Length of ACA sentence output is ok	Ok
<u>Item 1</u>: In high sea area	Check that channels AIS1 and AIS2 are in use		Ok
<u>Item 2:</u> Move position into outer TZ of region 2	Check ACA and TXT output (No required)	ACA and TXT output In use flag = 0	Acc
	Check the limit of the TZ (5 nm = 5.8 minutes)	Limit is 5 min instead of 5 Nm <u>Retest 15.01.04 Ba:</u> TZ border is now 5 nm	Ok
	Check that channel AIS 1 and A2 are used		Ok
	Check that reporting rate is doubled		Ok
<u>Item 3:</u> Move position into inner TZ of region 2 (crossing the area border)	Check ACA and TXT output (Required)	ACA and TXT output	Ok
	Check the border of area		Ok
<u>Item 4:</u> Move position into region 2 (out of TZ)	Check ACA and TXT output (not required)	ACA and TXT output	Ok

	Check the limit of the TZ (2 nm = 2.3 minutes)	The limit is 2 min, not 2 Nm as requiered Retest 15.01.04 Ba: TZ border is now 2 nm	Ok
	Check that channel A2 and B2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 5: Move position into TZ between region 1 and 2, inside area 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 6: Move position into area 1 (inside the TZ) (crossing the area border)	Check ACA and TXT output (Required)	ACA and TXT output	Ok
	Check the border of area		Ok
Item 7: Move position into region 1 (out of TZ)	Check that channels A1 and B1 are used		Ok
	Check the limit of the TZ 1 nm = 1.15 minutes)	The limit is 1 min, not 1 Nm as requiered Retest 15.01.04 Ba: TZ border is now 2 nm	Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 8: Move position into TZ of region 1 to high sea	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the TZ of region 1, into high sea	Check ACA and TXT output	No ACA and TXT output -> There was an ACA and TXT output when leaving region 1 (crossing the border)	acc
	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

5.4 17.4 Power setting

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit channel management message (msg 22) defining output power high/low.

Repeat test using ACA and manual input.

Required result

Check that EUT sets output power as defined.

03.12.03 Ba	Test details – Power setting by msg 22		
Test item	Check	Remark	Result
The EUT has to be in an area with regional operating settings and the channels as used in the following msg 22. Transmit a msg 22 from VDL generator like the following: 22,0,2345,0,2086,1086,0,**1**,[MMSI(MSB)],[MMSI(LSB)],1,0,0,,0			
Channel switch	Check that the EUT doesn't switch channels	Retest 01.03.04 Ba: EUT does not switch channels	Ok
Power low	Check that the transmitting power is changed from high to low	VDM output ok, but power level has not been changed, may be a problem of addressing with MMSI Retest 15.01.04 Ba: No change Retest 13.02.04 Ba: Addressing by MMSI not ok Retest 01.03.04 Ba: Addressing by MMSI is ok Power setting is ok	Ok
MKD	Check the low power settings are displayed on MKD	Power setting on display is not changed Retest 15.01.04 Ba: No change Retest 01.03.04 Ba: Display is ok	Ok
Transmitt the same message 22, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power		Ok

03.12.03 Ba	Test details – Power setting by ACA		
Test item	Check	Remark	Result
Apply the following message at PI: File name = AIACA_region_in_ch86.sst. Set power flag to 1 = low power and channels to actually used channels			
Power low	Check that the transmitting power is changed from high to low		Ok
	Check that the EUT does not perform a rescheduling	The EUT performs a rescheduling with msg 3. This is not necessary and should be avoided because each rescheduling increases the danger of slot collisions and should therefore only done if really necessary Retest 15.01.04 Ba: No change Retest 01.03.04 Ba: No rescheduling	Ok
MKD	Check the low power settings are displayed on MKD	Test 01.03.04 Ba:	Ok
Transmitt the same ACA sentence, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power	Test 01.03.04 Ba:	Ok

03.12.03 Ba	Test details – Power setting by manual input		
Test item	Check	Remark	Result
Set the power level of the region in use to low power, Don't change the channels			
Power low	Check that the transmitting power is changed from high to low	Power level could not be changed. An ACA output indicates that the regional setting command has been accepted, and a frame of msg 3 seems to be used for rescheduling, but the power level is not changed (not in ACA output, not on display, not on TX output. Retest 01.03.04 Ba: Change of power levels ok	Ok
Set power level back to high power.			
Power high	Check that EUT reverts to high power	Test 01.03.04 Ba:	Ok

5.5 17.5 Message priority handling

(M.1371 A1/4.1.8)

Method of measurement

Set-up standard test environment and operate test equipment with 90% channel load. Set the EUT to max reporting rate of 2 sec by applying a speed of >23kn and a ROT of >20°/sec. Record VDL messages and check for used slots. Initiate the transmission of two 5 slot messages (msg 12 and msg 8) by the EUT. Record transmitted messages on both channels.

Required results

Check that EUT transmits the messages in correct order according to their priority (ITU-R M.1371 A/3.3.8.1 table 13).

This test is modified in that way that first a BBM sentence is sent to make the EUT busy with a transmission process. Then the 2 test sentences with msg 8 and msg 12 are applied.

Otherwise the EUT has already started the transmission process of the first msg, has allocated slots or even has already transmitted the msg before the input of the ABM sentence with the msg 12 has been completed. In this case it would not be possible to transmit the msg 12 first.

10.03.04 Ba	Test details – Message priority handling		
Test item	Check	Remark	Result
Simulate a channel load of 90% on both channels, set reporting rate to 2 s Apply an BBM sentence with msg 8 and immediately following an ABM sentences with msg 12 to the PI port. File name is AIBBM_ABM_17_5.sst Check transmissions by VDL analyser.			
Transmission order	Check that msg 12 is transmitted first because of higher priority	This could not yet be tested because in test 16.6.3 even a single slot broadcast has not been transmitted under 90% load condition. Retest 01.03.04 Ba: Could not be tested because EUT does not transmit multislot messages (see test 14.2.1) Retest 10.03.04 Ba: The message 12 is transmitted first, but it is transmittedonly if there are free blocks of 5 slots. Retest 01.04.04 Ba: 5 slot msg is transmitted also unter slot reuse condition, not mor e than 1 free slot available.	Ok

5.6 17.6 Slot reuse (link congestion)

(M.1371 A1/4.4)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Transmit a Data Link Management message (msg 20) to the EUT with slot offset and increment to allocate slots for a base station. Assure that at test receiver location the signal level received from EUT exceeds the signal level received from test transmitter. Record transmitted messages and check frame structure. Set up additional test targets to simulate a VDL load of >90% until slot reuse by EUT is observed.

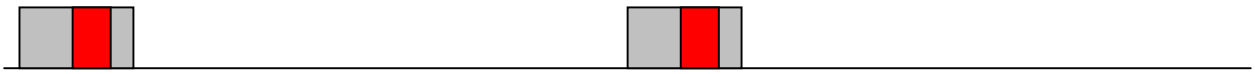
Required results

Check that the nominal reporting rate for Position Report msg 1 is achieved ±10% (allocating slots in selection interval SI) under link congestion conditions. Confirm that the slot occupied by the most distant station (within selection interval) is used by the slot reuse algorithm.

Check that a station is not subject to slot reuse more than once a frame. Check that slots allocated by a local base station are not subject to slot reuse.

Used test procedure:

In one frame 2 blocks of 60 targets in consecutive slot are transmitted. To avoid problems by system overloading every 10th slot is not used. One block is transmitted at the beginning of the frame and one at the middle.
The EUT is set to 2 s reporting rate. So the 1st and the 15th selection interval is covered by these transmissions of the same targets.



The gray area is covered by targets, the red area is the selection interval.

The targets are numbered from 1 to 60 and transmitted in the order of the IDs. They are devided into 2 groups:

- The even numbered targets have a low distance,
- the odd numbered targets have a high distance to the EUT

In addition 4 slots within the selection intervals are reserve by a message 20.

This test have to be run for at minimum 30 minutes to observe a sufficient number of slot allocations (every 3-8 min). The selected slots of selection interval 1 and 15 at time-out have to be checked.

02.12.03 Ba	Test details – Slot reuse		
Test item	Check	Remark	Result
This test can be done as described before.			
Reporting rate, use of selection interval	Check that the slots are selected within the SI		Ok
Slot reuse	Check that only the slots of odd numbered targets are used	Even and odd slots are used. The reason seems to be that the EUT does not received some slots (2..4) before and after its own transmission (see commented log file). So the slots seem to be free. Retest 15.01.04 Ba: Not retested because the Rx near tx slots problem still exists Retest 09.02.04 Ba: Only odd targets are used for slot reuse	Ok
	Check that a the slot of a target is not used twice in a frame	In 3 cases the slot of the same target is used twice in a frame. The reason seems to be that the targets are not received in slots near the own transmission and therefore it is not recognized as a slot reuse situation. Retest 09.02.04 Ba: The same target is not used twice in a frame	Ok
Reserved Slot	Check that slots reserved by msg 20 are not used	The test of use of reserved slots is done in 16.6.5 Fixed allocated transmissions (FATDMA)	
Time-out decrement	In 5 cases in the test the timeout is not decremented for 2 or 3 frames at a value of 1. Retest: 15.01.04 Ba: no change, still not ok Retest 09.02.04 Ba: The time-out is decremented in all cases		Ok
Random value of time-out	The new time-out after time-out 0 should be in the range of 3...7. In 4 cases a value of 2 is assigned, in no case a value of 7. So it seems that a value of 2..6 is assigned instead of 3...7 Retest: 15.01.04 Ba: no change, still not ok Retest 09.02.04 Ba: Only a time-out of 2 and 3 is used, values of 3 ... 7 should be used Retest 13.02.04 Ba: Time-out is now in the range of 3 ... 7		Ok

5.7 17.7 Management of received regional operating settings

(7.4.1)

5.7.1 17.7.1 Test for replacement or erasure of dated or remote regional operating settings

(7.4.1)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Send a valid regional operating setting to the EUT by msg 22 with the regional operating area including the own position of the EUT. Consecutively send a total of seven (7) valid regional operation settings to EUT, using both msgs 22 and DSC telecommands, with regional operating areas not overlapping to the first and to each other. Perform the following in the order shown:

a) Send a ninth msg 22 to the EUT with valid regional operating areas not overlapping with the previous eight regional operating areas.

b) Step 1: Set own position of EUT into any of the regional operating areas defined by the second to the ninth telecommands sent to the EUT previously.

Step 2: Send a tenth telecommand to the EUT, with a regional operating area which partly overlaps the regional operating area to which the EUT was set by Step 1 but which does not include the own position of the EUT.

c) Step 1: Move own position of EUT to a distance of more than 500 miles from all regions defined by previous commands.

Step 2: Consecutively set own position of EUT to within all regions defined by the previous telecommands.

Required results

After the initialization, the EUT should operate according to the regional operating settings defined by the first msg 22 sent.

a) The EUT shall return to the default operating settings.

b) Step 1: Check that the EUT changes its operating settings to those of that region which includes own position of the EUT.

Step 2: Check that the EUT reverts to the default operating settings.

Note: Since the regional operating settings to which the EUT was set in Step 1 shall be erased due to Step 2, and since there is no other regional operating setting due to their non- overlapping definition, the EUT shall return to default.

c) Step 1: Check that the EUT operates with the default settings.

Step 2: Check that the EUT operates with the default settings.

03.12.03 Ba	Test details – Test of replacement or erasure of dated or remote regional operating settings		
Test item	Check	Remark	Result
The following check of area entries can be done by MKD or by request of ACA			
Send by ACA • 1 area including own position • 7 areas not overlapping, not including own position File name: AIACA_8_regions_17_7_1.sst	Check that area 1...7 are displayed on MKD		Ok
	Check that all 8 areas are output on PI after request by sentence xxAIQ,ACA	No output on request See note Retest 11.02.04 Ba: No output on request Retest 13.02.04 Ba: Area setting are output on request	ok
a) Send a 9. msg 22 to the EUT	Check that the first area is deleted		Ok
	Check that the EUT returns to the default operating settings		Ok
b) step 1: Set own position to one of the 7 areas	Check that the EUT changes its operating settings according to that region		ok
b) step 2: Send an area overlapping the area of step 1 not including own position	Check the overlapped area is deleted and replaced by the new one		Ok
	Check that the EUT reverts to the default operating settings		Ok
d) Erasure by distance: Move own position of EUT to a distance of more than 500 miles from all regions defined by previous commands	Check that all areas are deleted		Ok
Check of erasure: Set own position of EUT to within all regions defined by the previous telecommands.	Check that the EUT operates with the default settings because the areas are deleted		Ok

Note) The output of area settings using ACA sentences on request by "$xxAIQ,ACA" is not explicitely required by the standard, but a channel management on an external unit is not possible without this function. It is practically not possible for to keep always track of all changes of area settings. Therefor from our view it is a required function of the AIS transponder.

5.7.2 17.7.2 Test of correct input via Presentation Interface or MKD

(7.4.1)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order:

a) Send msg 22 or a DSC telecommand with valid regional operating settings to the EUT with a regional operating area, which contains the current position of own station.

b) Input a different, valid regional operating setting via the MKD.

c) Send a different regional operating setting with a regional operating area which partly overlaps the regional operating area input via the MKD to the EUT via the Presentation Interface in the previous step, and which contains the present position of own station.

d) Input the default operating settings via the MKD for the regional operating area, which was received by the previous command via the Presentation Interface.

e) Send msg 22 or a DSC telecommand with a different regional operating setting to the EUT with a regional operating area, which contains current position of own station.

f) Within two hours, after e), send a different regional operating setting to the EUT via Presentation Interface with a valid regional operating area overlapping the regional operating area sent to the EUT by msg 22 or a DSC telecommand.

Required results

a) Confirm that the EUT uses the regional operating settings commanded by msg 22 or DSC telecommand.

b) Step 1: Confirm that the regional operating settings of the previous msg 22 or DSC telecommand are displayed to the user on the MKD for editing.

Step 2: Check, that the EUT allows the user to edit the displayed regional operating settings. Check, that the EUT does not accept incomplete or invalid regional operating settings. Check, that the EUT accepts a complete and valid regional operating setting.

Step 3: Check, that the EUT prompt the user to confirm the intended change of regional operating settings. Check, that the EUT allows the user to return to the editing menu or to abort the change of the regional operating settings.

Step 4: Check, that the EUT uses the regional operating settings input via the MKD.

c) Check, that the EUT uses the regional operating settings received via the Presentation Interface.

d) Check, that the EUT accepts the default operating settings for the regional operating area received in c). Check, that the EUT uses the default operating settings.

e) Check, that the EUT uses the regional operating settings commanded to it by msg 22 or DSC telecommand.

f) Check, that the EUT does not use the regional operating setting commanded to it via the Presentation Interface.

03.12.03 Ba	Test details – Correct input via Presentation Interface or MKD		
Test item	Check	Remark	Result
Send msg 22 with same settings as in 17.2 Channel management, set position of own ship into this area			
a) Use of settings	Confirm that the EUT uses the regional operating settings commanded by msg 22		Ok
b) MKD input Entering new area by MKD	Step 1: Confirm that the regional operating settings of the previous msg 22 is displayed to the user on the MKD for editing.		Ok
	Step 2: Check, that the EUT allows the user to edit the displayed regional operating settings.		Ok
	Check, that the EUT accepts a complete and valid new regional operating setting.	See note below Input of manual regions has to be tested some more times. Retest 19.01.04 Ba: The new area was not accepted and stored, and there was no error display on the MKD Rretest 11.02.04 Ba: Area is correctly stored	Ok
	Step 3: Check, that the EUT prompt the user to confirm the intended change of regional operating settings		ok
	Check, that the EUT allows the user to return to the editing menu or to abort the change of the regional operating settings.		Ok
Move position inside the new area	Step 4: Check, that the EUT uses the regional operating settings input via the MKD.		Ok
c) New area by ACA Input a new area via PI (ACA sentence) overlapping area of b), position inside	Check, that the EUT uses the regional operating settings received via PI		Ok
d) Default settings via MKD Input the default operating settings via the MKD for the regional operating area of c)	Check, that the EUT accepts the default operating settings for the regional operating area		Ok
	Check, that the EUT uses the default operating settings		Ok

	ACA output	There was an ACA output indicating that the area is not in use, but the display indicates correctly that it is in use (Position inside) Retest 19.01.04 Ba: Default values were not accepted, no ACA output, not displayed on MKD and not used on VDL Retest 11.02.04 Ba: Default values are accepted and used	Ok
e) Area setting by VDL Send message 22 with a different regional operating setting to the EUT with a regional operating area, which contains current position of own station	Check, that the EUT uses the regional operating settings commanded to it by message 22		Ok
f) Priority of VDL msg Rejection of a shipborne (ACA) regional operating setting when overlapping a setting from base station not older than 2 hours (Clarifications to 1371, 2.54 paragraph 4	Check, that the EUT does not accept the regional operating setting commanded to it via the Presentation Interface.		Ok

Note)

1. region input:

The region was not accepted (no ACA output, not stored) but there was no error indication.

2. region input:

The region was modifed (shifted 30 min to east). When saving the new region the EUT displayed: "ERROR, Parameter fault, storage failed", but there was an ACA output with the data of this region. It was not checked if the region was stored.

3. region input:

The same unchanged region was saved again, there was no ERROR output, and the area was stored.

4. region input

Another region was not accepted (no ACA output, not stored) but there was no error indication.

Repetition of the same input as input 1 under the same condition (as far as I know) the next day : Region was correctly accepted.

5.7.3 17.7.3 Test of addressed telecommand

(7.4.1)

Method of measurement

Set-up a standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order:

a) Send msg 22 or a DSC telecommand with valid regional operating settings, that are different from the default operating settings, to the EUT with a regional operating area, which contains the current position of own station.

b) Send an addressed msg 22 or an addressed DSC telecommand to the EUT with different regional operating settings than the previous command.

c) Move the EUT out of the regional operating area defined by the previous addressed telecommand into an area without regional operating settings.

Required results

a) Check, that the EUT uses the regional operating settings commanded to it in a).

b) Check, that the EUT uses the regional operating settings commanded to it in b).

c) Check, that the EUT reverts to default.

01.03.04 Ba	Test details – Test of addressed telecommand		
Test item	Check	Remark	Result
a) Send msg 22 with valid regional operating settings, with a regional operating area, which contains the current position of own station.	Check, that the EUT uses the regional operating settings commanded to it		Ok
b) Send an addressed DSC msg to the EUT with different regional operating settings	Check, that the EUT uses the regional operating settings commanded to it	Test 10.02.04 Ba:	Ok
b) Send an addressed msg 22, addressed **as ID 2**, to the EUT with different regional operating settings	Check, that the EUT uses the regional operating settings commanded to it		Ok
c) Move the EUT out of the regional operating area defined by the previous addressed telecommand	Check, that the EUT reverts to default		Ok

5.7.4 17.7.4 Test for invalid regional operating areas (3 areas with same corner)

(7.4.1)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Perform the following tests in the following order after completion of all other tests related to change of regional operating settings:

a) Send three different valid regional operating settings with adjacent regional operating areas, their corners within eight miles of each other, to the EUT by msg 22 or DSC telecommand, Presentation Interface input and manual input via MKD. The current own position of the EUT shall be within the regional operating area of the third regional operating set ting.

b) Move current own position of the EUT consecutively to the regional operating areas of the first two valid regional operating settings.

Required test results

a) Check, that the EUT uses the operating settings that were in use prior to receiving the third regional operating setting.

b) Check, that the EUT consecutively uses the regional operating settings of the first two received regional operating areas.

04.12.03 Ba	Test details – Test for invalid regional operating areas (three regional operating areas with same corner		
Test item	Check	Remark	Result
a) Send three different valid regional with adjacent corners by ACA, File name: AIACA_region_17_7_4.sst Position inside 3rd area.	Check, that the 3rd area is refused and settings are not used	3 regions with adjacent corners are accepted, 4 regions with adjacent corners are not accepted	acc
b) Move own position to the first 2 areas	Check, that the EUT uses the operational settings of these areas		Ok

5.7.5 17.7.5 Self-Certification of other conditions

(7.4.1)

The fulfilment of all other conditions of 7.4.1 shall be self-certified by the manufacturer.

Date	**Result**	**Status**
04.12.03 Ba	No selfcertification required	

5.8 17.8 Continuation of autonomous mode reporting rate

(M.1371- 1 A2/3.3.6, IALA Technical clarifications to recommendation ITU- R M.1371- 1)

Method of test

When in the presence of an assigned mode command and in a transition zone, check that the EUT continues to report at the autonomous mode-reporting rate.

Required result

Ensure that the autonomous reporting rate is maintained.

04.12.03 Ba	Test details – Continuation of autonomous mode reporting rate		
Test item	Check	Remark	Result
Set the EUT into a transitional zone Send assignment commands msg 16 with an higher update rate to the EUT			
Rate assignment command in a transitional zone	Check that an rate assignment command is ignored in a transitional zone	Assignment command is executed Retest 19.01.04 Ba: Assignment command is refused	Ok
Slot assignment command in a transitional zone	Check that an slot assignment command is ignored in a transitional zone	Assignment command is executed Retest 19.01.04 Ba: Assignment command is refused	Ok

6 18 Specific tests of Transport Layer

(7.5)

6.1 18.1 Addressed messages

(M.1371 A1/5.3.1)

6.1.1 18.1.1 Transmission

(M.1371 A1/5.3)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Set up a test target for scheduled transmissions on channel AIS1 only. Initiate the transmission of an addressed binary message (msg 6) by the EUT (test target as destination). Record transmitted messages on both channels.

Required results

Check that the EUT transmits msg 6 on channel AIS1. Repeat test for AIS2.

Basic test of addressed message is made in 14.1.4.1 Transmit an addressed message**"**

The test procedure is modified in that way that the test target is transmitting on both channels, and in case of channel = 0 it is checked that the transmission is always on that channel on that the target transponder was last received.

6.12.03 wa	Test details - Addressed binary message 6		
Test item	Check	Remark	Result
Transmit an addressed binary message 6 by sending an ACA sentence to the PI. PI sentence: File AIABM_bin.sst: !AIABM,1,1,2,000005002,x,6,06P0test,0 Change transmission channel x according to test item Transmit some messages for each test item and check the used channel.			
Channel = 0 (autoselect)	Check tx on last received channel		Ok
Channel = 1 (A)	Check Tx on channel A		Ok
Channel = 2 (ch. B)	Check Tx on channel B		Ok
Channel = 3 (ch. A+B)	Check Tx on channel A+B		Ok

6.12.03 wa	Test details - Addressed safety related message 12		
Test item	Check	Remark	Result
Transmit an addressed safety related message 12 by sending an ACA sentence to the PI. PI sentence: File AIABM_safety.sst: !AIABM,1,1,2,000005002,x,12,D5CD,0 (D5CD = „TEST“. Change transmission channel x according to test item Transmit some messages for each test item and check the used channel.			
Channel = 0 (autoselect)	Check tx on last received channel		Ok
Channel = 1 (ch. A)	Check Tx on channel A		Ok
Channel = 2 (ch. B)	Check Tx on channel B		Ok
Channel = 3 (ch. A+B)	Check Tx on channel A+B		Ok

6.12.03 wa	Test details - 4 addressed binary messages 6		
Test item	Check	Remark	Result
Transmit an set of 4 addressed binary messages 6 by sending 4 ABM sentences to the PI. Transmission channel is alternating on channel A and B as indicated int the ABM sentences. PI sentence: File AIABM_4_bin.sst: A response is automatically transmitted by the addressed transponder ID 5002			
VDO output of EUT	Check that the 4 messages are transmitted directly without waiting for ackn.		Ok
Channel	Check Tx on channel A and B as indicated in the ABM sentence		Ok
Message sequence number	Check that sequence number in VDL msg = Sequential message identifier of ABM sentences		Ok
RX of request	Check that message is received by addressed transponder (VDM)		Ok
Received by VDL Analyser	Check msg on VDL analyser		Ok
TX of ackn. msg 7 (VDO)	Check that ackn msg 7 is transmitted by addressed transponder (VDO)		Ok
RX of msg 7 (VDM)	Check that the ackn. msg 7 is received by EUT (VDM)		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	!AIABK,000001007,A,7,3,0*2F !AIABK,000001007,A,7,1,0*2D !AIABK,000001007,B,7,2,0*2D !AIABK,000001007,B,7,0,0*2F	Ok

6.1.2 18.1.2 Acknowledgement

Method of measurement

Operate standard test environment and EUT in autonomous mode. Apply up to 4 addressed binary messages (msg 6; EUT as destination) to the VDL on Channel AIS 1. Record transmitted messages on both channels. Repeat with AIS2.

