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

Automatic Identification System (AIS)

Equipment under test: **Furuno AIS**

Type: **FA-100**

Applying test standards:

IEC 61993-2 (2002) Sections 14, 16-21

IEC 61162-1 (2000) -2 (1998)

Test Report No.: 734.2/0043/2003 – S3220

Applicant: Ferropilot GmbH
Siemensstr. 35
D 25462 Rellingen
Germany

Hamburg, 21.1. 2003
Federal Maritime and
Hydrographic Agency

by order

Bartels
Test engineer

by order

Preuss
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nach DIN EN 45001
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Deutscher Akkreditierungs Rat
DAR
DAT-P-086/98-00

Translation

Deutsche Akkreditierungsstelle Technik (DATech) e.V.

represented in the

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Akkreditierung

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

of the
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Bernhard-Nocht-Straße 78
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Frankfurt/M., Dec. 23rd, 1998

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Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

General

Applicant: Ferropilot GmbH
Siemensstr. 35, 25462 Rellingen, Germany

Equipment under test:

Type: FA-100

Manufacturer: Furuno Electric Co. Ltd, Nishinomiya-City/ Japan

Place of test: BSH test laboratory Hamburg, Room 916

Start of test: 18. February 2002

End of test: 5.12. 2002

Test standards:[1]

IEC 61993-2 (2002)
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.

1 General

1.1 Components, Technical Data

Mobile station:			**Mobile station:**		
Transponder			**Transponder**		
Delivery date	13.03.02		Delivery date	01.07.02	
Transponder:	Furuno FA-100		Transponder:	Furuno FA-100	
Part No.:			Part No.:		
Serial No.:			Serial No.:	3539-001	
SW Version:			SW Version:		
Main	245-0001-001		Main	245-0001-0B1	
Sub	245-0002-001		Sub	245-0002-0A1	
H8S1	245-0003-001		H8S1	245-0003-001	
H8S2	245-0004-001		H8S2	245-0004-001	
H8S3	245-0005-001		H8S3	245-0005-001	
GPS Antenna			**alternative GPS Antenna**		
Type:	Furuno		Furuno	GSC-001	
Part No.:	GPA 019-S		Furuno	GVA-100	
Ser. No.:	001426				
junction box					
Furuno	**CB-100**				

Mobile station:			**Mobile station:**		
Transponder			**Transponder**		
Delivery date	01.07.02		Delivery date	21.08.02	
Transponder:	Furuno FA-100		Transponder:		
Part No.:			Part No.:		
Serial No.:	3539-001		Serial No.:	3539-001	
SW Version:	Update: 12.07.02		SW Version:	21.08.02	
Main	245-0001-0C1		Main	245-0001-0D1	
Sub	245-0002-0B1		Sub	245-0002-0C1	
H8S1	245-0003-001		H8S1	245-0003-001	
H8S2	245-0004-001		H8S2	245-0004-001	
H8S3	245-0005-0A1		H8S3	245-0005-0A1	

Mobile station:			**Mobile station:**		
Transponder			**Transponder**		
Delivery date	01.07.02		Delivery date	10.10.02	
Transponder:	Furuno FA-100		Transponder:		
Part No.:			Part No.:		
Serial No.:	3539-001		Serial No.:	3539-001	
SW Version:	Update: 17.09.02		SW Version:	10.10.02	
Main	245-0001-0G1		Main	245-0001-0I1	
Sub	245-0002-0E1		Sub	245-0002-0G1	
H8S1	245-0003-001		H8S1	245-0003-001	
H8S2	245-0004-001		H8S2	245-0004-001	
H8S3	245-0005-0A1		H8S3	245-0005-0A1	

23.10.02 New Software version:

Main	245-0001-0J1
Sub	245-0002-0I1

24.10.02 New Software version:

Main	245-0001-0K1
Sub	245-0002-0I1 (no change)

28.10.02 New Software version:

Main	245-0001-0M1
Sub	245-0002-0I1 (no change)

06.11.02 New Software version:

Main	245-0001-0N1
	245-0002-0J1
	245-0003-001
	245-0004-001
	245-0005-0A1

1.2 Composition

Minimum Keyboard and display (MKD)

☒ Internal ☐ Remote ☐ external

internal GNSS

☐ sync only ☒ backup pos. sensor

1.3 Remarks

Result marking:

Ok	Item is ok, test was successful
Nok	Test of a required item was not successful, change required
Rec	It is recommended to make a change.
???	temporarily, has to be clarified or discussed

1.3.1 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**
16.08.02 26.09.02 23.10.02	Stop of transmission	If EUT is without UTC direct after some time (1..2 hours) the transmission stops, no VDO output. Retest: Test over 2 nights, one with no other station, 1 with other station with UTC: No permanent stop of transmission, but in case of other station with UTC there were 3 TX stops of about 4 minutes and one TX stop of about 9 minutes Retest: Test over night, no UTC, 1 other station with UTC: no break of transmission	 ok
23.08.02	First message ignored	When transmitting messages like msg 16 or 22 from VDL generator to EUT, the first transmission is always ignored, no VDM output The second transmission of the same message is nearly always successful Both transmissions on Channel A 24.10.02 Retest: The first transmission of msg 16 and 22 are normally received	 ok

1.4 4.3 Manuals

1.4.1 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.