Required results

Confirm that EUT transmits a binary acknowledge message (msg 7) with the appropriate sequence numbers within 4 sec on the channel where the msg 6 was received. Confirm that EUT transmit the result with an appropriate message to PI.

A basic receive test is made in 14.1.4.2 Receive addressed message.

The content fields of the transmitted acknowledgement should be checked in 4.7.2 16.7.2 Transmitted messages.

6.12.03 wa	Test details - Acknowledgement of binary message 6		
Test item	Check	Remark	Result
Transmit 4 addressed binary message with consecutive Sequential message identifiers from other Transponder File name: AIABM_4_bin.sst			
Rx of messages (VDM)	Check that the messages are received by VDM output on PI of EUT		Ok
Transmission of acknowledgement msg 7	Check transmission of ackn. by VDO output of EUT		Ok
Sequence numbers	Check that sequence number in ackn = sequence number of Rx message		Ok
Ackn. channel	Check that ackn Tx channel = Rx channel		Ok
RX of ackn. msg 7	Check that the ackn. msg are received by Transmitter (VDM/ABK)		Ok

6.1.3 18.1.3 Transmission Retry

(M.1371 A1/5.3.1)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of up to 4 addressed binary messages by the EUT which will not be acknowledged (i.e. destination not available). Record transmitted messages.

Required results

Confirm that EUT retries the transmission up to 3 times (configurable) for each addressed binary message. Confirm that the time between transmissions is 4 to 8 sec. Confirm that EUT transmit the overall result with an appropriate message to PI.

Basic test of addressed message is made in 14.1.4.1 Transmit an addressed message**"**

6.12.03 wa	Test details - Addressed binary message 6		
Test item	Check	Remark	Result
Transmit an addressed binary message 6 by sending an ABM sentence to the PI. PI sentence: File AIABM_bin.sst: The message is addressed to a not available transponder. So no acknowledgement is received. Record the VDO output of VDE with time stamp.			
VDO output of EUT	Check the transmission by VDO		Ok
Number of repetitions	Note and check the number or repetitions	3	Ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s	4s	Ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	!AIABK,000001005,B,6,2,1*2F	Ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

6.12.03 wa	Test details - Addressed safety related message 12		
Test item	Check	Remark	Result
Transmit an addressed safety related message 12 by sending an ABM sentence to the PI. PI sentence: File AIABM_safety.sst: The message is addressed to a not available transponder. So no acknowledgement is received. Record the VDO output of VDE with time stamp.			
VDO output of EUT	Check the transmission by VDO		Ok
Number of repetitions	Note the number or repetitions	3	Ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s	4s	Ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	!AIABK,000001005,B,12,2,1*1A	Ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

6.2 18.1.4 Acknowledgement of Addressed safety related messages

Repeat test under 18.1.2 with addressed safety related message.

The contents of the acknowledgement should be entered in test 4.7.2 16.7.2 Transmitted messages

6.12.03 wa	Test details - Acknowledgement of safety related text message 12		
Test item	Check	Remark	Result
Transmit 4 safety related text messages 12 with consecutive sequential message identifiers from other Transponder			
Rx of messages (VDM)	Check that the messages are received by VDM output on PI of EUT		Ok
Transmission of acknowledgement msg 13	Check transmission of ackn. by VDO output of EUT		Ok
Sequence numbers	Check that sequence number in ackn = sequence number of Rx message		Ok
Ackn. channel	Check that ackn Tx channel = Rx channel		Ok
RX of ackn. msg 13	Check that the ackn. msg are received by Transmitter (VDM/ABK)		Ok

6.3 18.2 (M.1371 A1/5.3) Interrogation responses

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (msg 15; EUT as destination) to the VDL according to message table 7 for responses with msg 5 and slot offset set to defined value on channel AIS 1. Record transmitted messages on both channels.

Required results

Check that EUT transmits the appropriate interrogation response message as requested on channel AIS1. Repeat test for AIS2.

A simple operational test is made in 14.1.3.2 Interrogation response

The check of the contents of the transmitted message should be entered in 4.7.2 16.7.2 Transmitted messages

The test cases “case 1” to “case 4” are the four cases as defined in ITU-R M1371, “3.3.8.2.11 Message 15 Interrogation”

The requests have to be made by the VDL generator, because a mobile transponder cannot generate requests with slot offset.

08.12.03 Ba	Test details - case 1- Interrogation of msg 5, Ch 1		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 5 with given slot offset A response shall automatically be transmitted by the EUT Request is transmitted on channel 1			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser, note slot offset	Slot offset = 100	Ok
Response channel	Check that the response is transmitted on the request channel		Ok

08.12.03 Ba	Test details - case 1 - Interrogation of msg 5, Ch 2		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 5 with given slot offset A response shall automatically be transmitted by the EUT Request is transmitted on channel 2			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser, note slot offset	Slot offset = 100	Ok
Response channel	Check that the response is transmitted on the request channel		Ok

08.12.03 Ba	Test details - case 2 - Interrogation of msg 3 and 5		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 3 and 5 from EUT with given slot offsets A response shall automatically be transmitted by the EUT			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response 1 (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response 1 on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset 1 defined in the request is used		Ok
TX of response 2 (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response 2 on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset 2 defined in the request is used		Ok

08.12.03 Ba	Test details - case 3 Interrogation of msg 5		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 3 from other AIS and msg 5 from EUT with given slot offsets A response shall automatically be transmitted by the EUT			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response msg 5 is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset defined in the request 2.1 is used		Ok

08.12.03 Ba	Test details - case 4 - Interrogation of msg 3		
Test item	Check	Remark	Result
Transmit an interrogation message 15 requesting msg 3,5 from other AIS and msg 5 from EUT with given slot offsets A response shall automatically be transmitted by the EUT			
RX of request by EUT	Check that the request message is received by the EUT (VDM)		Ok
TX of response (VDO)	Check that response msg 5 is transmitted by EUT (VDO)		Ok
Response on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset defined in the request 2.1 is used	With a slot offset of 250 it is ok, with a slot offset of 300 a offset of 44 is used Retest 19.01.04 Ba: No change Retest 10.02.04 Ba Slot offset of 300 is ok	Ok Ok

6.4 18.3 Broadcast messages

(M.1371 A1/5.3)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Initiate the transmission of 5 binary broadcast messages (msg 8) by the EUT. Record transmitted messages on both channels.

Required results

Check that EUT transmits the msg 8 messages on channels A and B alternating.

Test of multislot broadcast messages is done in 14.2 Multiple slot messages

The check of message contents should be entered in 4.7.2 16.7.2 Transmitted messages

6.12.03 wa	Test details - Binary broadcast message 8		
Test item	Check	Remark	Result
Transmit 5 binary broadcast messages 8 by sending 5 BBM sentences to the PI. PI sentence: File AIBBM_5_bin.sst: !AIBBM,1,1,[7;8;9;0;1],0,8,06P0test1,0 AIS channel for broadcast is 0: autoselect The file contains 5 BBM sentences with consecutive sequential message identifiers.			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx alternating channels A and B		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,8,7,3*50 $AIABK,,,8,8,3*5F $AIABK,,,8,9,3*5E $AIABK,,,8,0,3*57 $AIABK,,,8,1,3*56	Ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
MMSI	Check Transmitter MMSI		Ok

6.12.03 wa	Test details - Safety related broadcast message 14		
Test item	Check	Remark	Result
Transmit 5 safety related broadcast messages 14 by sending 5 BBM sentences to the PI. PI sentence: File AIBBM_5_safety.sst: !AIBBM,1,1,[6;7;8;9;0],0,8,D5CDi,0 AIS channel for broadcast is 0: autoselect The file contains 5 BBM sentences with consecutive sequential message identifiers.			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx alternating channels A and B		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,14,6,3*6C $AIABK,,,14,7,3*6D $AIABK,,,14,8,3*62 $AIABK,,,14,9,3*63 $AIABK,,,14,0,3*6A	Ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
MMSI	Check Transmitter MMSI		Ok

7 19 Specific Presentation Interface Tests

(7.6)

7.1 19.1 General

The EUT (Equipment Under Test) including all necessary test equipment shall be set-up and checked that it is operational before testing commences.

The manufacturer shall provide sufficient technical documentation of the EUT and its interfaces in particular.

The following tests shall be carried out under "Normal" environmental conditions as defined in IEC 60945.

Where appropriate, tests against different clauses of this and other chapters may be carried out simultaneously.

6.12.03 wa	Test details - General interface tests		
Test item	Check	Remark	Result
Checksum	Check that the output sentences include a checksum		Ok
	Check that the checksum is correct		Ok

7.2 19.2 Check of the manufacturer's documentation

(7.6.1)

The following checks for formal consistency and compliance shall be made for all ports

- *approved sentences against IEC 61162*
- *proprietary sentences against IEC 61162*
- *usage of fields as required for different functions including provided default values or settings*
- *transmission intervals against IEC 61162*
- *configuration of hardware and software if this is relevant to the interface performance and port selection*

The following checks for compliance with IEC 61162

- *output drive capability*
- *load on the line of inputs*
- *electrical isolation of input circuits*

This Test does not check the documentation, this is done in 1.6 4.3 Manuals. Here the function of the EUT is checked using the documentation information, the content of the documentation is checked if the EUT complies with the requirements.

05.01.04 Ba	Test details - Check of manufacturers documentation		
Test item	Check	Remark	Result
Approved sentences	Check approved sentences against IEC 61162		Ok
Proprietary sentences	Check proprietary sentences against IEC 61162	No proprietary sentences used	Ok
Usage of Fields	Check usage of fields		Ok
Transmission intervals	Check transmission intervals		Ok
Hardware configuration	Check hardware configuration		Ok
Output drive capability	Check output drive capability		Ok
Input load	Check input load	The input impedance without termination is 940 Ohm, resulting in a current at 10 V of 10 mA. This exceeds the limits of V.11 (3.25 mA at 10 V). See note) Retest 02.03.04 Ba: Documentation has been changed but not really improved. The different values even match less than before. See updated list below! Retest 09.03.04 Ba: Documentation of input is ok now	Ok
Electrical Isolation	Check electrical isolation		Ok

Note)
There are different current values which does not match. The values are listed in the following table.

Table of input currents:

Information source	Input current at 10 V without termination	Input current at 10 V with termination
1.6 “Load requirements as listener”	940 Ohm = **10 mA**	190 Ohm = **53 mA**
1.8.1 “AIS port 1-6, I/O description”	< **0.5 mA** between –15V and +15 V	

Calculation of the resistors in the simplified diagram in 1.8.1	2400+940 = 3340 Ohm, **3 mA**	2400+190=2590 Ohm **3.8 mA**
Measured current	**3 mA**	**45 mA**
Requirement	**< 3.25 mA**	**< 100 mA**

Updated Table of input current, according to version B of "Technical Manual":

Information source	Input current at 10 V without termination	Input current at 10 V with termination
1.6 "Load requirements as listener"	940 Ohm = **10 mA**	190 Ohm = **53 mA**
1.8.1 "AIS port 1-6, I/O description"	< **0.5 mA** between –15V and +15 V	
Calculation of the resistors in the simplified diagram in 1.8.1	2x3600 + 2x 240 = 7680 Ohm, **1.3 mA**	2x240+240=720 Ohm **13.8 mA**
Measured current	**3 mA**	**45 mA**
Requirement	**< 3.25 mA**	**< 100 mA**

The values which nearly match the measured values are marked green

The documentation should be changed so that all the values match.

- It seems that the input impedance in 1.6 does not take into account the series resistors of 1200 Ohm.
- The input current in 1.8.1 Note 2 seems to be the input current of the Linear Tech. LTC 1535, but is related to the external Input[2] in the diagram.
- The termination resistor seems to be connected to the external side of the series resistors of 1200, not to the internal side as shown in the diagram.

7.3 19.3 Electrical test

(7.6.1)

Method of test

Input / Output Ports configured as IEC 61162-1 or IEC 61162-2 shall be tested according to the relevant standard with regard to minimum and maximum voltage and current at the input terminals.

Required results

The interfaces shall fulfil the requirements of the relevant standards.

09.12.03 Ba	Test details - Electrical test of inputs		
Test item	Check	Remark	Result
Minimum voltage	Check that input works with minimum input voltage	1 sensor input and 1 high speed port tested with an input voltage of 0.3 V The sensor input worked, but the high speed port did not respond to an ABM command Retest 19.01.04 Ba: All inputs worked with 0.3 V input voltage	Ok
Maximum voltage	Check that input is not damaged by maximum input voltage		Ok
Input current	Check the input current against the IEC 61162-1 or IEC 61162-2	Input current: With, without termination 5 V: +/- 23 mA, +/- 1.5 mA 10V: +/- 45 mA, +/- 3.0 mA 15 V: +/- 66 mA, +/- 4.5 mA This does not comply with the IEC 61162 requirements. I think this current is caused by the line termination resistors This termination should be “OFF” in the default configuration. Retest 05.01.04: Without termination the input current is ok The termination is optional, therefore it should be “OFF” in the default configuration Retest 15.01.04 Ba: The default setting is changed to termination “OFF” Input current without termination is changed to: 5 V: +/- 0.7 mA 10V+/- 1.38 mA 15 V: +/- 2.07 mA	Ok Ok Ok
Electrical isolation	Check that the inputs are electrical isolated		Ok

7.4 19.4 Test of input sensor interface performance

(7.6.2)

Method of measurement

Connect all inputs and outputs of the EUT as specified by the manufacturer and simulate VDL-messages using test system. Operate inputs with simulated sensor data that are both the relevant data and additional data with formatters not provided for the relevant input. Each sensor input shall be loaded with 70 to 80 percent of the interface's capacity. Record the VDL and output from the EUT's high speed port.

Required results

Verify that the output on the VDL and the presentation interface agree with simulated input and all output data is transmitted without loss or additional delay

6.12.03 wa	Test details - Test of input sensor interface performance		
Test item	Check	Remark	Result
Load all 3 sensor inputs with 70-80 % of the interface's capacity 1 Sensor input at 4800 with position data 1 Sensor input at 4800 with log data 1 Sensor input at 38400 with heading and ROT data			
VDL contents	Check that the VDL contents agree with in input data		Ok
VDO output	Check that VDO outputs on both high speed ports agree with the sensor input data		Ok
Loss of data	Check that VDL messages are transmitted without loss of sensor data		Ok
	Check that output data at VDO output are sent without loss of sensor data		Ok
Delay of data	Check that there is no delay from sensor input change to VDL messages		Ok
	Check that there is no delay from sensor input change to VDO output		Ok

7.5 19.5 Test of sensor input

(7.6.2)

Method of measurement

Set-up standard test environment and operate inputs with simulated sensor data. Record VDL output.

a) simulate sensor information for position, speed, heading, ROT

b) simulate invalid and unavailable data

Required results

a) Verify that the recorded VDL message contents agree with the simulated sensor information.

b) Verify that affected data is set to default values.

Switch off internal GPS to get default values in case of invalid sensor data. The intention of this test is to check the conversion of sensor input data to the VDL messages, VDO output and MKD display including the test, if invalid and unavailable data are recognised.

Fall back behaviour at sensor fail is checked in another test (14.9.3 Monitoring of sensor data).

For message content of VDL messages 1, 2, 3 (position reports) no special test is required. Please enter the results of this test in that test table (go to Information content of msg 1" at the end of this test

7.5.1 GLL sentence

6.12.03 wa	Test details – GLL position input		
Test item	Check	Remark	Result
Apply simulated GLL sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst			
Set status/mode to **A,A** Check on VDL	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Check VDO output on PI	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Check Display on MKD	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **A,D** (differential mode)	Check PA-Flag = 1 on VDL		Ok
	Check PA-Flag = 1 in VDO		Ok
	Check display of differential mode on MKD		Ok
Set status/mode to **V,N** (invalid data) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Check on VDO output of PI	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Check display on MKD	Check latitude = "-----"		Ok
	Check longitude = "-----"		Ok
	Check PA-Flag = 0		Ok
Set status/mode to A,A Change for latitude the number	Check that latitude on VDL is correct for all numbers		Ok

of digits after decimal point from 2 to 6			
Change the latitude to only degrees and minutes, without decimal point	Chack that the latitudo on VDL is correct		Ok
No GBS sentence applied	Check that RAIM-Flag = 0		Ok

7.5.2 GGA sentence

6.12.03 wa	Test details - GGA GPS position input		
Test item	Check	Remark	Result
Apply simulated GGA sentence to the sensor input File name is ais02_gga_vtg_hdt_rot.sst			
Set Mode = 1 (**autonomous**) Check on VDL	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Set mode = 2 (**differential**) Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set mode = 3 (GPS-PPS) Check on VDL	Short check data ok		Ok
	Check PA-Flag = 0 on VDL		Ok
Set mode =4 (RTK fixed) Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set mode =5 (RTK float Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set mode = 6 (dead reck.) Check on VDL	Short check default data		Ok
Set mode = 7 (manual) Check on VDL	Short check default data		Ok
Set mode = 8 (simulated) Check on VDL	Short check default data		Ok
Set mode = 0 (**no fix**) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok

7.5.3 GNS sentence

6.12.03 wa	Test details – GNS satellite position input		
Test item	Check	Remark	Result
Apply simulated GNS sentence to the sensor input, check on VDL File name is ais03_gns_vtg_hdt_rot.sst			
Set Mode = **AA** (autonomous GPS/GLONASS) Check on VDL	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
	Check RAIM-Flag = 0		Ok
Set Mode = AN (autonomous GPS/no GLONASS)	Short check data ok		Ok
	Check PA-Flag = 0 on VDL		Ok
Set Mode = NA (no GPS/ autonomous GLONASS)	Short check data ok		Ok
	Check PA-Flag = 0 on VDL		Ok
Set Mode = **DA** (differential GPS/ autonomous GLONASS)	Short check data ok		Ok
	Check **PA-Flag = 1** on VDL		Ok
Set Mode = DD (differential GPS/ differential GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set Mode = DN (differential GPS/ no GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set Mode = AD (autonomous GPS/ differential GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set Mode = ND (no GPS/ differential GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set Mode = **NN** (no GPS/ no GLONASS)	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok

7.5.4 RMC sentence

6.12.03 wa	Test details – RMC position input		
Test item	Check	Remark	Result
Apply simulated RMC sentence to the sensor input File name is ais04_rmc_hdt_rot.sst			
Set status/mode to **A,A** Check on VDL	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **A,D** (differential mode)	Short check of valid data		Ok
	Check PA-Flag = 1 in VDO		Ok
Set status/mode to **V,N** (invalid data) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **V,A** (invalid data) Check on VDL (Test if also status is evaluated)	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
	Check SOG = 102.3		Ok
	Check COG = 360°		Ok

7.5.5 DTM sentence

6.12.03 wa	Test details – DTM reference datum		
Test item	Check	Remark	Result
Apply simulated position sentences with DTM. Start with datum not WGS 84, change to WGS 84 and back to not WGS 84			
Apply **GLL** sentence with DTM File name: ais1d_gll_dtm_vtg_hdt_rot.sst Datum = not WGS 84	Check on VDL that data are default data		Ok
Set Datum = WGS 84	Check that data are valid		Ok
Set Datum = not WGS 84	Check that data are changed to default		Ok
Apply **GGA** sentence with DTM File name: ais2d_gga_dtm_vtg_hdt_rot.sst Datum = not WGS 84	Check on VDL that data are default data		Ok
Set Datum = WGS 84	Check that data are valid		Ok
Set Datum = not WGS 84	Check that data are changed to default		Ok
Set Datum = WGS 84	To get valid data for further tests		Ok

7.5.6 GBS sentence

6.12.03 wa	Test details – GBS input		
Test item	Check	Remark	Result
Apply simulated gll sentence with GBS sentence to the sensor input File name is ais01g_gll_vtg_gbs_hdt_rot.sst			
Fields with expected error of Lat and Lon contain values	Check that RAIM-Flag = 1		Ok
Fields with expected error of Lat and Lon are empty (NULL fields)	Check that RAIM-Flag = 0	Still = 1 Retest 29.01.04 wa	Ok

7.5.7 VTG sentence

6.12.03 wa	Test details – VTG speed input		
Test item	Check	Remark	Result
Apply simulated VTG sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst			
Set mode to **A** (autonomous) Check on VDL	Check SOG		Ok
	Check COG		Ok
Check VDO output on PI	Check SOG		Ok
	Check COG		Ok
Check Display on MKD	Check SOG		Ok
	Check COG		Ok
Set mode to **D** (differential)	Short check SOG/COG ok		Ok
Set mode to **N (**invalid) Check on VDL	Check SOG = 102.3 (default)		Ok
	Check COG = 360 (default)		Ok
Check VDO output on PI	Check SOG = 102.3 (default)		Ok
	Check COG = 360 (default)		Ok
Check Display on MKD	Check SOG = "-----"		Ok
	Check COG = "-----"		Ok
Set mode to E (estimated)	Short check SOG/COG default		Ok
Set mode to M (manual)	Short check SOG/COG default		Ok
Set mode to S (simulated)	Short check SOG/COG default		Ok
Delete SOG-N field and add SOG K-Field (speed in km/h)	Check SOG value in VDL It has to be converted into knots or set to default		Ok

7.5.8 VBW sentence

6.12.03 wa	Test details – VBW log input with VTG sentence valid		
Test item	Check	Remark	Result
Apply simulated VBW sentence to the sensor input File name is ais06_gll_vtg_vbw_hdt_rot.sst			
Status of bottom track: **A** (valid) Ahead and across speed available. Check on VDL	Check that SOG = resultant of ahead and across speed	SOG from VTG Retest 29.01.04 wa Failed for neg speed values Retest 12.02.04 wa	Ok
	COG = calculated from SOG vector and heading	COG from VTG Retest 29.01.04 wa Failed for neg speed values Retest 12.02.04 wa	Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value		Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value		Ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG from VTG		Ok
	COG from VTG		Ok
Check on VDO output of PI	SOG from VTG		Ok
	COG from VTG		Ok
Check on MKD	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VTG		Ok
	COG from VTG		Ok

6.12.03 wa	Test details – VBW log input, no VTG		
Test item	Check	Remark	Result
Apply simulated VBW sentence to the sensor input, GPS disconnected, No VTG speed available File name is ais08_gll_vbw_hdt_rot.sst			
Status of bottom track: **A** (valid) Ahead and across speed available. Check on VDL	Check that SOG = resultant of ahead and across speed		Ok
	COG = calculated from SOG vector and heading	COG calculation wrong Retest 29.01.04 wa Failed for neg speed values Retest 12.02.04 wa	Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = = VDL COG value		Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = = VDL COG value		Ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG = default		Ok
	COG = default		Ok
Check on VDO output of PI	SOG = default		Ok
	COG = default		Ok
Check on MKD	SOG = default		Ok
	COG = default		Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG = default		Ok
	COG = default		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VBW or default	From VBW	Ok
	COG = default		Ok

7.5.9 OSD sentence

6.12.03 wa	Test details – OSD own ship data input		
Test item	Check	Remark	Result
Apply simulated GLL and OSD sentence to the sensor input. External GLL is required for the test because with internal position the speed is taken from the internal source too. File name is ais09_gll_osd.sst			
Heading status = A (valid) Speed reference = B (bottom) Check on VDL	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Check VDO output on PI	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Check Display on MKD	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Set speed reference to P (Positioning system)	Check SOG and COG from OSD		Ok
Set speed reference to R Radar tracking	Check SOG and COG from OSD		Ok
Set speed reference to W (Water speed)	Check SOG = default		Ok
	Check COG = default		Ok
	Check heading from OSD		Ok
Set speed reference to M (Manual)	Check SOG = default		Ok
	Check COG = default		Ok
	Check heading from OSD		Ok
Set speed reference to P (Positioning system) Set **heading status = V** (invalid)	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading = default		Ok
Change speed reference from N (kn) to K (km/h)	Check SOG value in VDL It has to be converted into knots		Ok

7.5.10 HDT sentence

6.12.03 wa	Test details – HDT heading input		
Test item	Check	Remark	Result
Apply simulated HDT sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst			
Heading value = 359.0	Check heading on VDL		Ok
	Check heading on VDO		Ok
	Check heading in MKD		Ok
Change value to 359.9	Check that heading on VDL = 359 or 0, **not 360**	359	Ok
Delete heading value (empty field)	Check that heading = default on VDL		Ok
	Check that heading = default on VDO		Ok
	Check that heading = default on MKD		Ok
Change talker to “HC” (Magnetic compass)	Check that heading is not used	Not used	Ok
If HC talker data are used: Apply • A HE talker with valid data • A HC talker without data	Check that only HE data are used and not changed sometime to HC data		
Apply • A HE talker with valid data • A HC talker without data	Check that only HE data are used and not changed sometime to invalid		

7.5.11 ROT sentence

6.12.03 wa	Test details – ROT Rate of Turn input		
Test item	Check	Remark	Result
Apply simulated ROT sentence to the sensor input, Talker = TI File name is ais01_gll_vtg_hdt_rot.sst			
ROT status = **A** (valid) ROT value = 0.0 degr./min	Check ROT on VDL		Ok
	Check ROT on VDO		Ok
	Check ROT on MKD	ROT value on MKD is false 10 is displayed as 15 15 is dispplayed as 18 ... retest 29.01.04 wa	Ok
Change rate of turn to different values according to the check column and check the VDL value. The VDL value has to be the nearest value according the conversion formula (see conversion table)	10 converted to 10.0 (15)		Ok
	20 converted to 19.7 (21)		Ok
	60 converted to 61.1 (37)		Ok
	180 converted to 177.2 or 182.8 (63/64)	177.2	Ok
	360 converted to 361.6 (90)		Ok
	720 converted to 708.7 (126)	720.0 retest 29.01.04 wa	Ok
	-20 converted to 19.7 (-21)		Ok
	-720 converted to –708.7 (-126)	-720.0 retest 29.01.04 wa	Ok
Set ROT status = **V** (invalid)	Check that ROT = default on VDL (default = -731.4 = -128)	Value 0 calculation from heading	Ok
	Check that ROT = default on VDO		Ok
	Check that ROT = default on MKD		Ok
ROT status = A (valid) ROT value = 0.0 degr./min Set Talker = HE	Check ROT = 0.0 on VDL		Ok
	Check ROT = 0.0 on VDO		Ok
	Check ROT = 0.0 on MKD		Ok
Change rate of turn to different values according to the check column and check the VDL value. Values have to be according to 6.10.3.6	9 converted to 0		Ok
	11 converted to 720	Still 0 Retest 29.01.04 wa	Ok
	- 9 converted to 0		Ok
	-11 converted to -720	Still 0 Retest 29.01.04 wa	Ok

7.5.12 Additional Tests

6.12.03 wa	Test details – Additional Tests		
Test item	Check	Remark	Result
Apply simulated sensor sentences to the sensor input File name is ais01_gll_vtg_hdt_rot.sst			
Send sentences without checksum, check on VDL	Check position = default	Still valid Retest 29.01.04 wa	Ok
	Check SOG/COG = default	Still valid Retest 29.01.04 wa	Ok
	Check heading = default	Still valid Retest 29.01.04 wa	Ok
	Check ROT = default	Still valid Retest 29.01.04 wa	Ok
Send sentences with false checksum, check on VDL	Check position = default		Ok
	Check SOG/COG = default		Ok
	Check heading = default		Ok
	Check ROT = default		Ok
Back to valid checksum Set baud rate of simulator to 38400 Bd, The purpose is to check if input survives wrong baudrate.	Check position = default		Ok
	Check SOG/COG = default		Ok
	Check heading = default		Ok
	Check ROT = default		Ok
Set baud rate of simulator and sensor input also to 38 400, check on VDL	Check position		Ok
	Check SOG/COG		Ok
	Check heading		Ok
	Check ROT		Ok

7.5.13 Compatibility check

For the practical use of AIS transponders mainly in case of retrofit it may make sense that the AIS transponder is compatible to older versions of IEC 61162.

Therefore we accept if an EUT evaluates also sentences according to IEC 61162 Eddition 1 (1995)

This is not a test of required functions of the EUT but a record of the capabilities of the AIS transponder.

6.12.03 wa	Test details – Compatibility check		
Test item	Check	Remark	Result
Apply simulated sensor sentences to the sensor input File name is ais01_gll_vtg_hdt_rot.sst			
GLL sentence	Record if position is used		Ok
Without mode indicator	Check that PA flag is set to 0		Ok
RMC sentence	Record if position is used		Ok
Without mode indicator	Check that PA flag is set to 0		Ok
VTG sentence Without mode indicator	Record if SOG/COG is used		Ok
Priority check: • GGA sentence and	Check that GGA sentence is used	If GGA sentence is implemented	Ok
• GLL sentence without mode indicator	Check that data frome GLL are not used		Ok

7.5.14 Check of different inputs

6.12.03 wa	Test details – Different inputs		
Test item	Check	Remark	Result
Apply simulated sensor sentences to the sensor inputs File name of 1st part is ais01_gll_vtg_hdt_rot.sst			
Connect simulator to sensor input 2. Change configuration according to the used input	Check position		Ok
	Check SOG/COG		Ok
	Check heading		Ok
	Check ROT		Ok
Connect simulator to sensor input 3. Change configuration according to the used input	Check position		Ok
	Check SOG/COG		Ok
	Check heading		Ok
	Check ROT		Ok
• Connect simulator output 1 to sensor input 1 and apply GLL and VTG. File name is ais10_gll_vtg.sst • Connect simulator output 2 to sensor input 2 and apply VBW . , File name is ais11_vbw.sst • Connect simulator output 3 to sensor input 3 and apply HDT and ROT. File name is ais12_hdt_rot.sst	Check position		Ok
	Check SOG and COG		Ok
	Check heading		Ok
	Check ROT		Ok

7.5.15 Sensor sentences overview

	Supported sentences overview			
Sentence	Description	Required	Supported	Result
This list is derived from the results of the above tests of the single sentences for overview, not an additional test				
GLL	Geographical Latitude Longitude	required	Yes	Ok
GGA		optional	Yes	Ok
GNS		required	Yes	Ok
RMC		required (COG)	Yes	Ok
DTM		required	Yes	Ok
GBS		required	Yes	Ok
VTG	Velocity True Ground	optional	Yes	Ok
VBW	Velocity Bottom Water	required	Yes	Ok
OSD	Own Ship Data	optional	No	Ok
HDT	Heading	required	Yes	Ok
ROT	Rate of Turn	required	Yes	Ok

7.6 19.6 Test of high speed output

(7.6.3)

Method of measurement

Set_up standard test environment and simulate VDL-position reports using test system. Record output from the EUT high speed port (see table 11).

Required results

Verify that the recorded message contents agree with the simulated VDL contents (VDM) and own transmitted data (VDO) and in accordance with the sentence specifications of IEC 61162-1.

This contents of VDM and VDO are checked in

- 4.7.1 16.7.1 Received messages and
- 4.7.2 16.7.2 Transmitted Messages

7.6.1 VDM – Received message

6.12.03 wa	Test details – Content of received messages		
Test item	Check	Remark	Result
Transmit all types of messages from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Message id	8 binary broadcast message, multiy slot File name: AIBBM_multi_bin.sst		
Number of sentences	Check that value = 3	3	Ôk
Check sentence number	Check that value = 1,2,3 according to length of message		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Always 1 Retest 29.01.04 wa	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 1008 bit)		Ok
Message id	Safety related broadcast message, multi slot File name: AIBBM_multi_safety.sst		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Always 1 Retest 29.01.04 wa	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 1000)		Ok
	Additional checks		
Length of sentence	Confirm that no sentence exceeded the length of 82 character (no warning from monitor program)	Second sentence of transmission with AIBBM_multi_xxx.sst more than 82 char. Retest 29.01.04 wa	Ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

7.6.2 VDO Transmitted messages

6.12.03 wa	Test details – Content of transmitted messages		
Test item	Check	Remark	Result
Transmit all applicable types of messages Check the field content of the fields listed under Test item.			
Message id	8 binary broadcast message, multiy slot File name: AIBBM_multi_bin.sst		
Number of sentences	Check that value = 3	3	Ôk
Check sentence number	Check that value = 1,2,3 according to length of message		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Always 1 Retest 29.01.04 wa	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 1008 bit)		Ok
Message id	Safety related broadcast message, multi slot File name: AIBBM_multi_safety.sst		
Number of sentences	Check that value = 3	3	Ôk
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	Always 1 Retest 29.01.04 wa	Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 1000 bit)		Ok
	Additional checks		
Length of sentence	Confirm that no sentence exceeded the length of 82 character (no warning from monitor program)	Second sentence of transmission with AIBBM_multi_xxx.sst more than 82 char. Retest 29.01.04 wa	Ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

7.7 19.7 High speed output Interface performance

(7.6.3)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Increase the VDL load to >90%. Record transmitted messages and check PI output of EUT on port for "external Display" and "auxiliary Display".

Required results

Confirm that EUT outputs all received messages to the PI. Repeat test for port "auxiliary display".

Date	Result	Status
01.12.03 Ba	It is not completely clear how to interprete the results. In any case, we could not get more then about 85 % output. In the lower band the receiving probability seems to be generally not sufficient (see 20% test) but the 90% test has a even lower probability. Ín the lower band be know that the VDL analyser output has an effect that decreases the Rx probability of up to 10 % in 90% load test, but the result is much lower.	
19.01.04 Ba 12.02.04 Ba	Retest: Result is 94% on channel A and 88 % on channel B. A modified target timing (30 Tx – 3 free slots) is used to avoid the VDL generator problem A test over 34 min. showed a rx probability of 86%/87%. In any case the Rx probability at 90% load is much lower than at lower load (20% or 2s reporting rate). So it still seems to be a performance problem	
24.02.04 Ba	Retest: Test on channel 2084 and 2086, Result is 99% on both channels over a time of 15 min	Ok

7.8 19.8 Test of high speed input

(7.6.3)

Method of measurement

Set-up standard test environment. Apply simulated input data, in accordance with the sentence specifications of IEC 61162-1 and 7.6.3.3 table 10, to the EUT and record VDL output.

Required results

Verify that the VDL message contents agree with simulated input data.

Date	Format	Result	Status
	VSD	See test details below	
	SSD	See test details below	

All other sentences are tested in special test items

6.12.03 wa	Test details – Evaluation of SSD sentence		
Test item	Check	Remark	Result
Apply an SSD sentence to an high speed input (PI)			
VDL transmission	Check that msg 5 is transmitted after change of data by SSD sentence		Ok
Call sign	Check that the new call sign is transmitted in msg 5		Ok
	Check that the new call sign is displayed on MKD	Menu not active Retest 12.02.04 wa	Ok
Ship's name	Check that the new ship's name is transmitted in msg 5		Ok
	Check that the new ship's name is displayed on MKD	Menu not active Retest 12.02.04 wa	Ok
A – Distance from bow B – Distance from stern C – Distance from port D – Distance from starboard	Check that the new dimensions are transmitted in msg 5		Ok
	Check that the new dimensions are displayed on MKD		Ok
DTE indicator flag	Check if the DTE flag is entered in VDL message 5 Not required		Ok

6.12.03 wa	Test details – Evaluation of VSD sentence		
Test item	Check	Remark	Result
Apply an VSD sentence to an high speed input (PI)			
VDL transmission	Check that msg 5 is transmitted after change of data by VSD sentence		Ok
Navigational status	Check that the new Navigational status is transmitted in msg 1		Ok
	Check that the Navigational status is displayed on MKD		Ok
Type of ship and cargo	Check that the new type is transmitted in msg 5		Ok
	Check that the new type of ship is displayed on MKD		Ok
Maximum actual static draught	Check that the new draught is transmitted in msg 5		Ok
	Check that the new draught is displayed on MKD		Ok
Destination	Check that the new destination is transmitted in msg 5		Ok
	Check that the new destination is displayed on MKD		Ok
Estimated Time of Arrival (ETA)	Check that the new ETA is transmitted in msg 5		Ok
	Check that the new ETA is displayed on MKD		Ok
Regional application flag	Check if the regional application flag is entered in VDL message 1		Ok
Persons on board	Check if the persons on board are displayed on MKD Not required		Ok

6.12.03 wa	Test details – Evaluation of VSD sentence		
Test item	Check	Remark	Result
Apply an VSD sentence to an high speed input (PI)			
VDL transmission	Check that msg 5 is transmitted after change of data by VSD sentence		Ok
Navigational status	Check that the new Navigational status is transmitted in msg 1		Ok
	Check that the Navigational status is displayed on MKD		Ok
Type of ship and cargo	Check that the new type is transmitted in msg 5		Ok
	Check that the new type of ship is displayed on MKD		Ok
Maximum actual static draught	Check that the new draught is transmitted in msg 5		Ok
	Check that the new draught is displayed on MKD		Ok
Destination	Check that the new destination is transmitted in msg 5		Ok
	Check that the new destination is displayed on MKD		Ok
Estimated Time of Arrival (ETA)	Check that the new ETA is transmitted in msg 5		Ok
	Check that the new ETA is displayed on MKD		Ok
Regional application flag	Check if the regional application flag is entered in VDL message 1		Ok
Persons on board	Check if the persons on board are displayed on MKD Not required		Ok

8 20 DSC functionality tests

(M.1371 A3)

8.1 20.1 General

(M.1371 A3/1)

(a) For the tests in this clause, set the EUT into autonomous mode using channels AIS1 and AIS2 with a reporting interval of 2 s (for method of measurement see also IEC 61993-1).

(b) Check with a sequence of valid calls consisting of a test signal number 1, a geographic call from ITU-R M.493, a test signal number 1, an individual call from ITU-R M.493 and a test signal number 1 that the EUT correctly receives and processes the three tests calls and its correct AIS operation is not affected by the interleaved calls.

(c) Check that the EUT does not respond to invalid calls - incorrect MMSI, position outside addressed geographic area, different course, or ship's type.

(d) Send to the EUT a standard test signal number 1 but with symbol numbers 104 and 03 followed by values 01 and 120 (Activate alternate system with group number 1 and sequence number 120). Check that the EUT does not respond.

28.11.03 Ba	Test details – General DSC functions check		
Test item	Check	Remark	Result
This is a first check that DSC transmission, reception and addressing is working in principle. Special addressing and data content checking is done in special tests			
Start DSC transmission of Test signal 1 (Position and name request) File name is "eut\Test_Signal_1.sst"	Check that the call is answered -> Contents are checked in a special test	No response Retest 15.01.04 Ba: No response Retest 09.02.04 Ba: With a modified MMSI (0 at beginning instead of at the end as required the EUT transmits a response. The further tests are done with a modified MMSI Retest 13.02.04 Ba: MMSI is used correctly now	Ok
Start DSC transmission of area addressed call (Position and name request) File name is "area_pos_name_rq.sst"	Check that the call is answered within 20 s Contents are checked in a special test	No response Retest 15.01.04 Ba: No response Retest 09.02.04 Ba: Response ok	Ok

10.02.04 Ba	Test details (b) – Sequence of 5 calls		
Test item	Check	Remark	Result
Set reporting interval to 3 s and record VDL			
Start DSC transmission of test sentence File name is "eut\Sequence_20_1.sst" Delay between the calls is 3 s	Check that the three test signal 1 calls are acknowledged		Ok
	Check that the two M.493-calls are not acknowledged		Ok
	Check that the schedule of the AIS position reports is not changed by the transmission of the DSC calls		Ok
Increase the channel load so that there are no 20 free succeeding slots (1 position report every 5 s) Transmit test signal 1	Check that no responses are transmitted by the EUT		Ok

10.02.04 Ba	Test details (c), (d) – Check of addressing		
Test item	Check	Remark	Result
Start DSC transmission of Test signal 1 (Position and name request) File name is "eut\Test_Signal_1.sst" Change MMSI according to the test item			
With correct MMSI	Check that the call is answered		Ok
Change MMSI to not matching value	check that call is not answered		Ok
Start DSC transmission of area call (Position and name request) File name is "area_pos_name_rq.sst" Change position, course and type of ship according to the test item			
Position inside area	Check that the call is answered within 20 s		Ok
Change position to outside the area,	check that call is not answered		Ok
Position inside area again, add course matching the course of ship,	check that call is answered		Ok
Change course to a value differing > 2 degrees	Check that call is not answered		Ok
Delete course, add matching type of ship	check that call is answered		Ok

Change type of ship to All ships of this type	check that call is answered		Ok
Change type of ship	Check that call is not answered		Ok
Position inside area , area now in a critical region (lon about 180 degr.) File name =area_pos_name_rq_180.sst	Check that the call is answered within 20 s		Ok
Change position to outside the area,	check that call is not answered		Ok
Start DSC transmission of Selective call with command “Activate alternate system” File name is “eut\sel_act_alt_system.sst”			
Sel. Call with symbols: 104+03+01+120 (68+03+01+78)hex	Check that EUT does not transmit a response		Ok

8.2 20.2 Regional area designation

(M.1371 A3/5)

Perform the test specified in 17.2 using the following DSC command:

Send to the EUT a standard test signal number 1 but with symbol numbers appropriate to the geographical regions and channels specified in the test. Note the transition boundary is 5nm in this test.

10.02.04 Ba	Test details – Regional area designation		
Test item	Check	Remark	Result
Send a selective region setting call File name “eut\sel_set_region.sst”	Check that an acknowledgement is received		Ok
	Check that an ACA sentence is output at PI port		Ok
	Check that new region is stored in the region list of the EUT		Ok
	Check that transition zone is 5 nm		Ok
Send a area addressed region setting call File name “area_set_region.sst”	Check that an acknowledgement is received		Ok
	Check that an ACA sentence is output at PI port		Ok
	Check that new region is stored in the region list of the EUT		Ok

Send a selective call with channel setting in the area in use. File name"eut\sel_set_ais_channel_65.sst"	Check that an acknowledgement is received		Ok
	Check that an ACA sentence is output at PI port	An ACA sentence is output but the in use flag is set to 0 Retest 13.02.04 Ba: The in use flag is set to 1	Ok
	Check that AIS channels are set according to the call content		Ok
	Check that new AIS channels are used for transmission and reception		Ok

10.02.04 Ba	Test details – Channel management test of 17.2		
Test item	Check	Remark	Result
Set-up EUT in autonomous mode transmitting on channel AIS1/AIS2, send 2 DSC messages, defining 2 adjacent areas with channels A1, B1 and A2, B2. File name is area_set_region_20_2.sst Use external sensor input to simulate a voyage through both areas. Set the position outside the areas. Set the positions near the limits of the transitional zones to check the dimensions. The transitional zone is 5 nm by default			
MKD display defined area	Check that the defined areas are correctly displayed on MKD or output as ACA on request	Displayed on MKD and output as ACA	Ok
Item 1:	Check that channels AIS1 and AIS2 are in use		Ok
Item 2: Move position into transitional area of region 2	Check the size of transitional zone	The border of the TZ is between 54°08 and 54°09. It seems that the calculation of TZ size in min. which has to be used for the lon is also used for the lat. For lat 1 min is always 1 Nm Retest 13.02.04 Ba: Border is now at 5 nm = 5 min	Ok
	Check that channel AIS 1 and A2 are used		Ok
	Check that reporting rate is doubled		Ok
Item 3: Move position into region 2	Check border of area		Ok
	Check the inner size of transitional zone	TZ size is about 8 min = 8 Nm See above Retest 13.02.04 Ba: Border is now at 5 nm = 5 min	Ok

	Check that channel A2 and B2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 4: Move position into transitional area between region 1 and 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 5: Move position into region 1	Check that channels A1 and B1 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Move position into transitional area of region 1	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the transitional zone of region 1	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

8.3 20.3 Scheduling

(M.1371 A3/2)

Check that the time sequence of the TDMA messages is not changed when the EUT transmits a DSC signal.

Send a valid geographical call to the EUT. Check that the response is transmitted after a random delay distributed over the range of 0 to 20 s and subject to the restrictions of ITU-R M.1371 A3/2.2..

Send a valid geographical call to the EUT followed by a signal consisting of test signal 1 with a signal level of -107 dBm at the receiver input of 25 s duration. Check that the response is not transmitted.

10.02.04 Ba	Test details – Scheduling		
Test item	Check	Remark	Result
Set reporting interval to 2 s and record VDL			
Start DSC transmission of test signal 1 File name: "eut\test_signal_1.sst" Delay between calls is 3 s	Check that the schedule of the AIS position reports is not changed by the transmission of the DSC calls		Ok
Send area addressed calls with a rate of 30 s for about 30 min. File name is "area_pos_name_rq.sst"	Record the transmissions and responses with time stamp and enter delay times in a prepared Excel sheet. Add diagram and check times		Ok
Start DSC transmission Test sequence 20.3 (Area call + 25 s test signal 1) File name: "test_sequence_20_3.sst"	Check that EUT does not transmit a response	In 2 of 5 test there was a response Retest 09.03.04 Ba: No response in 3 tests	Ok

8.4 20.4 Polling

(M.1371 A3/3)

(a) Check that the EUT is capable of receiving, processing and automatically transmitting a response to the following calls from ITU-R M.825: 101 (command to duplex-channel), 102, 103, 108, 109, 111, 112, and 116. The sequence of calls consisting of test signals number 1 and valid geographic calls shall demonstrate the capability of the EUT to operate on single frequency channels as well as on two frequency channels.

(b) Verify through this test, that ships maritime mobile service identify (MMSI), ship name, ships length and type of ship is programmed into the EUT.

(c) Send a standard test signal number 1 with additional symbols number 109 and 116 and check that the reply messages 100, 119 and 120 are programmed automatically.

(d) Check that when information is not available to respond to a command the transmitted response is followed by the symbol 126.

(e) Send a standard test signal number 1 with additional symbol 101 followed by channel number 87. Repeat the test with channel number 88 and with symbol 104 and 00 followed by channel number 2087 and 2088. Check in all cases that the response is made on channel 70.

(f) Send a DSI sentence to CH 4 and CH 5 (see annex D) with an individual station address and with command sets 103 (report your position) and 111 (report ship name). Check that the EUT does not transmit a DSC message.

(g) Set the RF output power of the EUT high / low using the appropriate DSC command. Check that the output power is set accordingly.

10.02.04 Ba	Test details (a),(b),(c) – Information polling		
Test item	Check	Remark	Result
Start DSC transmission of Test signal 1. File name is "eut\Test_Signal_1.sst". Modify sentence according test item			
Set channel (101+xx) (101+ch 72) (65h+48h)	Check that direct answer on channel xx		Ok
	Check if following answers on channel xx		Ok
Request automatic position report (102+xx) (66 xx) hex	Check that immediate response with EOS=BQ is received		Ok
	Check automatic reporting rate	The automatic position reports are transmitted by EUT but not received by test equipment. It seems that there is a failure in the call content, e.g. wring MMSI. All other calls from EUT are received by BSH test equipment. <u>Retest 13.02.04 Ba:</u> Automatic position reports are received now	Ok
	Check that further TX are transmitted with EOS = RQ (117)		Ok
	Check that automatic reporting is finished after 5 transmissions (without ackn. by base station)		Ok
	Check that the automatic reporting is not finished with ackn. by base station.		Ok
Send message with 102+00 (66 00) hex	Check that the automatic position report is finished		Ok
Request position (103) (67 hex)	Check position in response		Ok
	Check time		Ok
	Check type of ship		Ok
Request length of ship (108=6Ch)	Check length of ship (124=7Ch)		Ok
Request course (109=6Dh)	Check course (119=77h)		Ok
Request ships name (111=6Fh)	Check name (115=73h)		Ok
Request ackn. (112=70h)	Check ackn. (110=6Eh)		Ok
Request speed (116=74h)	Check speed (120=78h)		Ok
(C) Request test signal 1 (pos, name request) + 109 + 116 (6F 67 6D 74))	Check automatic response submitting • name (115=73h), • position (100=64h), • course 119=77h) and • speed (120=78h)		Ok

Send • modified test signal 1 (101+72)=(65h+48h) (set DSC channel to a simplex channel) + • Geographically addressed call. File: sel_check_channel.sst	Check that the communication on selected simplex channel is working		Ok
Send • Modified test signal 1 (101+60) =(65h+3Ch) (set DSC channel to a duplex channel) + • Geographically addressed call.	Check that the communication on selected duplex channel is working		Ok
	Check that the AIS transmits on the ship station frequency of the duplex channel (lower band frequency)		Ok

10.02.04 Ba	Test details (d) – polling, information not available		
Test item	Check	Remark	Result
Start DSC transmission of Test signal 1. File name is “eut\Test_Signal_1.sst” Change request symbols according to the test item.			
Request position (103 = 67h)	Check response = (100+126) = (64 7E)h		Ok
Request length of ship (108 = 6Ch)	Check length of ship (124+126) = (7C 7E)h		Ok
Request course (109 = 6Dh)	Check course (119 + 126) = (77 7E)h		Ok
Request ships name (111 = 6Fh)	Check name (115 + 126) = (73 7E)h	Name annot be deleted	---
Request speed (116 = 74h)	Check speed (120 + 126) = (78 7E)h		Ok

10.02.04 Ba	Test details (e) – Use of AIS channels for DSC		
Test item	Check	Remark	Result
Start DSC transmission of Test signal 1. File name is “eut\Test_Signal_1.sst”. Modify sentence according test item			
Set channel (101+87) (65 57) + 67 (pos requ.)	Check that response is transmitted on channel 70		Ok
Set channel (101+88) (65 58) + 67	Check that response is transmitted on channel 70		Ok
Set channel (104+00+2087) (68 00 14 57) + 67	Check that response is transmitted on channel 70		Ok
Set channel (104+00+2088) (68 00 14 58) + 67	Check that response is transmitted on channel 70		Ok

10.02.04 Ba	Test details (f) – DSI sentence check		
Test item	Check	Remark	Result
Apply DSI sentence to the PI interface. File name is ais_dsi.sst			
ON CH4 = PI interface	Check that the EUT does not transmit a DSC message.		Ok

10.02.04 Ba	Test details (g) – Power setting check		
Test item	Check	Remark	Result
Start DSC transmission of Test signal 1. File name is "eut\Test_Signal_1.sst". Modify sentence according test item			
Ad symbols to set power = 2 watt (low power) (Symbols 104+ 01+ 02) (68 01 02) h	Check that response is transmitted with low power	No response, Tx power is not changed Retest 13.02.04 Ba: Power is set to low power	Ok
Request position (103 = 67 h)	Check that response is transmitted with low power		Ok
	Retest 13.02.04 Ba: There was a break in the response call so that it could not be received. In nav mode 1 (at anchor) there was no break in the call Retest 11.03.04 Ba: The response of power setting is transmitted now with the correct power and without break or changing power during the call. It has been tested in "at anchor" mode and in mode "under way using engine"		Ok
Ad symbols to set power = 12.5 watt (high power) (Symbols 104+ 01+ 12) (68 01 0C) h	Check that response is transmitted with high power		Ok
Request position (103 = 67 h)	Check that response is transmitted with high power		Ok

9 21 Long Range functionality tests

(9)

9.1 21.1 LR interrogation

(9.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Apply a LR addressed interrogation message to the LR-interface port of EUT; Record LR output port and AIS high-speed output port Set EUT to

- *Automatic response*
- *Manual response via MKD*
- *Manual response via PI*

Required results

Check that EUT displays LR interrogation messages and sends to PI.

Check that EUT outputs a LR position report message

- *Automatically (and indicates action on display)*
- *After manual confirmation via MKD*
- *After manual confirmation via PI*

6.12.03 wa	Test details – LR automatic response, all data		
Test item	Check	Remark	Result
Set EUT to automatic response. Apply an addressed request to the LR port of EUT requesting all possible information File name: LRI_LRF_MMSI_all.sst			
Response	Check that a response is output on LR port		Ok
Display on MKD	Check that the request is displayed on MKD		Ok
	Check that replay status is displayed on MKD		Ok
PI output	Check that LR interrogation and response is output on PI		Ok
Contents of LRF response	Check output of LRF sentence		Ok
	Check that sequence number = request		Ok
	Check MMSI = requestor		Ok
	Check name of requestor		Ok
	Check function request = request		Ok
	Check that function reply is according to the availability of data (2=avail, 3= not av.)		Ok
Contents of LR1 response	Check output of LR1 sentence		

	Check that sequence number = request = LRF		Ok
	Check own MMSI		Ok
	Check MMSI of responder = responder of request		Ok
	Check ship's name		Ok
	Check Call sign		Ok
	Check IMO number		Ok
Contents of LR2 response	Check output of LR2 sentence		Ok
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder = responder of request		Ok
	Check date, UTC		Ok
	Check Lat, Lon		Ok
	Check COG		Ok
	Check SOG		Ok
Contents of LR3 response	Check output of LR3 sentence		Ok
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder = responder of request		Ok
	Check destination		Ok
	Check ETA		Ok
	Check draught		Ok
	Check ship/cargo		Ok
	Check length of ship		Ok
	Check breadth of ship		Ok
	Check ship type		Ok
	Check persons		Ok

6.12.03 wa	Test details – LR automatic response, selected data		
Test item	Check	Remark	Result
Set EUT to automatic response. Apply an addressed request to the LR port of EUT requesting selected information File name: LRI_LRF_MMSI_all.sst, modified by deleting not requested information			
Request A Name Call sign IMO number	Check that only LF and LR1 is transmitted	Also LR2 and LR3	acc
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that the requested fields are not empty		Ok
Request A,E,F Name Call sign IMO number COG SOG	Check that only LF and LR1 and LR2 is transmitted	Also LR3	acc
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided		Ok
	Check that only requested fields are not empty		Ok
Request C,E,F Position COG SOG	Check that only LF and LR2 are transmitted	Als LR1 and LR3	Acc.
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided		Ok
	Check that only requested fields are not empty		Ok
Request P,W Ship/cargo Persons	Check that only LF and LR3 is transmitted	Also LR1 and LR2	Acc.
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided		Ok
	Check that only requested fields are not empty		Ok

6.12.03 wa	Test details – Manual Confirmation		
Test item	Check	Remark	Result
Set EUT to manual response. Apply an addressed request to the LR port of EUT requesting all possible information File name: LRI_LRF_MMSI_all.sst			
Display on MKD	Check that the request for manual response is displayed on MKD		Ok
	Check that response is transmitted after manual confirmation on MKD		Ok

16.02.04 Ba	Test details – Confirmation via PI		
Test item	Check	Remark	Result
Set EUT to external or manual confirmation as implemented Apply an addressed request to the LR port of EUT requesting all possible information File name: LRI_LRF_MMSI_all.sst			
Confirmation via PI	Check that the request for manual response is output on PI (Copy of long range request input)		Ok
	Check that response is transmitted after external confirmation via PI		Ok

9.2 21.2 LR “all ships” interrogations

(9.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Apply a LR “all ships” interrogation message to the LR-interface port of EUT defining a geographical area which contains own ships position; Record LR output port. Set EUT to

- *Automatic response*
- *Manual response.*

Repeat check with own ship outside specified area.

Required results

Check that EUT outputs a LR position report message

- *Automatically (and indicates action on display)*
- *After manual confirmation.*

No response shall be output on the repeat check.

6.12.03 wa	Test details – Area addressing - Automatic response		
Test item	Check	Remark	Result
Set EUT to automatic response Apply an area addressed request to the LR port of EUT requesting position and speed information			
Own position in Area File name: LRI_LRF_area_CEF.sst	Check that the request is automatically responded		Ok
	Check that the request and response status is displayed on MKD		Ok
	Check that the request and response is output on PI		Ok
Own position not in Area File name: LRI_LRF_out_area_CEF.sst	Check that the request is not responded		Ok
	Check that the request is not displayed on MKD		Ok
	Check that the request is not output on PI		Ok

6.12.03 wa	Test details – Area addressing – Manual confirmation		
Test item	Check	Remark	Result
Set EUT to manual response Apply an area addressed request to the LR port of EUT requesting position and speed information			
Own position in Area File name: LRI_LRF_area_CEF.sst	Check that the request is displayed on MKD		Ok
	Check that response is transmitted on confirmation on MKD		Ok
	Check that the request and response is output on PI		Ok
Own position not in Area File name: LRI_LRF_out_area_CEF.sst	Check that the request is not displayed on MKD		Ok
	Check that the request is not output on PI		Ok

9.3 21.3 Consecutive LR "all ships" interrogations

(9.2)

Method of measurement

Set-up standard test environment and operate EUT in autonomous mode. Set EUT to automatic mode. Apply 5 LR "all ships" interrogation messages to the LR-interface port of EUT defining a geographical area which contains own ships position;

Record LR output port. Set the control flag in the LRI message to

- *0 (reply on first interrogation only)*
- *1 (reply on all applicable interrogations)*

Required results

Check that EUT outputs a LR position report message

- *On the first interrogation only*
- *On all interrogations.*

6.12.03 wa	Test details – Area addressing - Automatic response		
Test item	Check	Remark	Result
Set EUT to automatic response Apply some area addressed requests to the LR port of EUT requesting position and speed information File name: LRI_LRF_area_CEF.sst			
Control flag = 1 (reply on all requests)	Check that the 1. request is automatically responded		Ok
	Check that the following interrogations are responded		Ok
Control flag = 0 (reply only on first request) Change MMSI to get the first response	Check that the 1. request is automatically responded		Ok
	Check that the following interrogations are not responded		Ok
	Check that the following interrogations are not displayed on MKD		Ok
	Check that the following interrogations are not output on PI		Ok

Annex A Test equipment

A.1 Test equipment summary

#	description	type	identification
1	VDL analyser / Generator	Attingimus UAIS Test unit	S/N 001 BSH PC5593 SW AISterm V1.0rev47 AISmain V1.47011120R
2	Target simulator	Simutech	BSH PC3007 SW BSHSIM7T
3	Presentation Interface Monitor	BSH	BSH PC 3481 BSH PC 3544 SW NewMoni V2.1
4	DSC Testbox	DEBEG 3817 DEBEG 6348	S/N 475533
	Auxiliaries:		
5	Digital Multimeter	Voltcraft	S/N 1010365036
6	Fluke Scopemeter	123	BSH 101275/2001
7	5 Converters RS 422 to RS 232		
8	1 fixed voltage power supply (24 V/10A)		
9	3 adjustable power supplies (30 V/5 A)		
10	active retransmitting GPS antenna		

for a description of pos. 1-4 see below

A.1.1 VDL analyser / generator

The VDL analyser/generator:

- receives the radio data telegrams transmitted by the AIS under test, slotwise evaluates their radio parameters (field strength, SNR, etc.) and provides a transparent display of the decoded radio data telegrams (VDL messages).
- transmits radio data telegrams which have been entered/edited via a control panel. The AIS under test receives these messages and either passes the received data to it's presentation interface and/or responds as appropriate.
- records all data contained in the received radio telegrams and radio parameters in a data base for offline evaluation and documentation purposes.
- simulates AIS targets by transmitting position reports of virtual targets up to the maximum channel capacity.

A.1.2 Target simulator

The target simulator consists of a standard PC with

- special Radar and Target Simulator software
- extension boards for generation of Radar signals and RS422 serial output signals

Connection of AIS Test system
For tests of AIS transponders the data of 60 moving targets defined in the Radar Simulator are transferred to the VDL Generator and transmitted on VHF. Thus the AIS VHF data link is loaded with simulated AIS targets.
Connection of display systems
Radar systems as well as ECDIS systems will have the ability to receive, process and display AIS information in the near future. In order to test this feature the data of moving targets defined in the Radar Simulator are transferred to the RADAR (together with video, sensor data etc as known).
Connection of AIS under Test
The AIS under test can be connected to the own ship sensor outputs in order to provide full control over own ships dynamic data (for tests of reporting rates, channel management...).

A.1.3 Presentation Interface Monitor

The Presentation Interface Monitor is a PC software running on two standard PCs.
It is used to

- simulate Sensor inputs
- analyse the AIS high speed input / output
- analyse the AIS long range function
- generate DSC calls for the DSC test box and to display, log and evaluate the received DSC calls from EUT.

For that purpose it includes the functions:

- coding / decoding of NMEA 6-bit data fields
- online AIS message filtering
- online AIS message editing
- load and transmit predefined sequences
- online modification of transmitted sequences

A.1.4 DSC Testbox

The DSC test box includes:

- A standard VHF DSC controller DEBEG 3817 with open interface
- A standard VHF radiotelephone DEBEG 6348

The software modification of the DSC controller comprises a remote control input/output facility

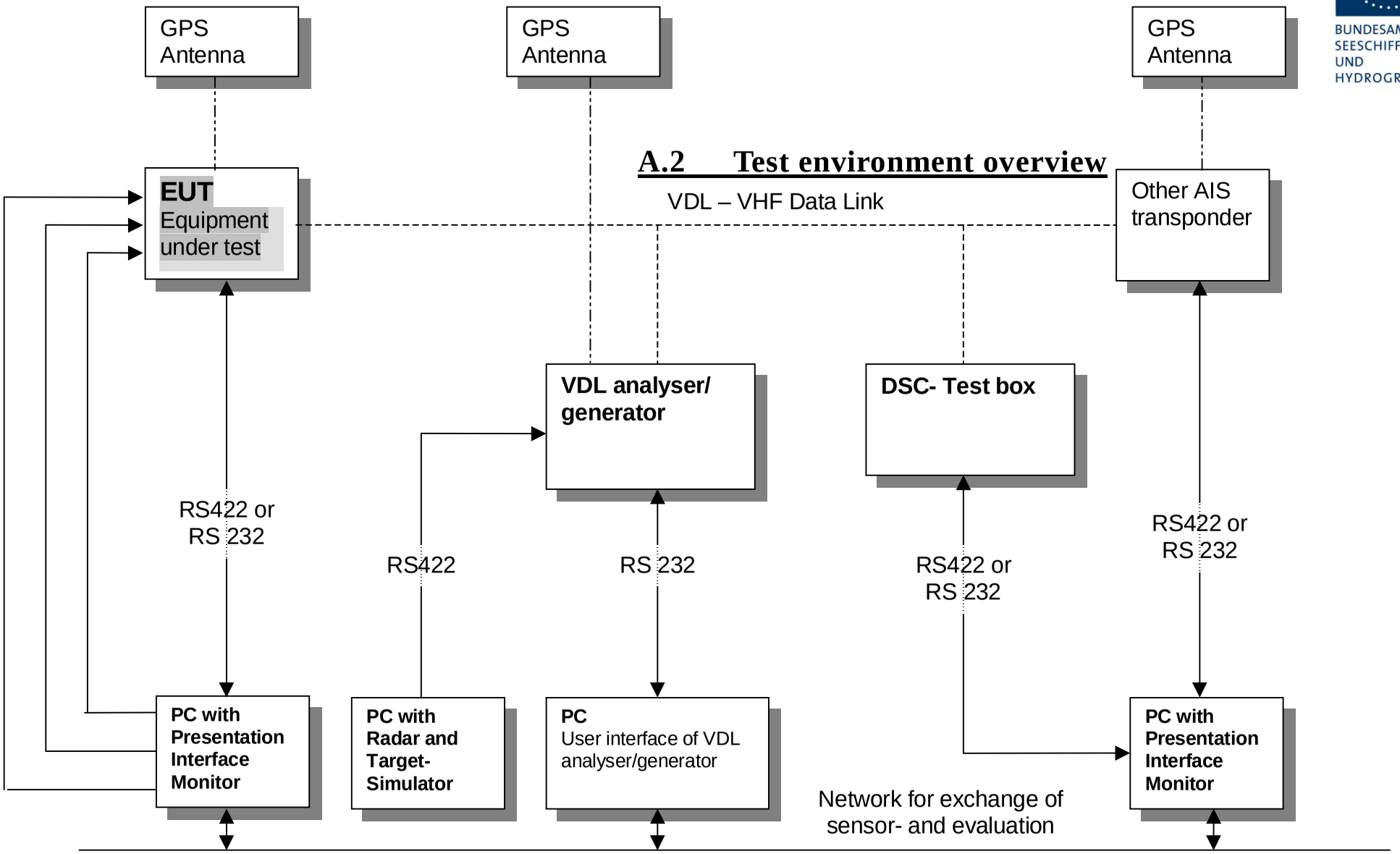
- to transmit DSC calls according to ITU 825-3 generated in an external device on DSC channel 70 and
- to output received DSC calls from the EUT to the external device.

The Presentation Interface Monitor is used to generate the DSC calls and to display, log and evaluate the received DSC calls.

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

A.2 Test environment overview

VDL – VHF Data Link



Annex B Test sentences

B.1 IEC 61162 test sentences

Many of the test sentences are modified manually during the test according to the requirements of the actual test items.
Mainly the MMSI in all addressed sentences are adapted to the actual MMSI of the EUT or of the unit the EUT communicates with.
In addition the files containing these sentences contain also some control information used by the monitor program like:

<UTC> is replaced by the actual UTC time at time of output
<WAIT EVENT> waiting for user action before next output
<WAIT xxxx> waiting xxx ms before next output

This control information is not shown in the following sentence examples because it is not sent to the EUT.

B.1.1 Sensor input

Sensor input sentences	
File name	Description
Sentences	
AIS01_gll_vtg_hdt_rot.sst	Standard sensor input sentences
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS01d_dtm_gll_vtg_hdt_rot.sst	Standard sensor input with DTM
Similar files with an additional DTM sentence are also available for the other position sentence sets and not listed explicitely	
$GPDTM,w84,,,,,,,P90 $GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS01g_gll_vtg_gbs_hdt_rot.sst	Standard sensor input with GBS sentence
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A $GPGBS,141800.00,2.6,2.8,4.2,,,, $TIHDT,359.9,T $TIROT,0.0,A	
AIS01x_gll_vtg_hdt_rot_180.sst	Standard sensor input at Longitude of 180°

$GPGLL,0001.00,N,17959.00,W,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS02_gga_vtg_hdt_rot.sst	Sensor Input set with GGA position
$GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M,,, $GPVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS02d_dtm_gga_vtg_hdt_rot.sst	Sensor Input set with GGA position and DTM
$GPDTM,999,,,,,,,P90 $GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M,,, $GPVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS03_gns_vtg_hdt_rot.sst	Sensor input set with GNS position
$GNGNS,122500.00,5330.1234,N,01001.2345,E,AA,5,1.2,35.5,41.1,, $GNVTG,350.0,T,,M,10.0,N,,K,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS04_rmc_hdt_rot.sst	Sensor input set with RMC position and speed
$GPRMC,122500.00,A,5330.1234,N,01001.2345,E,11.2,352.2,120202,2.0,E,A $TIHDT,359.9,T $TIROT,0.0,A	
AIS06_gll_vtg_vbw_hdt_rot.sst	Sensor input set with speed by VBW and VTG
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A $VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V $TIHDT,359.9,T $TIROT,0.0,A	
AIS07_osd.sst	Single OSD sentence
$INOSD,359.9,A,5.2,B,12.6,B,150.0,1.2,N	
AIS08_gll_vbw_hdt_rot.sst	Standard sensor input with VBW instead of VTG
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V $TIHDT,359.9,T $TIROT,0.0,A	
AIS09_gll_osd.sst	Sensor input set with GLL and OSD
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $INOSD,359.9,A,5.2,B,12.6,B,150.0,1.2,N	
AIS10_gll_vtg.sst	GPS receiver sentences (GLL and VTG)
$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A $GPVTG,350.0,T,,M,10.0,N,,K,A	
AIS11_vbw.sst	Log sentence VBW
$VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V	
AIS12_hdt_rot.sst	Gyro sentences (HDT and ROT)
$TIHDT,359.9,T $TIROT,0.0,A	

B.1.2 Settings (VSD,SSD)

Settings (VSD,SSD)	
File name	Description
Sentences	
AISSD_transpondertype.sst	Settings of static data, specific set for each transponder type
`$AISSD,callsign,name,100,20,15,10,1,GP`	
AIVSD_Hamburg.sst	Settings of voyage related data
`$AIVSD,51,11.5,26,HAMBURG,131020,20,05,0,0`	

B.1.3 Messages (ABM,BBM)

The addressed messages include a MMSI number which is changed according to the actual MMSI number of the EUT

Messages (ABM,BBM)	
File name	Description
Sentences	
AIABM_bin.sst	Standard addressed binary message
`!AIABM,1,1,2,000001005,1,6,06P0test,0`	
AIABM_safety.sst	Standard addressed safety related message
`!AIABM,1,1,2,000001005,1,12,D5CD,0`	
AIABM_4_bin.sst	Set of 4 addressed binary messages

`!AIABM,1,1,3,000008001,1,6,06P0test,0`
`!AIABM,1,1,0,000008001,2,6,06P0test,0`
`!AIABM,1,1,1,000008001,1,6,06P0test,0`
`!AIABM,1,1,2,000008001,2,6,06P0test,0`	

AIABM_4_safety.sst	Set of 4 addressed safety related messages

`!AIABM,1,1,0,000001005,1,12,D5CD,0`
`!AIABM,1,1,1,000001005,1,12,D5CD,0`
`!AIABM,1,1,2,000001005,1,12,D5CD,0`
`!AIABM,1,1,3,000001005,1,12,D5CD,0`	

AIBBM_bin.sst	Standard binary broadcast message
`!AIBBM,1,1,6,1,8,06P0test,0`	
AIBBM_safety.sst	Standard safety related broadcast message
`!AIBBM,1,1,6,1,14,D5CD,0`	
AIBBM_5_bin.sst	Set of 5 binary broadcast messages

!AIBBM,1,1,7,0,8,06P0test1,0 !AIBBM,1,1,8,0,8,06P0test2,0 !AIBBM,1,1,9,0,8,06P0test3,0 !AIBBM,1,1,0,0,8,06P0test4,0 !AIBBM,1,1,1,0,8,06P0test5,0	
AIBBM_5_safety.sst	Set of 5 safety related broadcast messages
!AIBBM,1,1,6,0,14,D5CDi,0 !AIBBM,1,1,7,0,14,D5CDj,0 !AIBBM,1,1,8,0,14,D5CDk,0 !AIBBM,1,1,9,0,14,D5CDl,0 !AIBBM,1,1,0,0,14,D5CDm,0	
AIBBM_bin_stuffing.sst	Special message for bit stuffing test
!AIBBM,1,1,6,1,8,06Qv>khvOP,4	
AIBBM_multi_bin.sst	Long 5 slot binary broadcast message
!AIBBM,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,012345678901234567890123456789012345678901,4	
AIBBM_multi_safety.sst	Long 5 slot safety related broadcast message
!AIBBM,4,1,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,14,0123456789012345678901234567890123456789,0	
AIBBM_multi_bin_1.sst	Longer than 5 slots binary broadcast message, all bits 1
!AIBBM,4,1,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,2,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,3,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,4,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0	
AIBBM_ABM_17_5.sst	Set of 2 long messages 8 and 12 for message priority test
!AIBBM,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,0123456789012345678901234567890123456789,0 !AIABM,4,1,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,2,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,3,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,4,2,000001005,1,12,0123456789012345678901234567890123456789,0	
AIBBM_25.sst	25 broadcast message to check 20 slots per frame rule

!AIBBM,1,1,6,1,8,06P0test1,0 !AIBBM,1,1,6,1,14,D5CD1,0 !AIBBM,1,1,7,1,8,06P0test2,0 !AIBBM,1,1,7,1,14,D5CD2,0 !AIBBM,1,1,8,1,8,06P0test3,0 !AIBBM,1,1,8,1,14,D5CD3,0 !AIBBM,1,1,9,1,8,06P0test4,0 !AIBBM,1,1,9,1,14,D5CD4,0 !AIBBM,1,1,0,1,8,06P0test5,0 !AIBBM,1,1,0,1,14,D5CD5,0 !AIBBM,1,1,1,1,8,06P0test6,0 !AIBBM,1,1,1,1,14,D5CD6,0 !AIBBM,1,1,2,1,8,06P0test7,0 !AIBBM,1,1,2,1,14,D5CD7,0 !AIBBM,1,1,3,1,8,06P0test8,0 !AIBBM,1,1,3,1,14,D5CD8,0 !AIBBM,1,1,4,1,8,06P0test9,0 !AIBBM,1,1,4,1,14,D5CD9,0 !AIBBM,1,1,5,1,8,06P0test10,0 !AIBBM,1,1,5,1,14,D5CD10,0 !AIBBM,1,1,6,1,8,06P0test11,0 !AIBBM,1,1,6,1,14,D5CD11,0 !AIBBM,1,1,7,1,8,06P0test12,0 !AIBBM,1,1,7,1,14,D5CD12,0 !AIBBM,1,1,7,1,8,06P0test13,0

AIAIR_5.sst	Simple interrogation for msg 5
$AIAIR,000001005,5,,,,,	
AIAIR_35_5.sst	Interrogation of msg 3 and 5 from ID1 and msg 5 from ID2
$AIAIR,000005002,3,,5,,000007001,5,,	
AIS_DSI.sst	Test that EUT ignores command to send a DSC msg
$AIDSI,1,1,2210393930,,,,03,,11,,	

B.1.4 Regional operational settings (ACA)

Regional operational settings (ACA)	
File name	Description
Sentences	
AIACA_Region_in_ch86.SST	Region around standard position with test channels
$ECACA,2,5400.0,N,01030.0,E,5300.0,N,00930.0,E,4,2086,0,1086,0,0,1,,,	
AIACA_Region_out_ch74_76.SST	Region not including standard position with channels 74 and 76
$ECACA,2,5500.0,N,00900.0,E,5400.0,N,00800.0,E,4,0074,0,0076,0,0,1,,,	
AIACA_Region_17_3_SW.SST	2 adjacent regions in SW quadrant, for test 17.3

$ECACA,2,3000.00,S,01200.00,W,3100.00,S,01300.00,E,1,2081,0,1081,0,0,1,,, $ECACA,2,3000.00,S,01100.00,W,3100.00,S,01200.00,E,1,2082,0,1082,0,0,1,,,	
AIACA_8_Regions_17_7_1.SST	8 different regions to fill quickly the complete list, for test 17.7.1
$ECACA,,5400.00,N,01030.00,E,5300.00,N,00930.00,E,2,72,0,74,0,0,1,,, $ECACA,,5200.00,N,00700.00,E,5100.00,N,00600.00,E,2,2060,0,1060,0,0,1,,, $ECACA,,5200.00,N,00900.00,E,5100.00,N,00800.00,E,2,2061,0,1061,0,0,1,,, $ECACA,,5200.00,N,01100.00,E,5100.00,N,01000.00,E,2,2062,0,1062,0,0,1,,, $ECACA,,5200.00,N,01300.00,E,5100.00,N,01200.00,E,2,2063,0,1063,0,0,1,,, $ECACA,,5200.00,N,01500.00,E,5100.00,N,01400.00,E,2,2064,0,1064,0,0,1,,, $ECACA,,5100.00,N,00800.00,E,5000.00,N,00700.00,E,2,2065,0,1065,0,0,1,,, $ECACA,,5100.00,N,01000.00,E,5000.00,N,00900.00,E,2,2066,0,1066,0,0,1,,,	
AIACA_Region_17_7_2_c.SST	Region for test 17.7.2 c
$ECACA,2,5430.00,N,01200.00,E,5300.00,N,01100.00,E,4,2083,0,1083,0,0,1,,,	
AIACA_Region_17_7_2_f.SST	Region for test 17.7.2 f
$ECACA,2,5300.00,N,01320.00,E,5200.00,N,01200.00,E,4,2081,0,1081,0,0,1,,,	
AIACA_Region_17_7_4.SST	4 adjacent regions for test 17.7.2 f
$ECACA,2,5800.00,N,00800.00,E,5700.00,N,00700.00,E,4,2081,0,1081,0,0,1,,, $ECACA,2,5800.00,N,00900.00,E,5700.00,N,00800.00,E,4,2082,0,1082,0,0,1,,, $ECACA,2,5700.00,N,00800.00,E,5600.00,N,00700.00,E,4,2083,0,1083,0,0,1,,, $ECACA,2,5700.00,N,00900.00,E,5600.00,N,00800.00,E,4,2084,0,1084,0,0,1,,,	
AIACA_Region_lon180.SST	Special region at longitude = 180°
$ECACA,2,0100.00,N,17900.00,W,0100.00,S,17900.00,E,2,0074,0,0076,0,0,1,,,	
AIACA_Set_channel.SST	Set channel command, without area co-ordinates
$ECACA,,N,,W,,N,,W,2,2074,0,2076,0,0,1,,,,	
Request_ACA.SST	Request of ACA sentences from EUT
$ECAIQ,ACA	

B.1.5 Long range requests

The of long range requests include a MMSI number which is changed according to the actual MMSI number the EUT

Long Range (LRI, LRF)	
File name	Description
Sentences	
LRI_LRF_MMSI_all.sst	Request of all data addressed by MMSI
`$LRLRI,5,0,211003000,000002002,,,,,,,,` `$LRLRF,5,211003000,VTS,ABCEFIOPUW,`	
LRI_LRF_area_CEF.sst	Request of some data addressed by area
`$LRLRI,6,1,211003000,,6000.0,N,2000.0,E,4000.0,N,0500.0,E` `$LRLRF,6,211003000,VTS,CEF,`	
LRI_LRF_out_area_CEF.sst	Request of some data addressed by area, standard position not in area
`$LRLRI,6,1,211003000,,6000.0,N,1500.0,E,5500.0,N,0800.0,E` `$LRLRF,6,211003000,VTS,CEF,`	
LRI_LRF_area_at_180_CEF.sst	Request of some data addressed by area, area around longitude of 180° and latitude of 0°
`$LRLRI,6,1,211003000,,0500.0,N,17500.0,W,0500.0,S,17500.0,E` `$LRLRF,6,211003000,VTS,CEF,`	
LRF_ack_all.sst	For external confirmation of request
`$LRLRF,5,211003000,VTS,ABCEFIOPUW,`	

B.2 DSC sentences

The sentences are listed as they are applied to the DSC Testbox for transmission of DSC test calls. There is a special format used based on an earlier definition of NMEA private sentences.

The frame for transmitting a DSC call is:
`$PDEBT,CCDSC,T,00014600<call content>FF`

The <call content> has to be entered in Hex code, 2 hex numbers for each 7 bit DSC symbol, without spaces, beginning with the format specifiere which included only ones. The DSC coding and addition of redundance (3 bit symbol redundance and symbol repetition) are done by the test box. The content description of the calls is available on request.

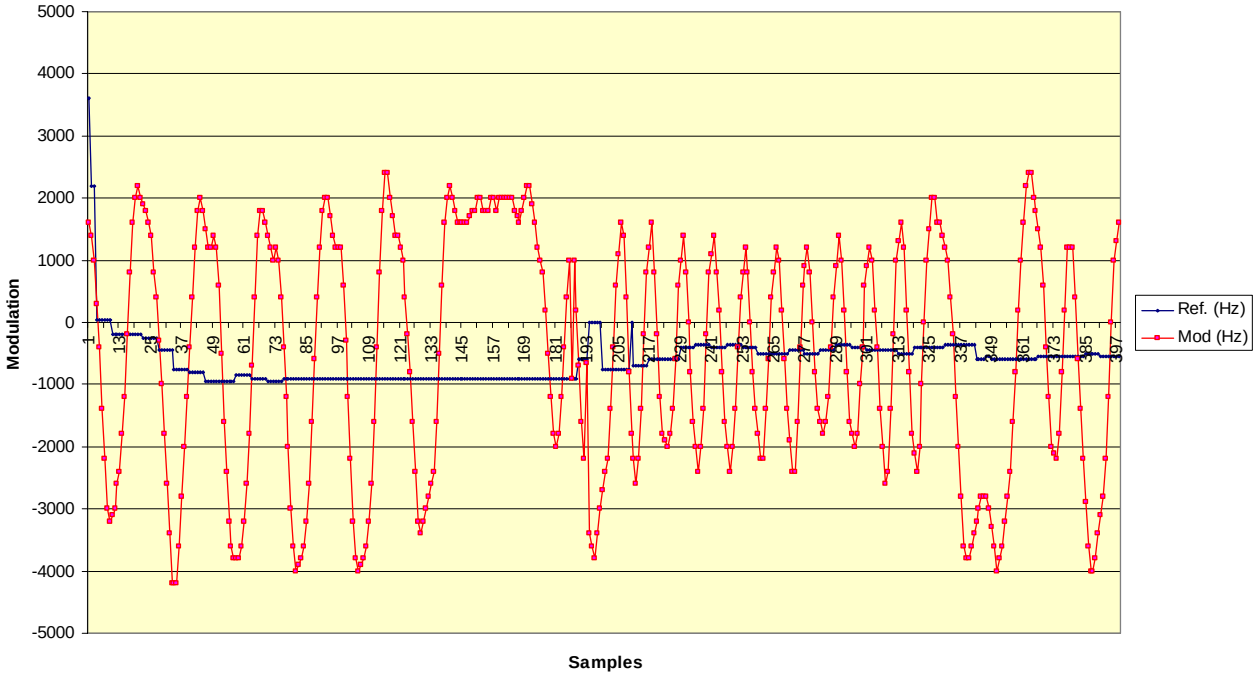
The DSC sentences include MMSI number which is changed according to the actual MMSI number the EUT

DSC Sentences	
File name	Description
Sentences	
Test_Signal_1.sst	Standard test signal no 1, selective position and name request.
$PDEBT,CCDSC,T,00014600780000010050671 50A27271E676F75FF	
area_pos_name_rq.sst	Position and name request addressed to an area, standard position inside
$PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E676F75FF	
area_pos_name_rq_180.sst	Position and name request addressed to an area around a longitude of 180° and latitude of 0°.
$PDEBT,CCDSC,T,00014600670003000 14F1E003C003C0067150A27271E676F75FF	
sel_set_region.sst	Selective regional setting by DSC, standard pos. outside, channel 61
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E68090A3D00680A143D00680C053C0001140068 0D053200010A0075FF	
sel_set_region_in.sst	Selective regional setting, standard position inside, channel 72, 73, 12.5 kHz
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E680900480A680A00490A680C05280001030068 0D051E00005D0075FF	
sel_set_ais_channel_ch65.sst	Setting AIS channel to 65
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E68090A4100680A14410075FF	
sel_check_channel.sst	Test of channel use in 20.4
$PDEBT,CCDSC,T,00014600780000010100671 50A27271E654875FF $PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E676F75FF	
area_set_region.sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E68090A3C00680A143C00680C05 1400005A00680D050A0000500075FF	
area_set_region_20_2.sst	Area addressed regional setting for test 20.2
$PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145200680A0A5200680C0F 1E00011E00680D0F140001280075FF $PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145100680A0A5100680C0F 1400011E00680D0F0A0001280075FF	
Sequence_20_1sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF $PDEBT,CCDSC,T,000146006606000 50A0A64150A27271E646E5A00487E7E7E7FFF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E646E5A00487E7E7E75FF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF	
Test_sequence_20_3.sst	Sequence of an area addressed call and continues transmission of other call for test of free channel check
$PDEBT,CCDSC,T,000146006705320000091E003C003C0067150A27271E676F75FF $PDEBT,CCDSC,T,000846007800000001010 7150A27271E676F75FF	
Sel_act_alt_system.sst	Activate an alternative system
$PDEBT,CCDSC,T,00014600780000000A0567150A27271E6803017875FF	

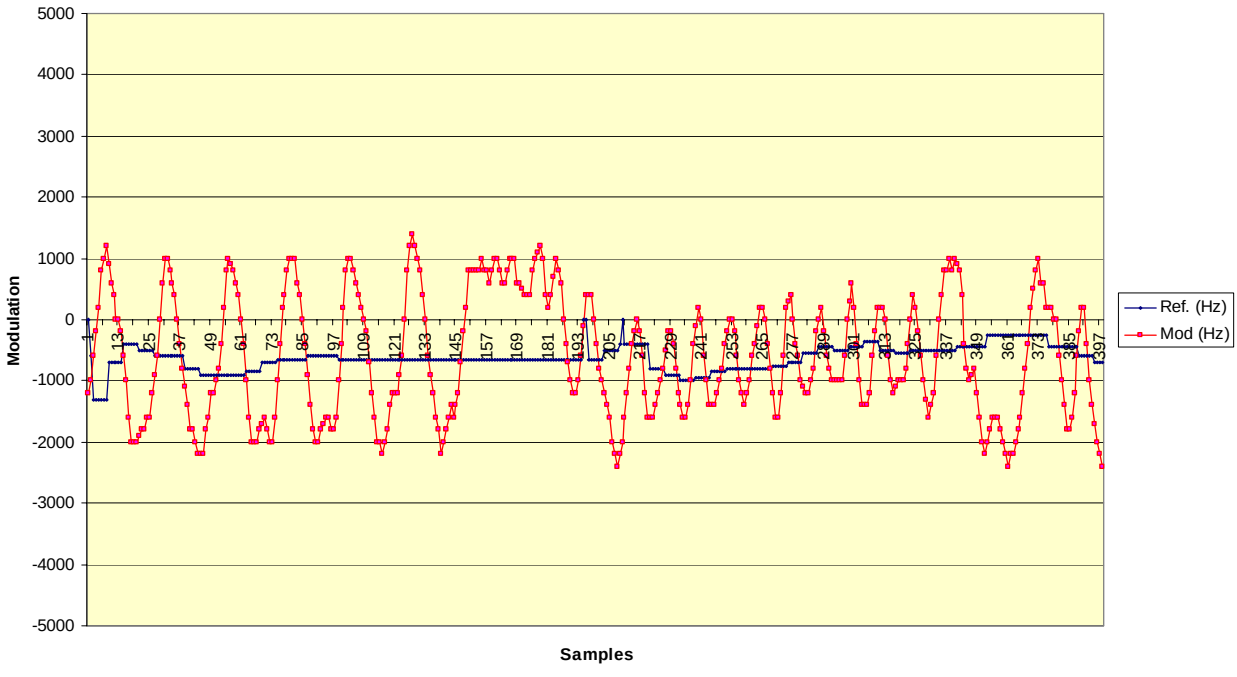
Annex C test diagrams

C.1 GMSK modulation 12.5 and 25 kHz bandwidth

13.04.04 - Jotron TR-2500, 25 kHz, RX A, ch 2084

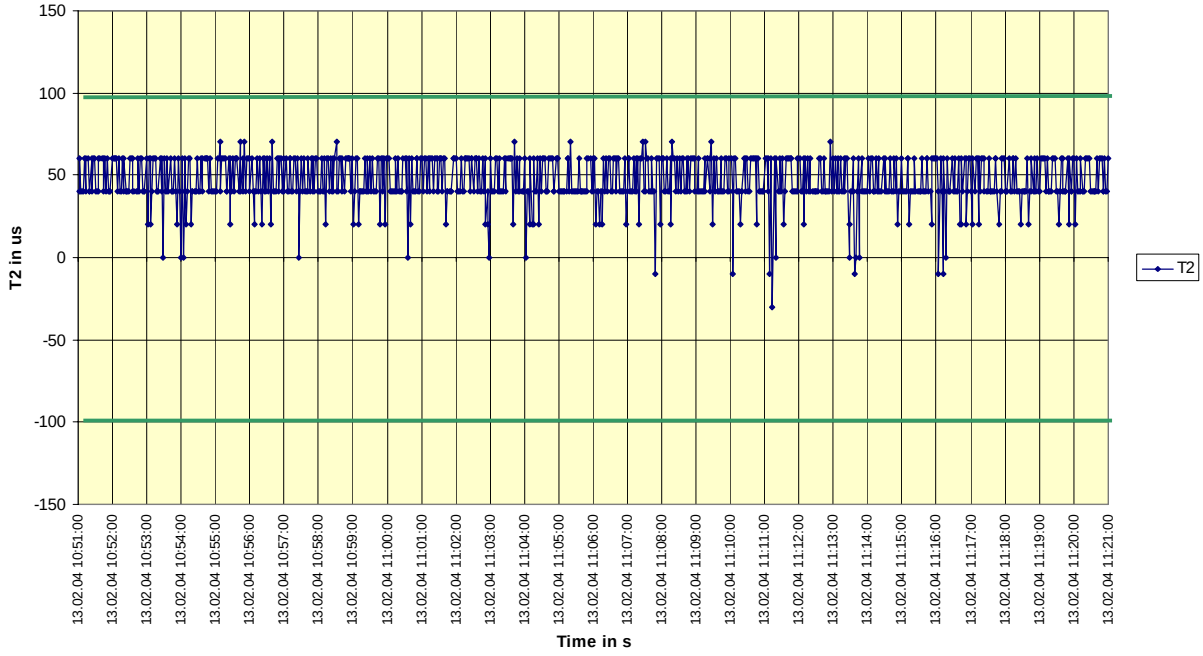


13.04.04 - Jotron TR-2500, 12.5 kHz, RX A, ch 2084

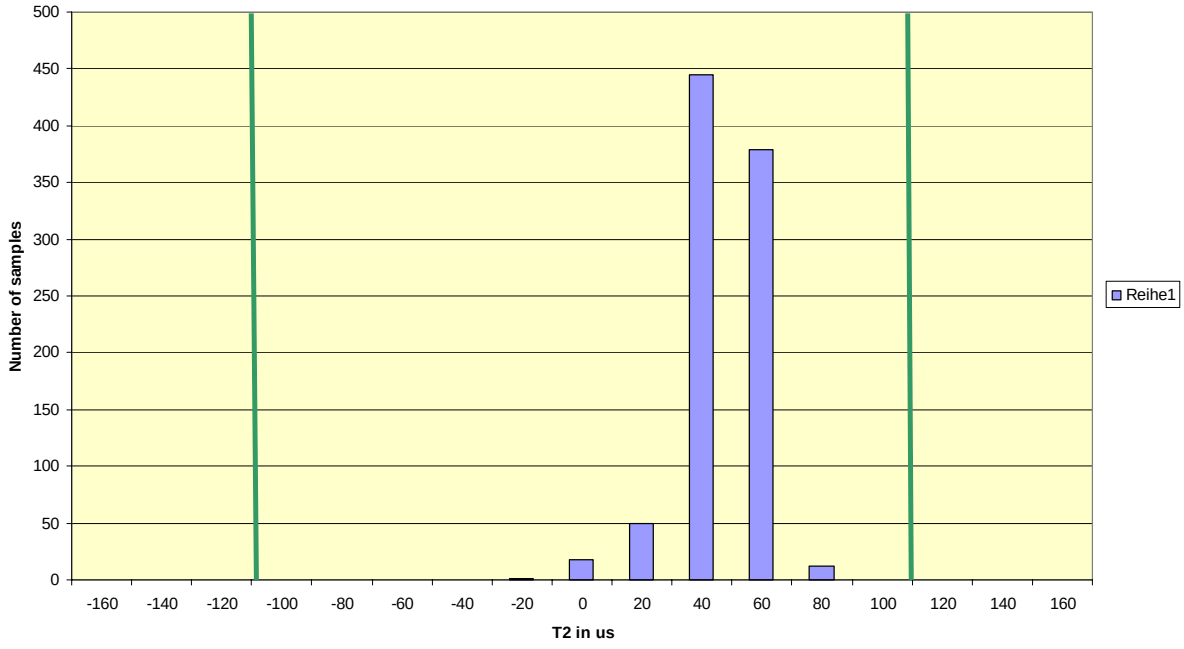


C.2 Sync Jitter

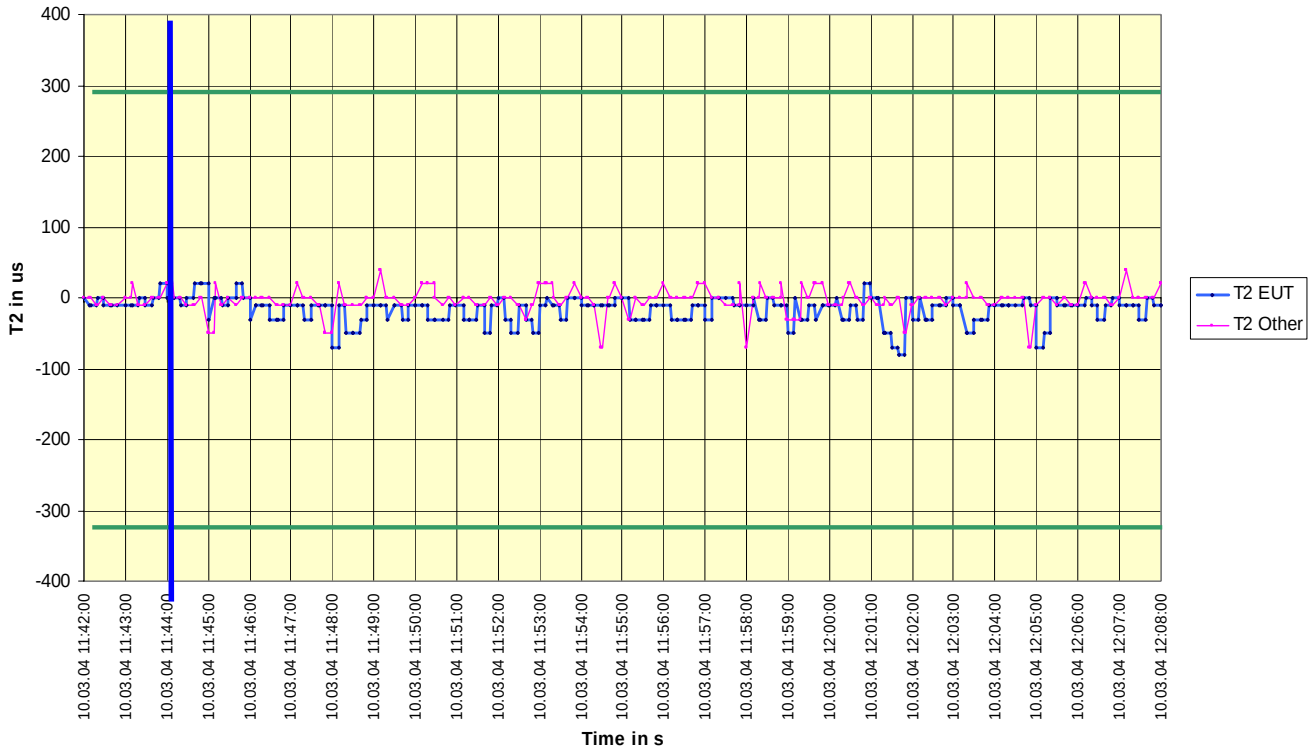
13.02.2004 - Jotron TR-2500 - 16.3 - Sync jitter deviation vs. time in sync mode 0



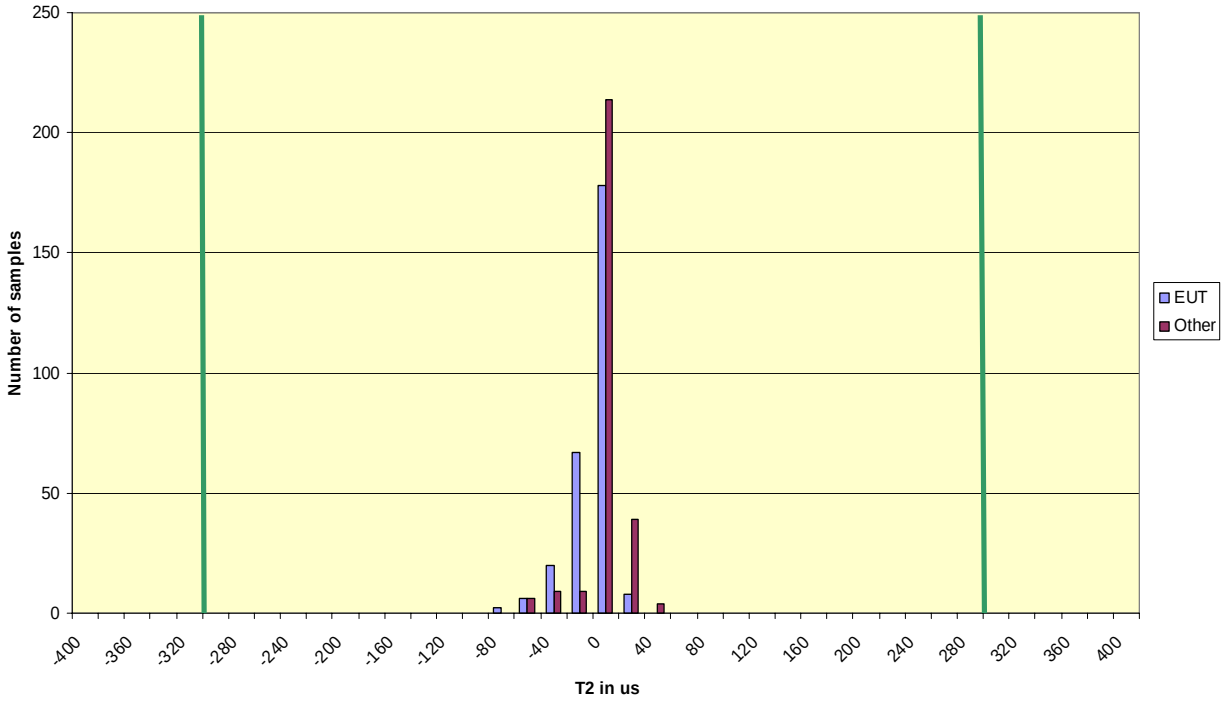
13.02.2004 - Jotron TR-2500 - 16.3 - Sync jitter deviation histogram in sync mode 0



10.03.04 - Jotron TR-2500 - 16.3 - Sync jitter deviation vs. time in sync mode 1

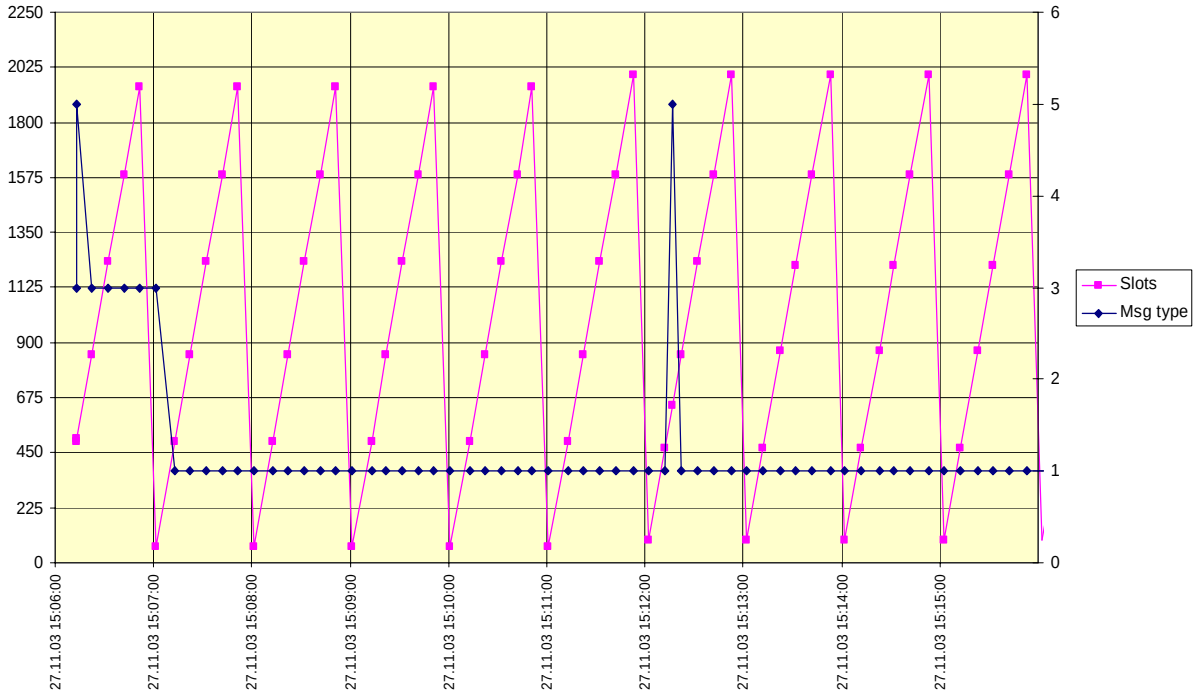


10.03.04 - Jotron TR-2500 - 16.3 - Sync jitter deviation histogram in sync mode 1

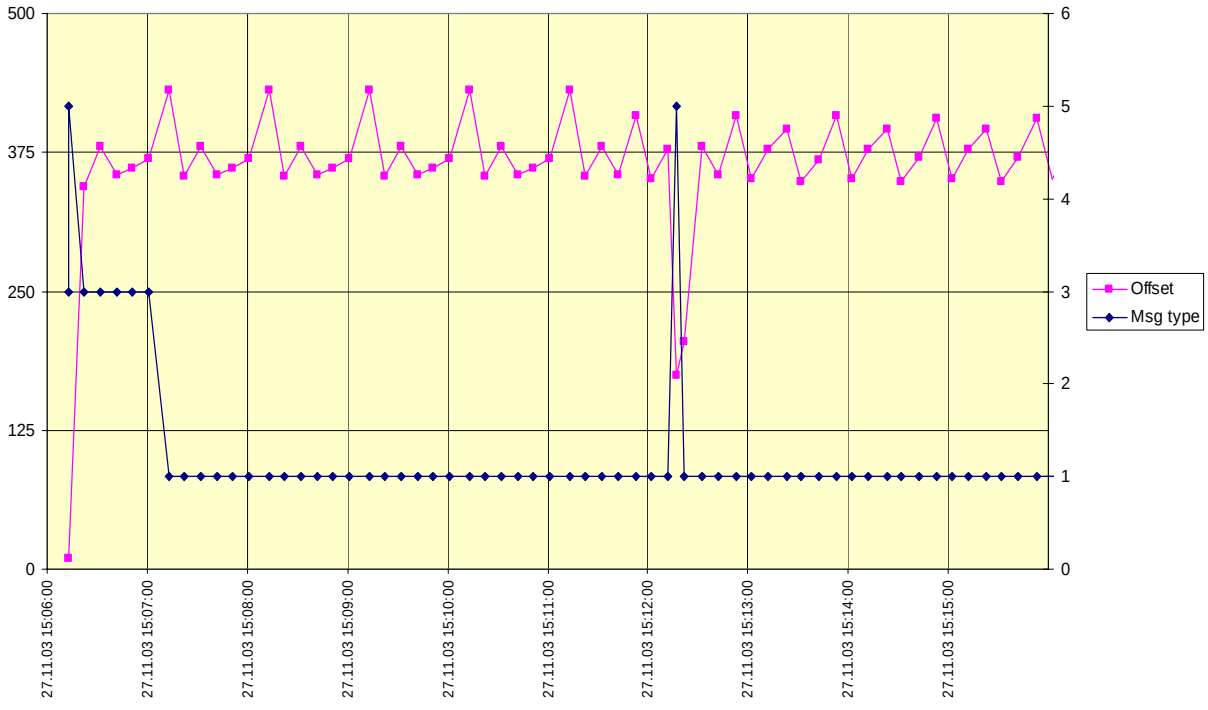


C.3 Network entry phase

27.11.03 - Jotron TR-2500 - 16.6.1 - Slot allocation at Network entry

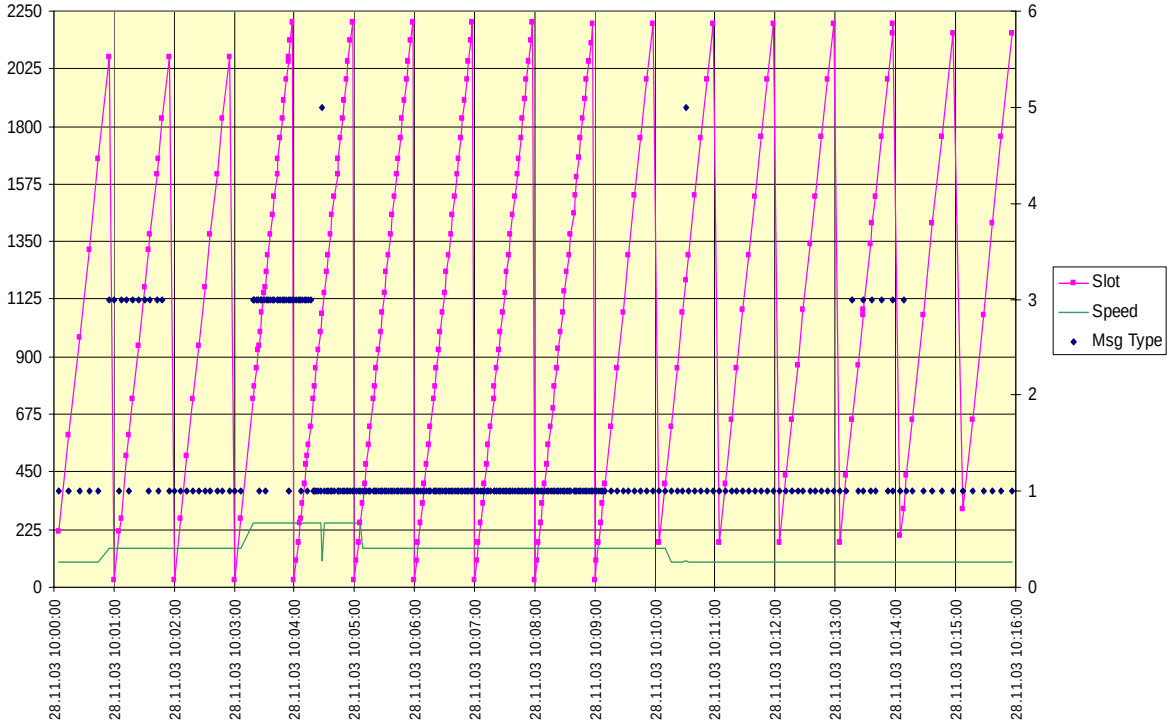


27.11.03 - Jotron TR-2500 - 16.6.1 - Slot offsets at Network entry

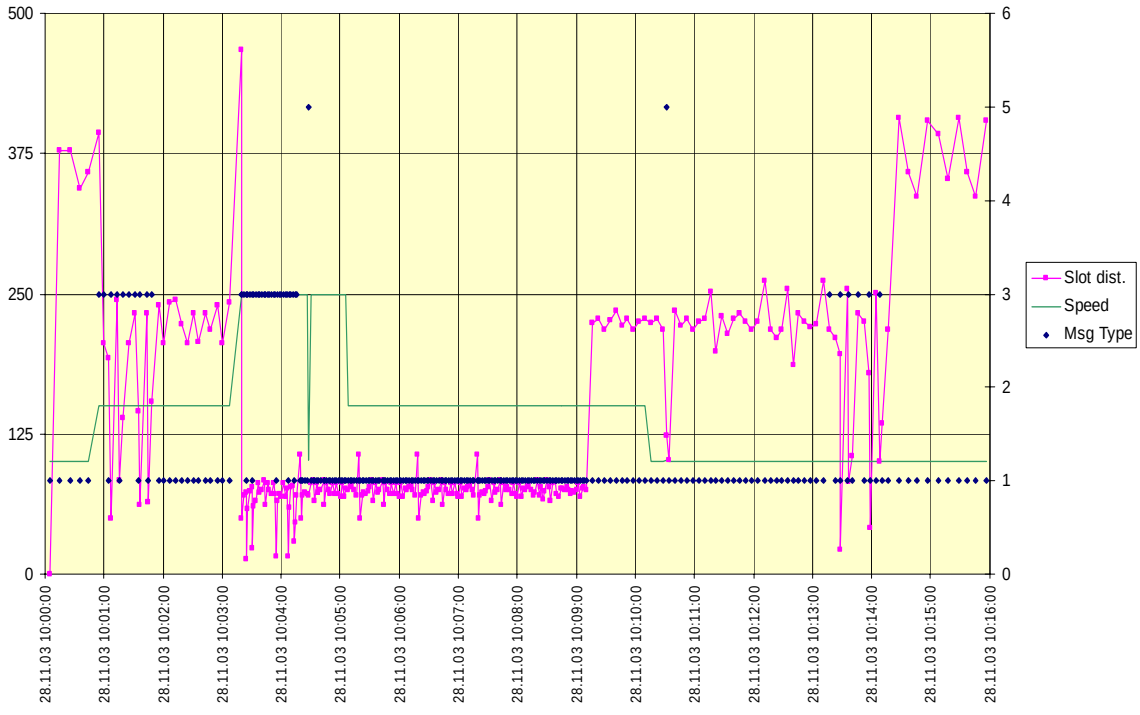


C.4 Reporting rate by speed

28.11.03 - Jotron TR-2500 - 14.4.1 - Reporting rate by speed - Slots

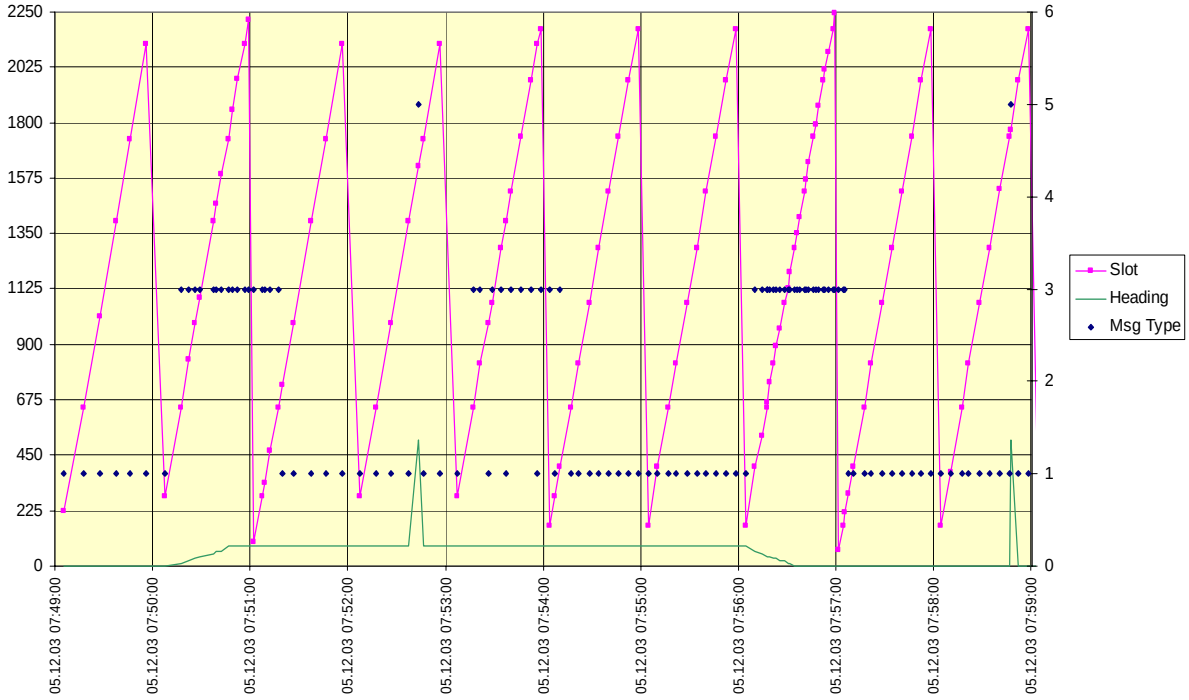


28.11.03 - Jotron TR-2500 - 14.4.1 - Reporting rate by speed - Slot offset

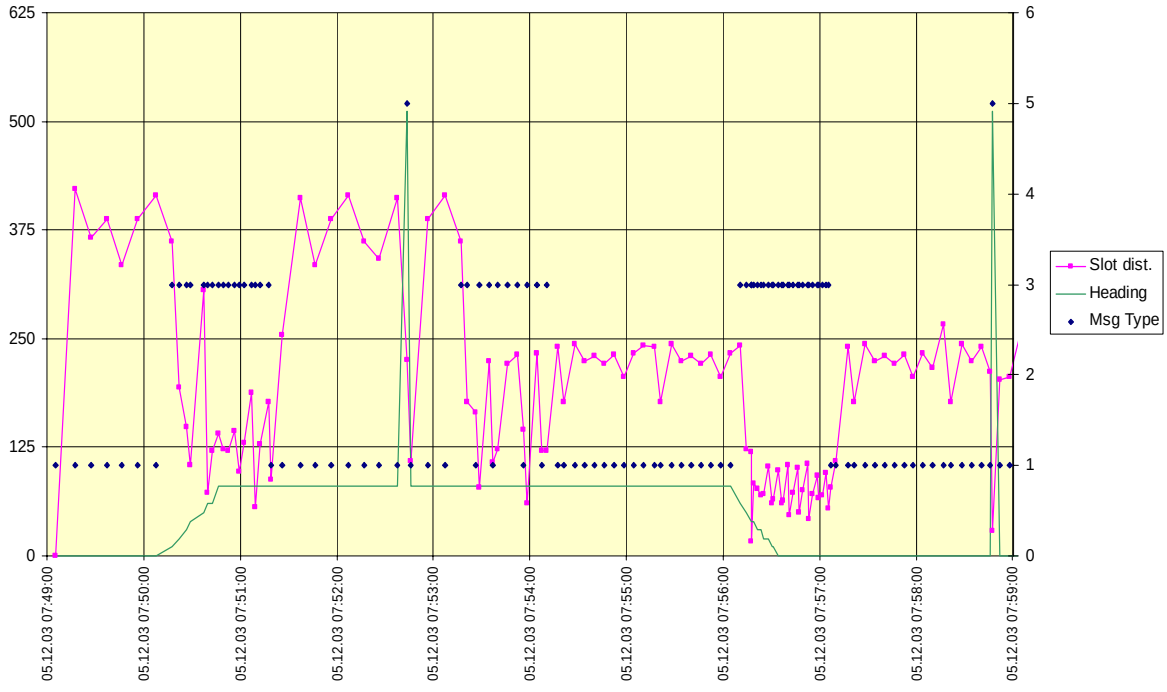


C.5 Report rate by heading

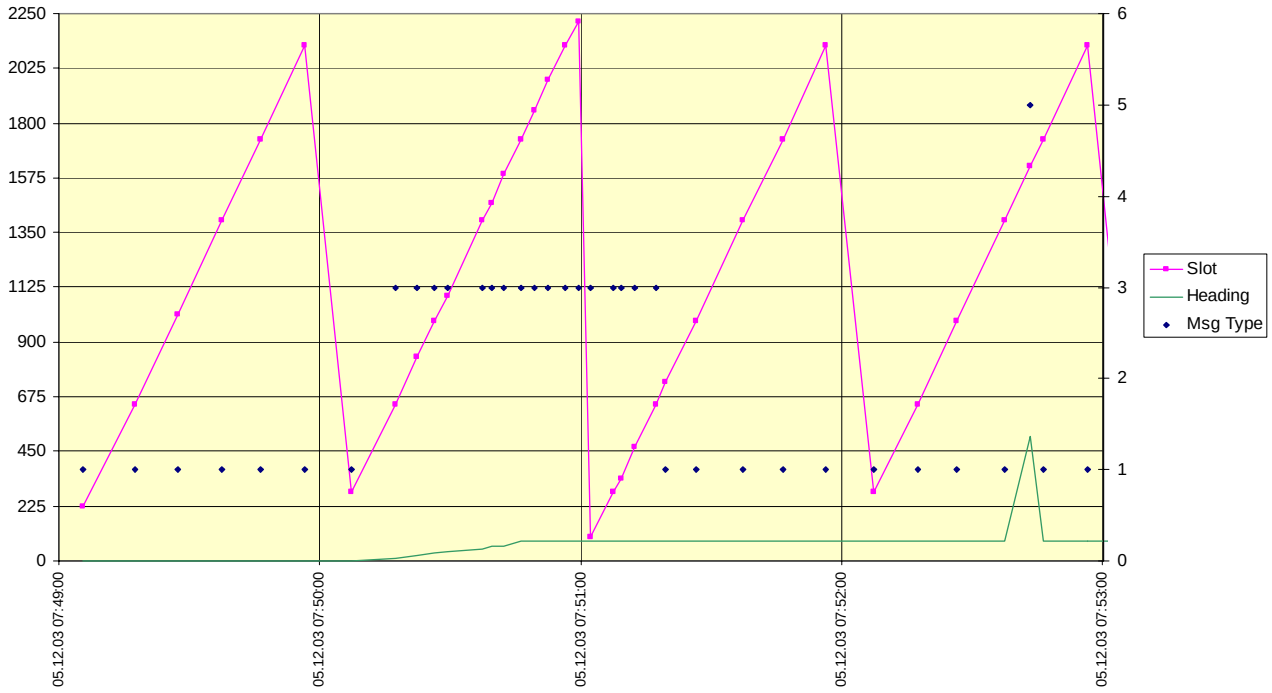
05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate by heading change - Slots



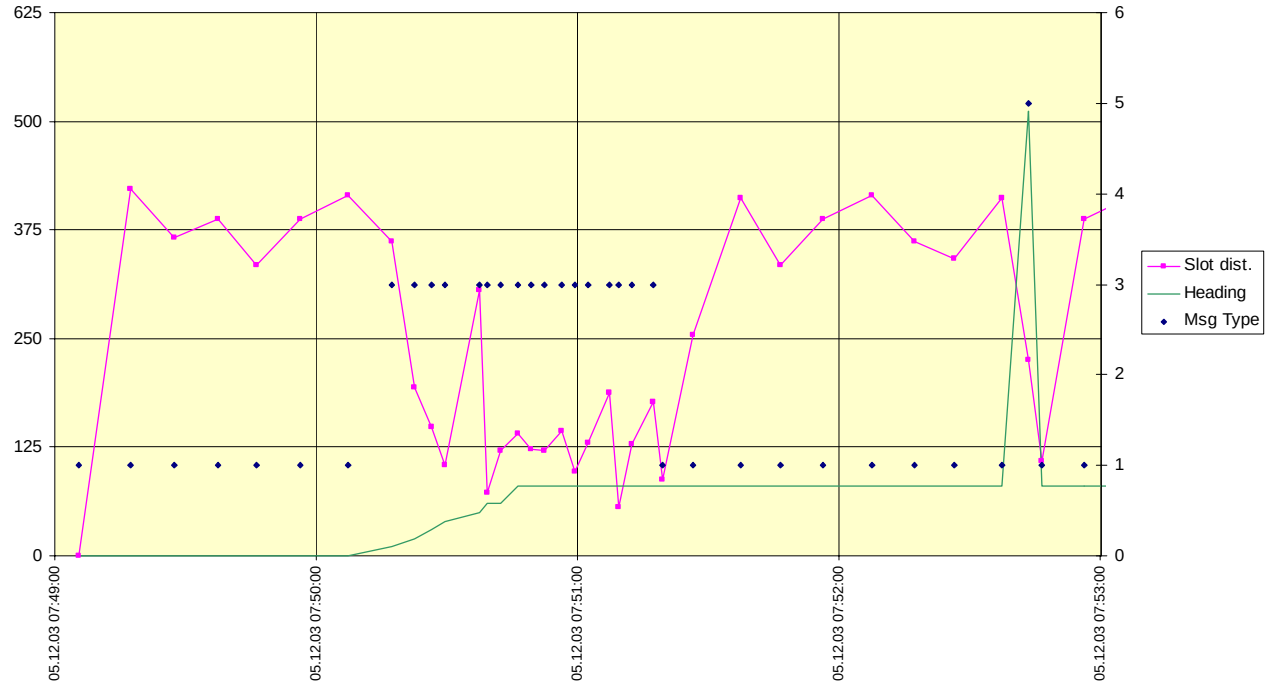
05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate by heading change - Slot offset



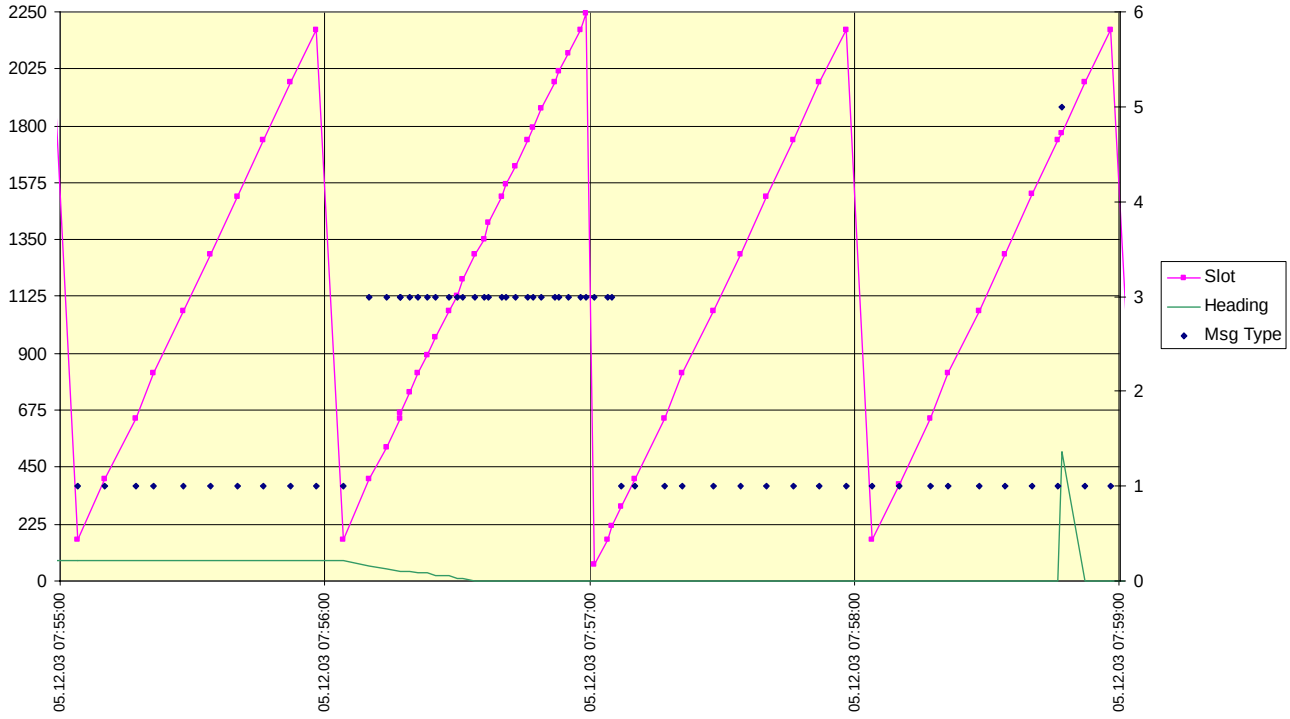
05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate change by heading at 10 kn - Slots



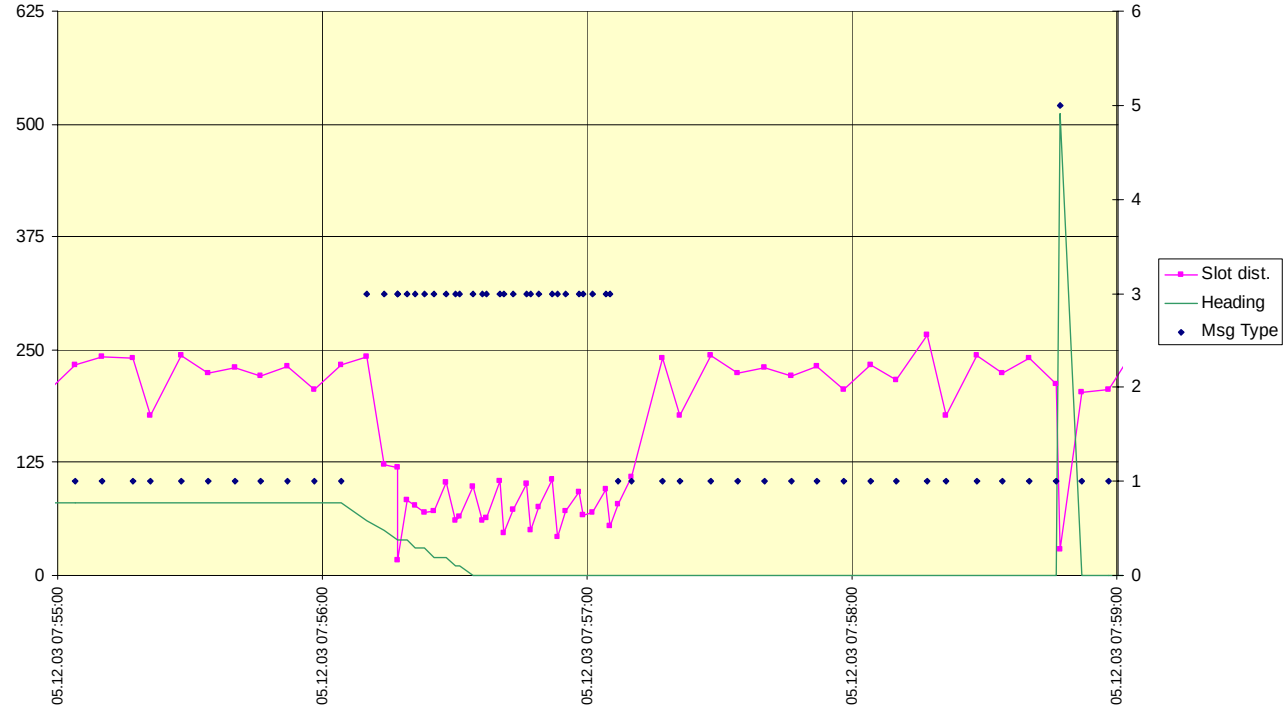
05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate change by heading at 10 kn - Slot offset



05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate change by heading at 15 kn - Slots

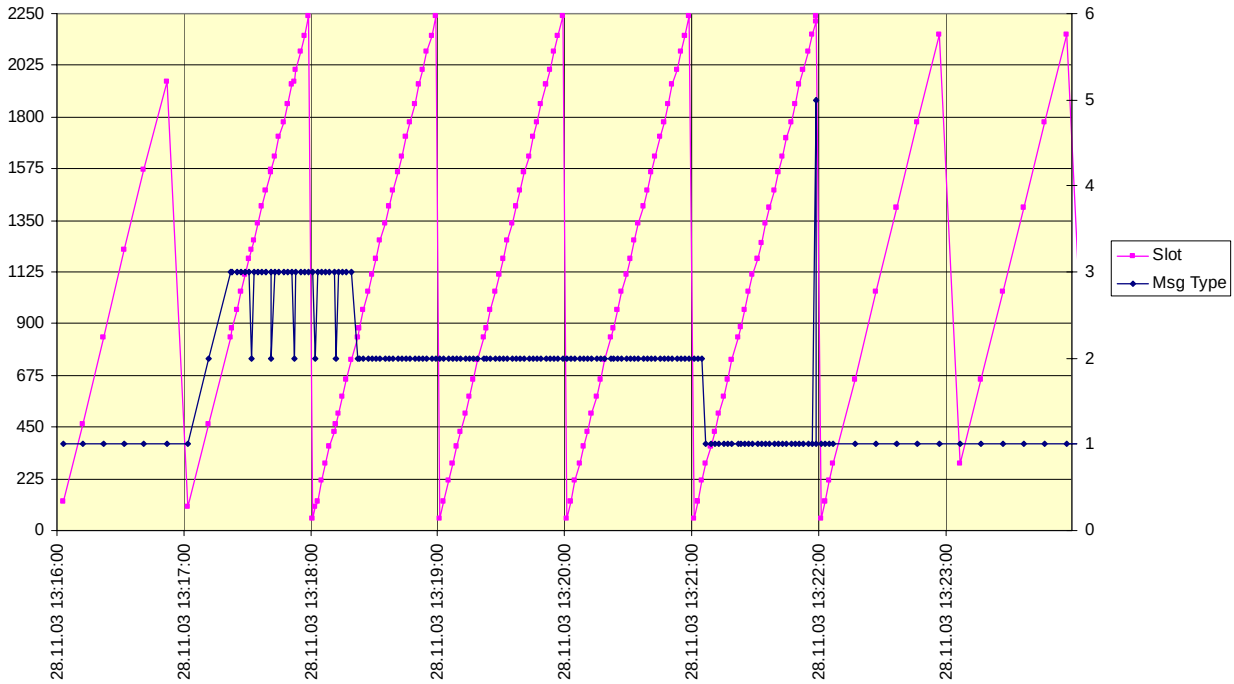


05.12.03 - Jotron TR-2500 - 14.4.1 - Reporting rate change by heading at 15 kn - Slot offset

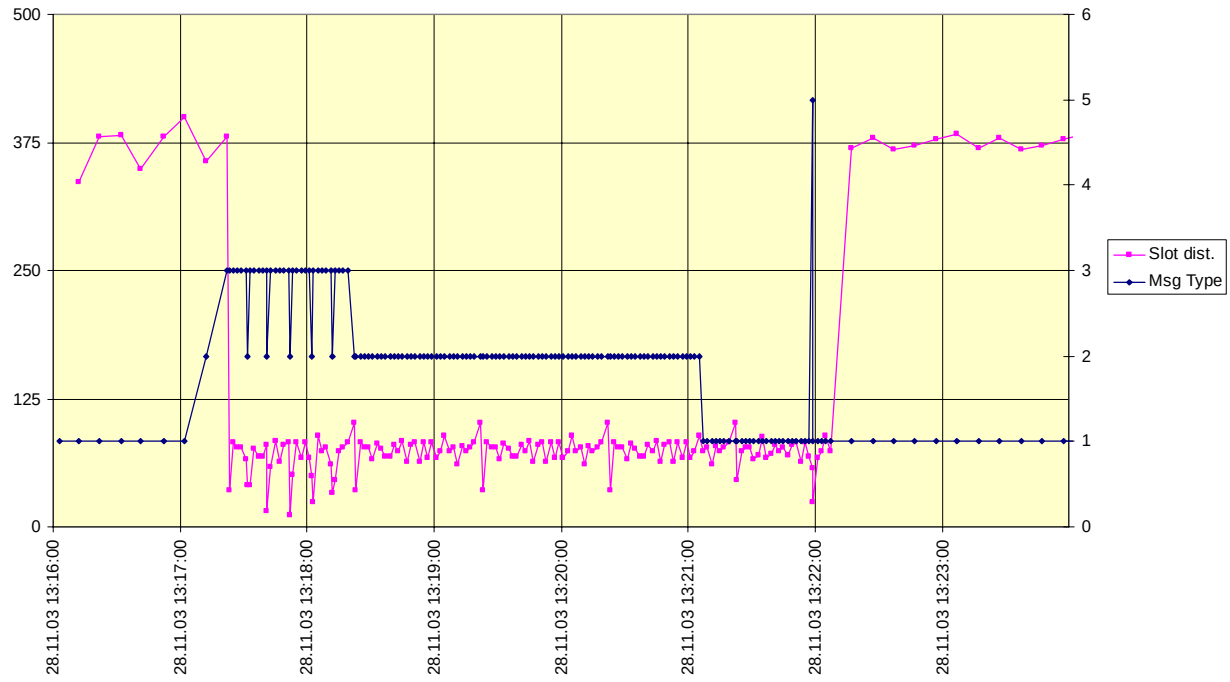


C.6 Assigned mode / rate assignment

28.11.03 - Jotron TR-2500 - 16.6.4.2 - Rate assignment - Slots

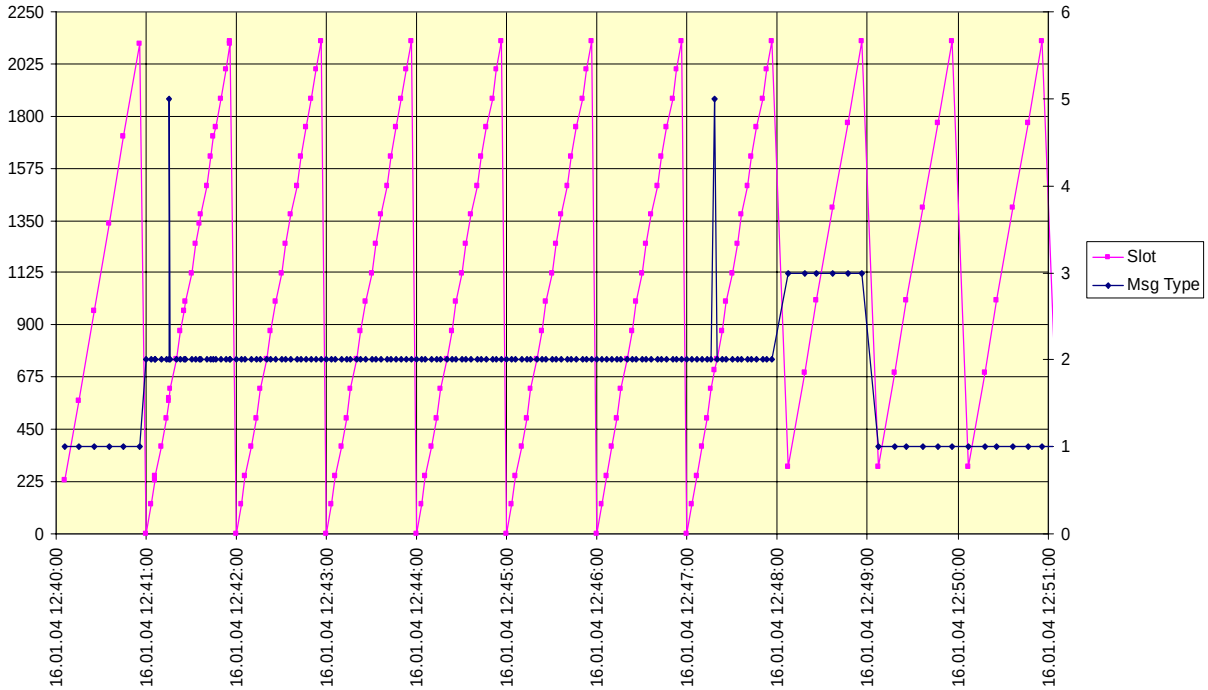


28.11.03 - Jotron TR-2500 - 16.6.4.2 - Rate assignment - Slot offset

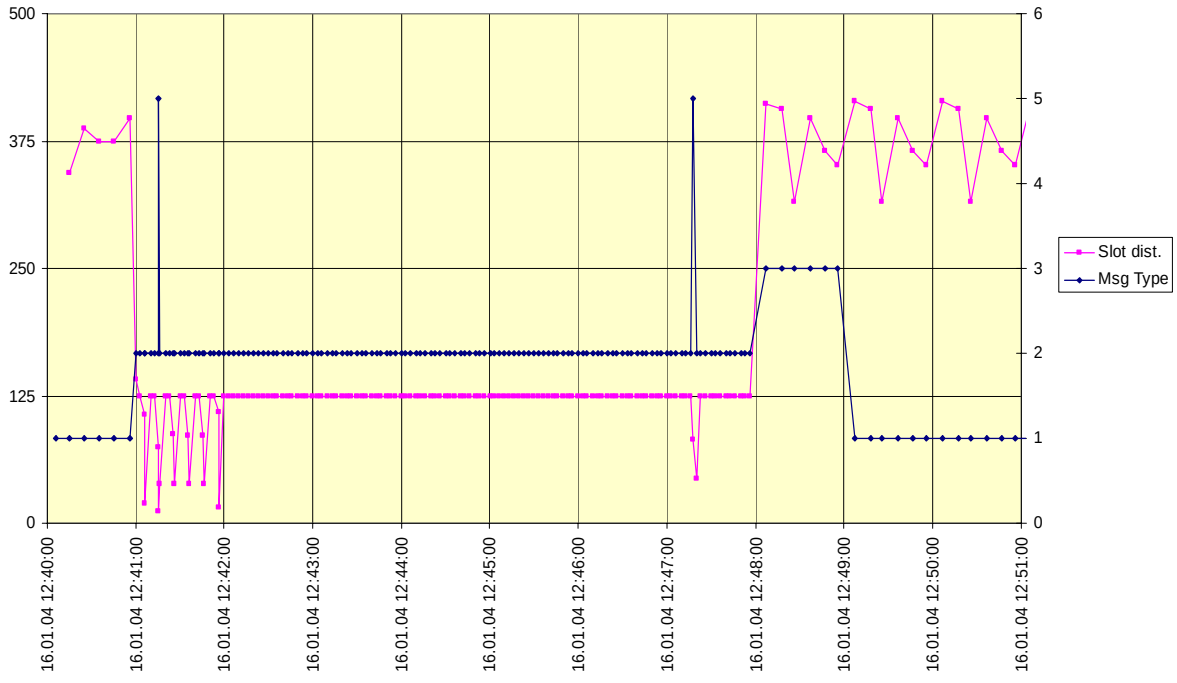


C.7 Assigned mode / slot assignment

15.01.04 - Jotron TR-2500 - 16.6.4.2 - Slot assignment - Slots

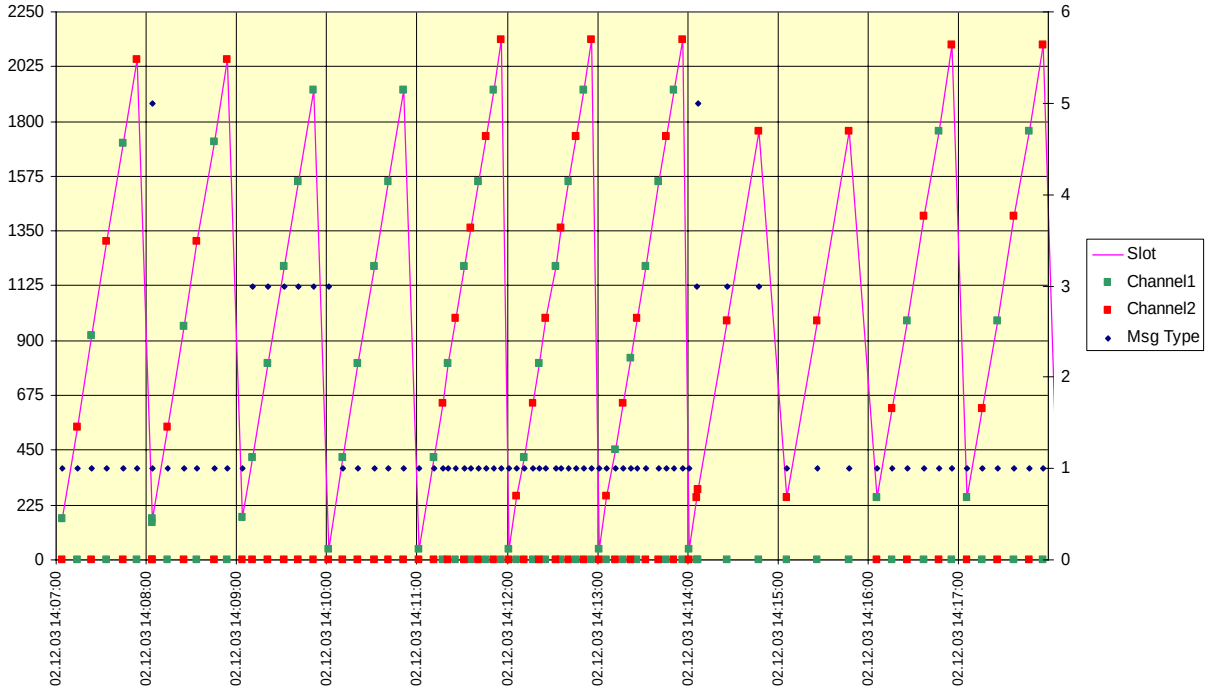


15.01.04 - Jotron TR-2500 - 16.6.4.2 - Slot assignment - Slot offset

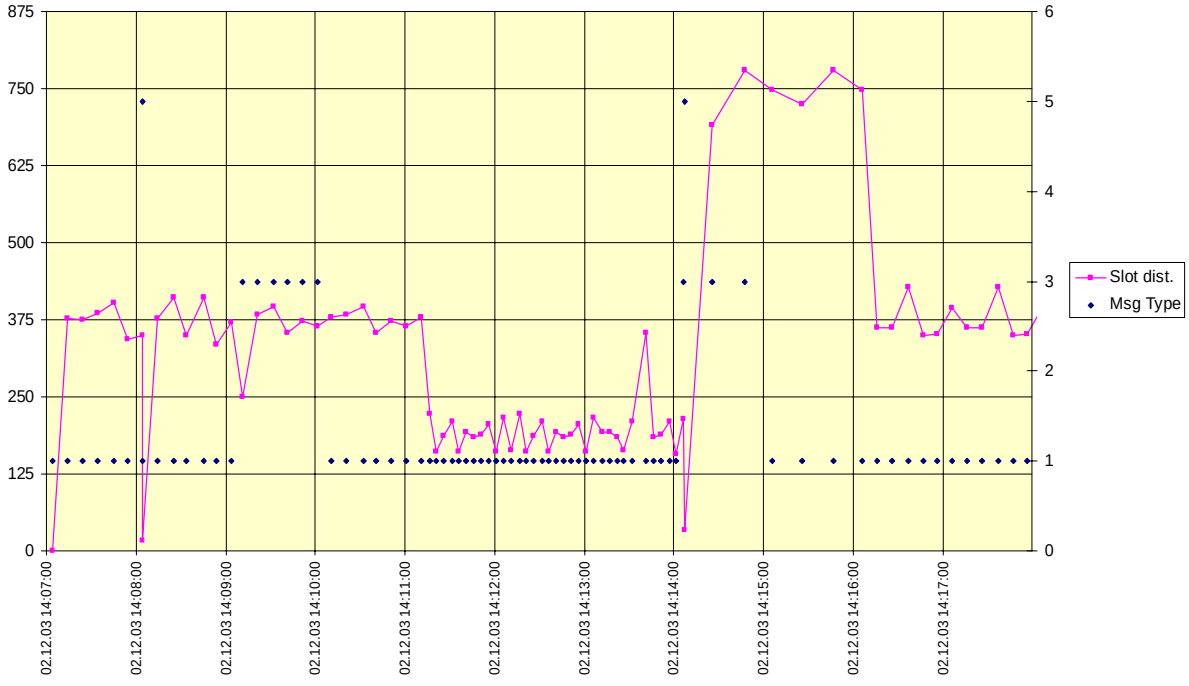


C.8 Area entry through transitional zone

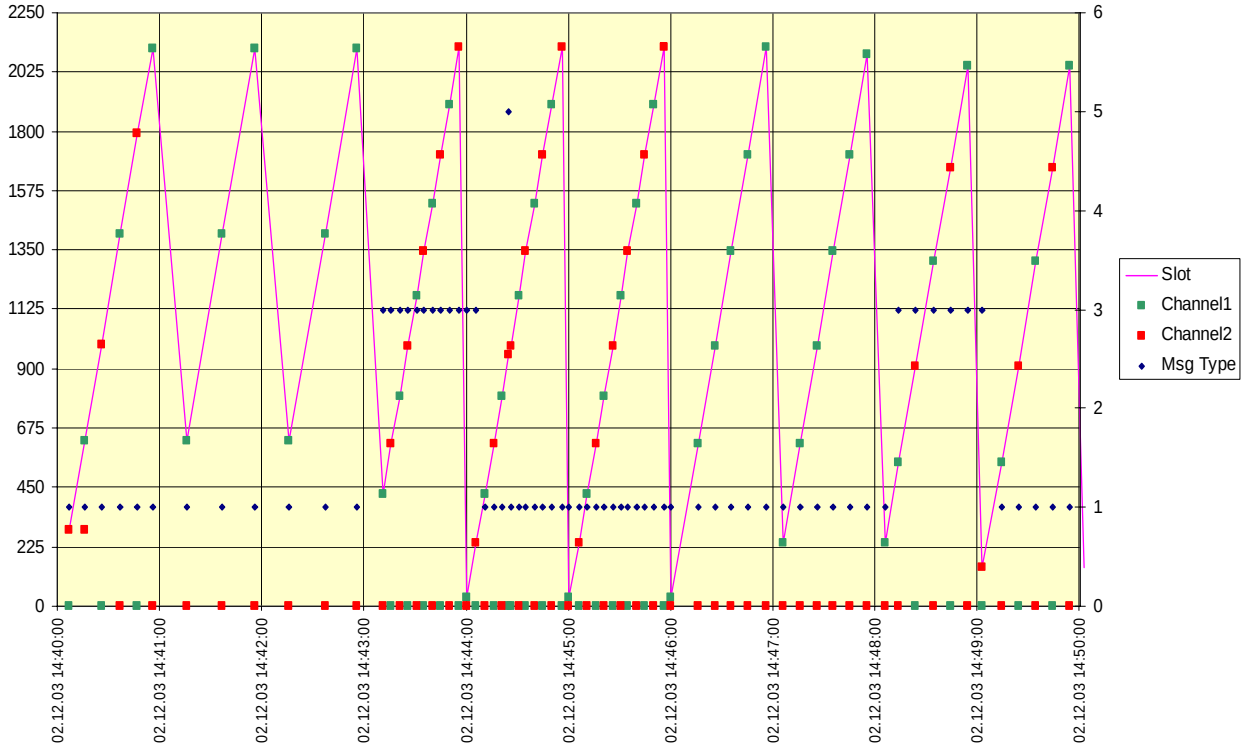
02.12.03 - Jotron TR-2500 - 17.2 - Area Entry, previous channels - Slots



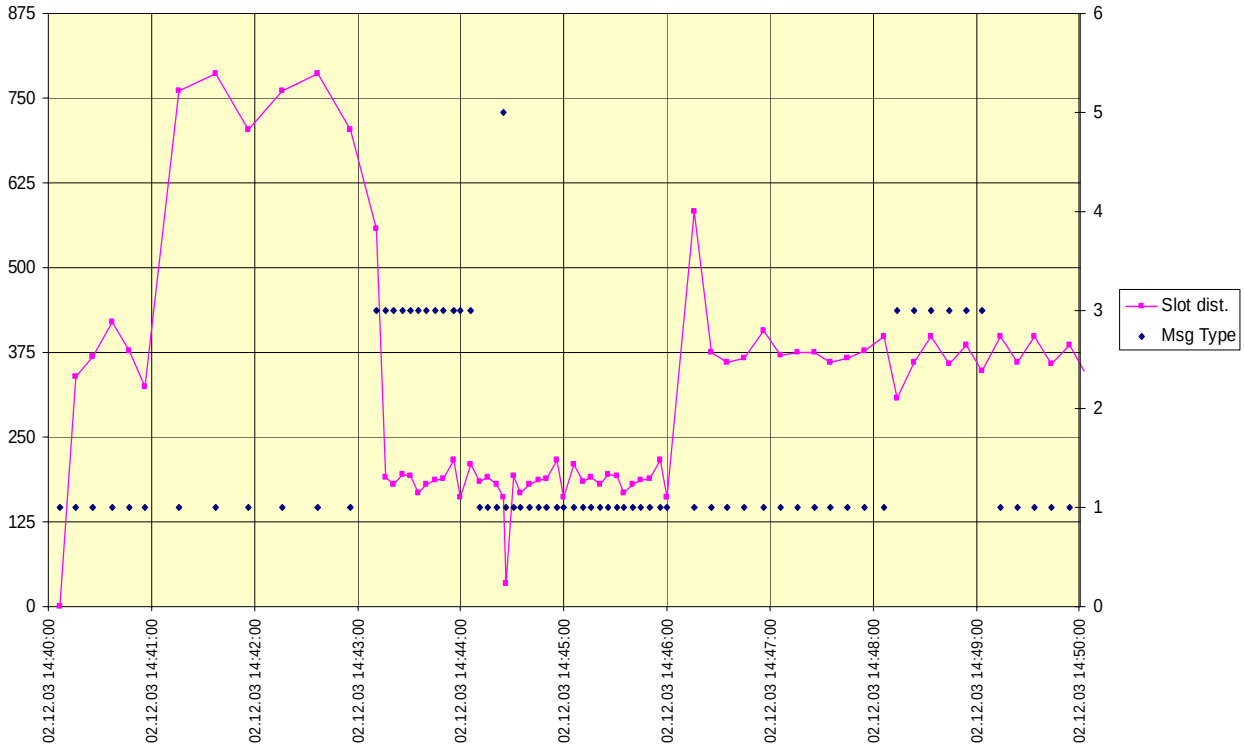
02.12.03 - Jotron TR-2500 - 17.2 - Area Entry, previous channels - - Slot offset



02.12.03 - Jotron TR-2500 - 17.2 Area Entry, new channels - Slots



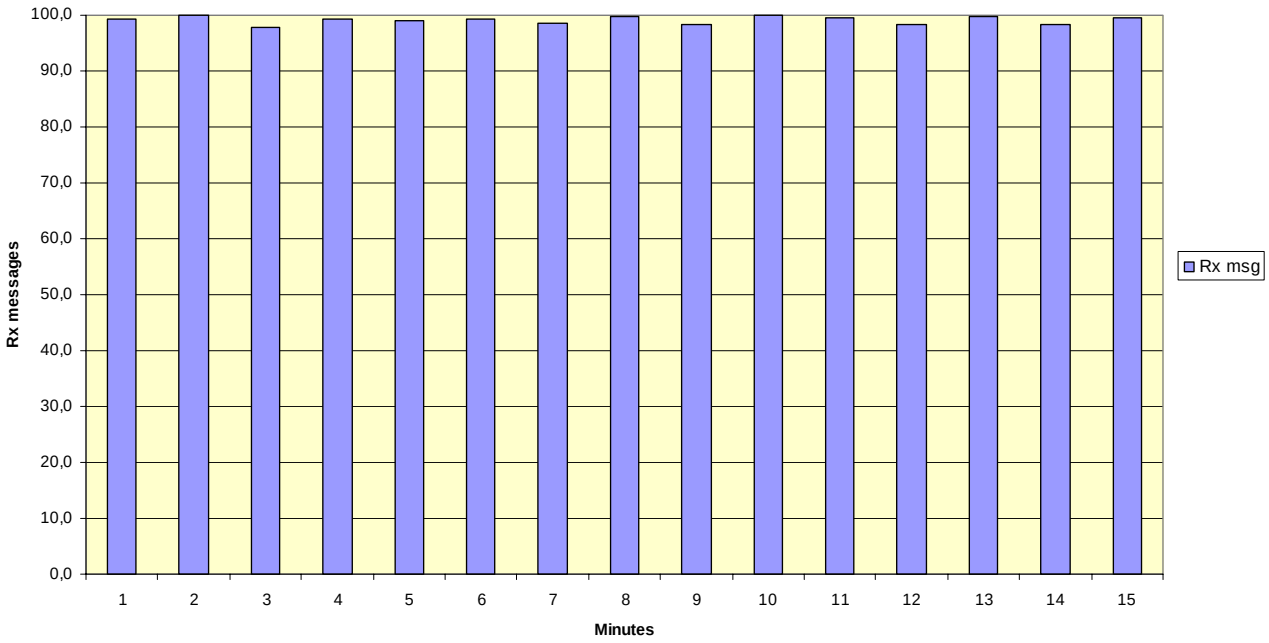
02.12.03 - Jotron TR-2500 - Area Entry, new channels - - Slot offset



C.9 High speed output performance

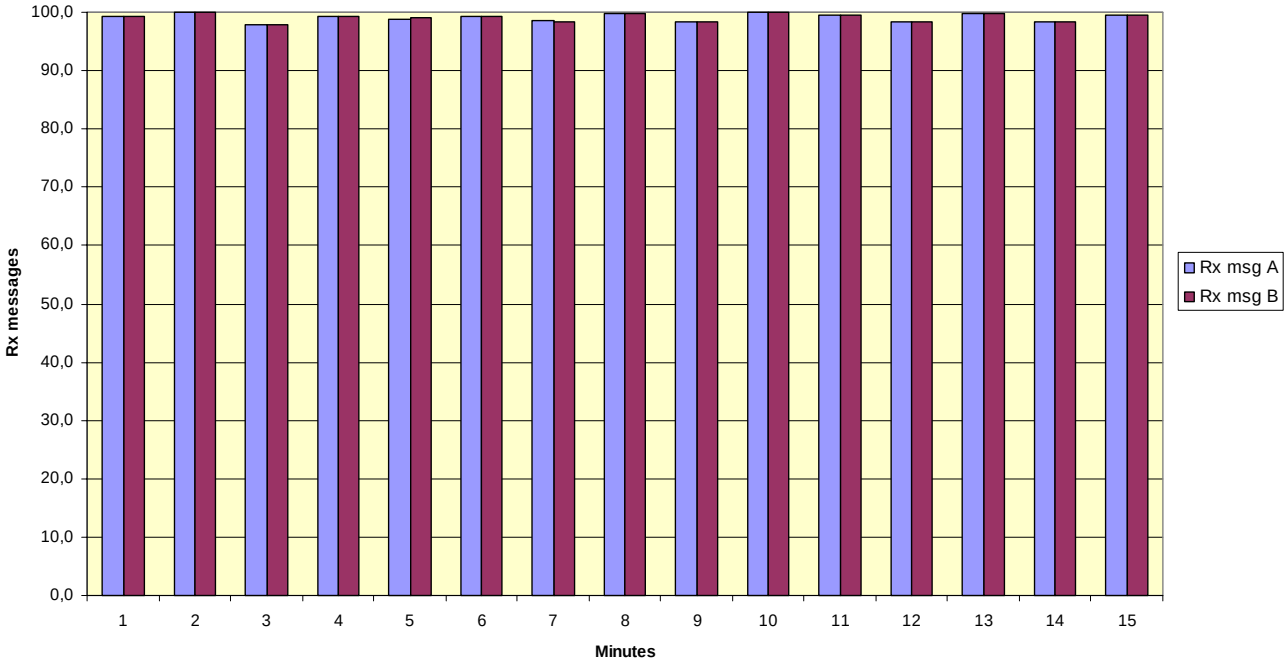
24.02.04 - Jotron TR-2500 - 19.7 PI output performance

Result: Average = 99,1% Ch A: 2084 Ch B: 2086



24.02.04 - Jotron TR-2500 - 19.7 PI output performance

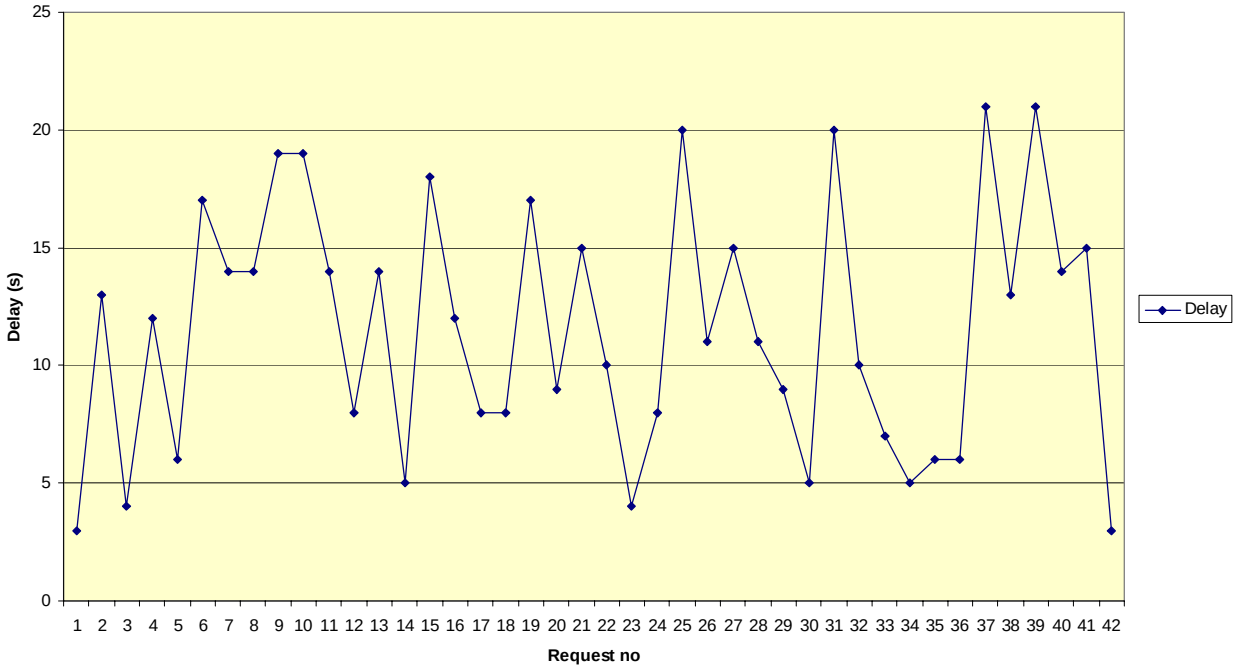
Result: Average = A= 99,1%, B=99,1% Ch A: 2084 Ch B: 2086



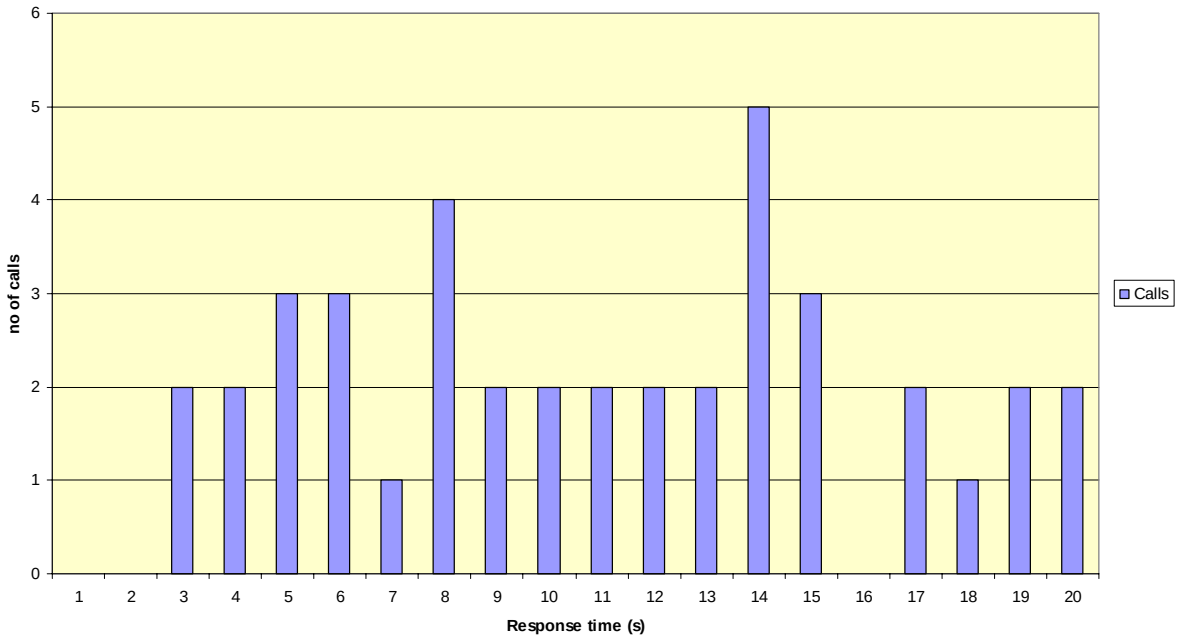
C.10DSC response time

see test clause 8.4

10.02.04 - Jotron TR-2500 - Area call response delay time



10.02.04 - Jotron TR-2500 - Area call response time

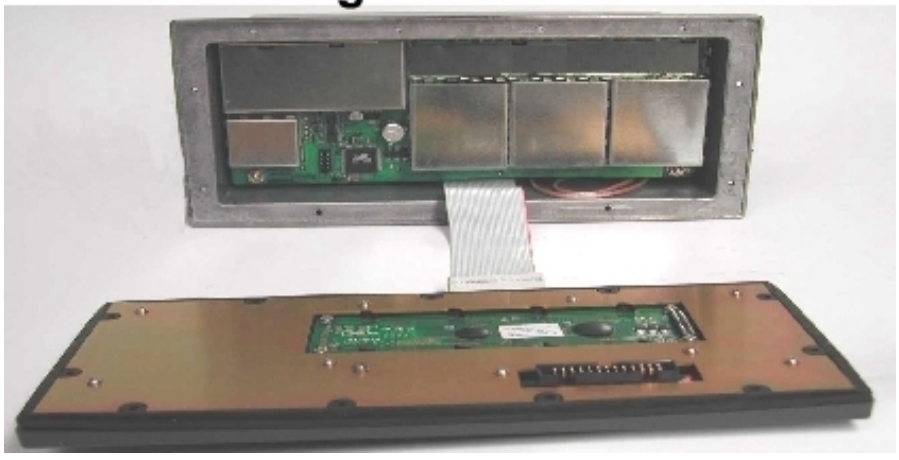


Annex D Photos of equipment under test

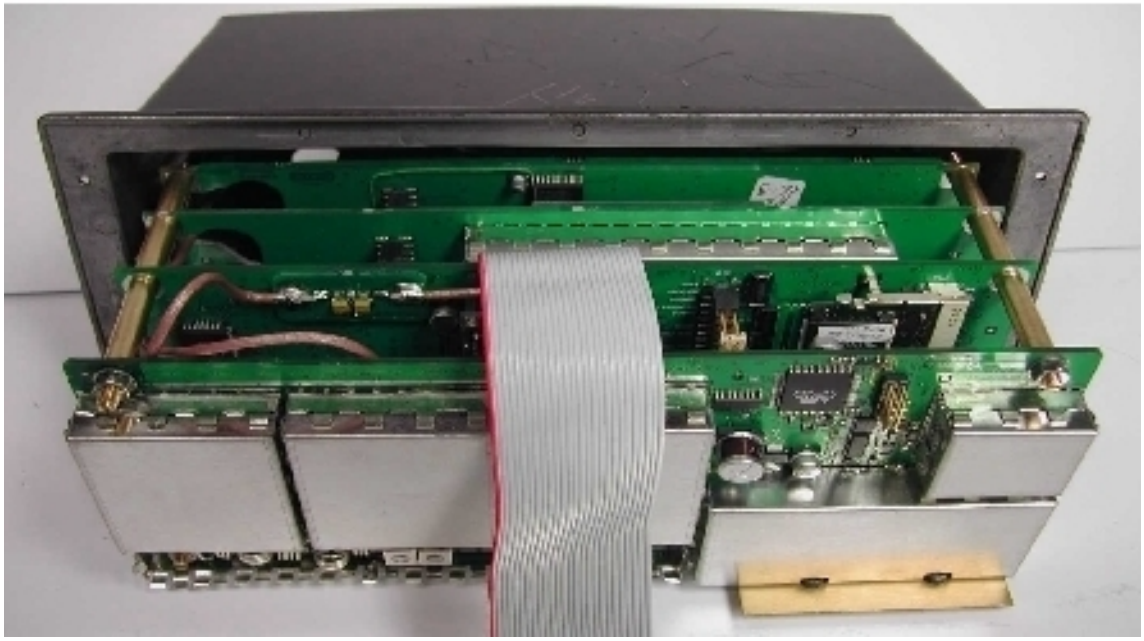
D.1 Transponder Unit

TR-2500 rear side

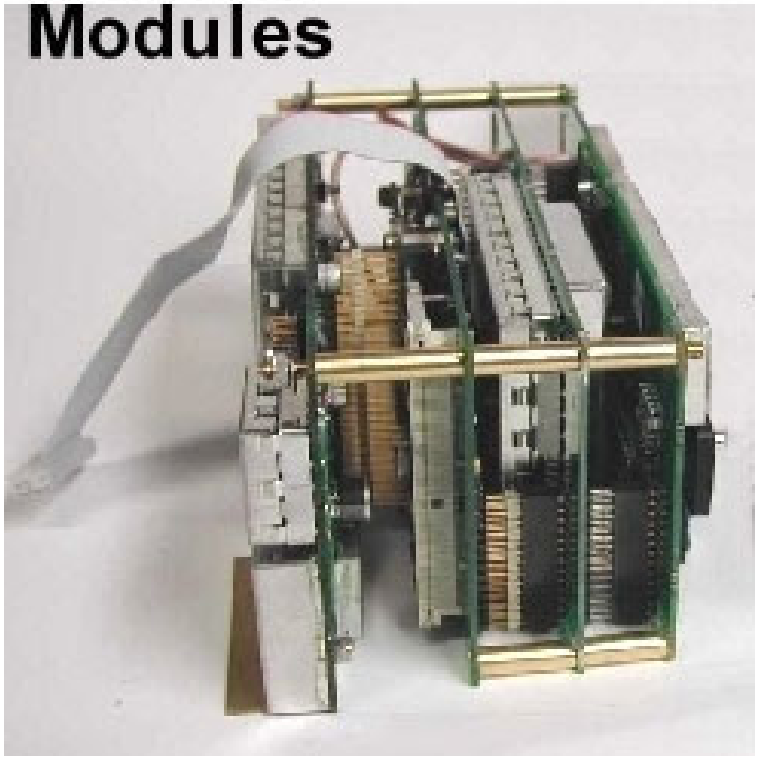
Adding Front Module



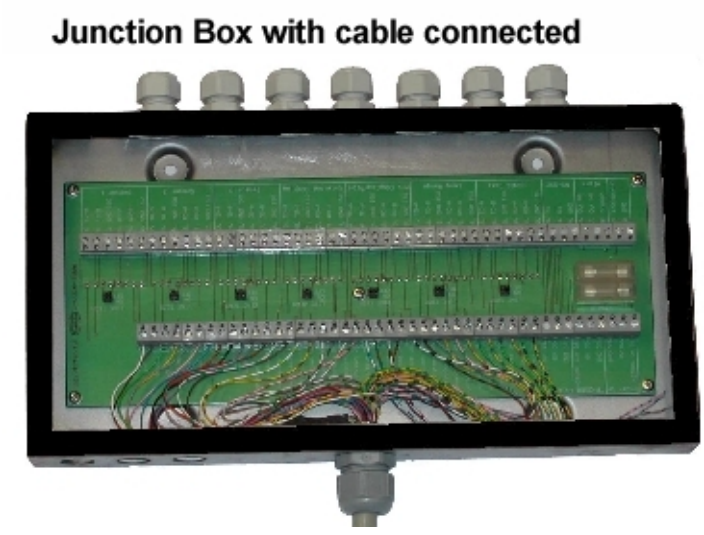
Modules and Box

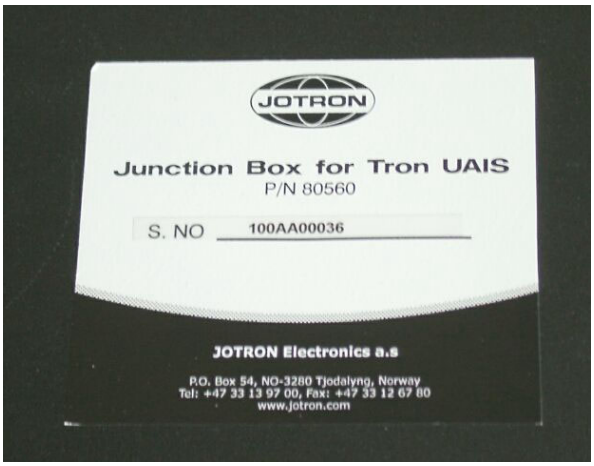


Composition of Modules



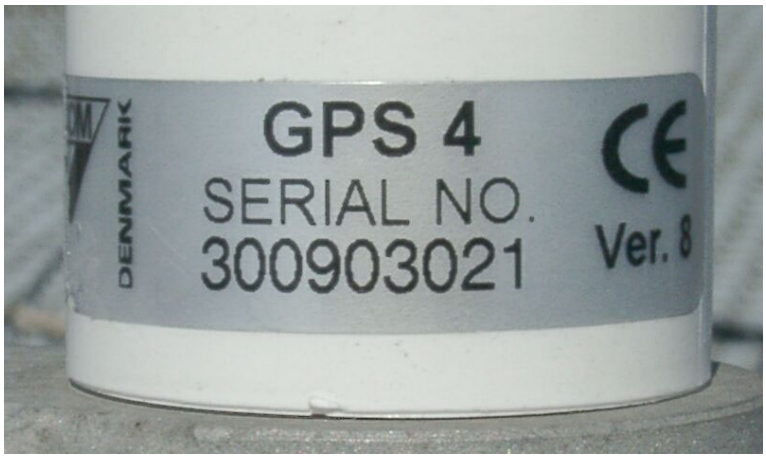
D.2 Connectin box





D.3 GPS antenna

D.3.1 Procom GPS 4



D.3.2 Procom AIS2/ GPS