26.08.02	Test details – General documentation		
Test item	**Check**	**Remark**	**Result**
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.		ok
Operating information	Check that an operating manual is included		ok
Technical information	Check that an technical manual is included	Not included	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	Outline drawings are listed in the table of contents, but are missing in the manual 08.10.02 Retest: ok	ok
	Check that mechanical dimension drawings of MKD are available	Not applicable, internal MKD	----

26.08.02	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 in a junction box with terminals. No special connector required	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	---

1.4.2 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.

26.08.02	**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
b) Output driver	Check that the output drive capability is included	Not found	ok
c) Talker sentences of PI ports	Check that list of sentences is included		ok
	Check that unused fields are noted	No information of unused fields 08.10.02 Retest: ok All sentences are listed with a description of all fields and unused fields marked as (unused)	ok
	Check if proprietary sentences are included if available	No proprietary sentences, MKD is internal	ok

c) Talker sentences of long range port	Check that list of sentences is included	List of long range sentences is part of the list of "PC, Long range, EXTRA1". It would be better to have an extra list for long range function.	Acc.
	Check that unused fields are noted	No information of unused fields 08.10.02 Retest: ok	ok
	Check if proprietary sentences are included if available	No proprietary sentences, MKD is internal	ok
d) Input load	Check that the input load is included	No information found 08.10.02 Retest: ok	ok
e) Input sentences of PI ports	Check that list of sentences is included		ok
	Check that required and unused fields are noted	No information of unused fields 08.10.02 Retest: ok	ok
	Check if proprietary sentences are included if available	No proprietary sentences, MKD is internal	ok
e) Input sentences of long range port	Check that list of sentences is included	List of long range sentences is part of the list of "PC, Long range, EXTRA1". It would be better to have an extra list for long range function.	Acc.
	Check that required and unused fields are noted	No information of unused fields 08.10.02 Retest: ok	ok
	Check if proprietary sentences are included if available	No proprietary sentences	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	Seems to be no difference between the 3 sensor inputs.	ok
	Check that required and unused fields are noted	No information of unused fields 08.10.02 Retest: ok	ok
	Check if proprietary sentences are included if available	No proprietary sentences	ok
f) Software version	Check that the relevant software version is included	Not actual version, but description, how to read the SW version 08.10.02 Retest: The software versions are listed, but not the actual version, and no indication that the listed version is not the actual version!	

		There should be an indication like: The actual software version is indicated like this and can be displayed on the MKD .... 28.10.02: Clarification: The software version in the manual will be the production version	ok
f) Hardware version	Check that the relevant hardware version is included	Is defined by the actual type of equipment and the column "Remarks" in the assembly parts list	ok
g) Hardware input/output circuit	Check that information about hardware interface components is included	Not found 08.10.02 Retest: ok Is included, but shows that there is no electrical isolation	ok
h) Standards	Check that the version number and date of update of the relevant standard is included	Only "IEC 61162-1/2" mentioned, not the version of the standard. 28.10.02 Retest: Version of standard is included now	ok

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)

2.1.1.1 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.

20/03/02	**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	Internal GNSS in use	ok
Speed	Check the values of SOG and COG		ok
Heading/ROT	Check that the values of heading and ROT are default		ok

Date	**Result**	**Status**
20/03/02	Transmit Position reports	ok

2.1.1.2 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.

20/03/02	**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 and MKD 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	No HDG display on MKD	Ok

20/03/02	**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 and MKD 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

Date	Result	Status
20/03/02	Receive Position reports	ok
15.05.02 09.07.02 14.08.02 25.09.02	EUT did not receive calls if transmitter and EUT were not synchronised by GPS (transmitter without GPS). A AIS transponder should be able to receive calls which are not synchronised to the beginning of time slots Retest: Does still not received calls if not synchronised by GPS Retest: Does receive unsynchronised stations not if it is already transmitting during the startup phase of the transponder. Does still not received unsynchronised stations if the other station starts transmission when the EUT is already in operation Retest: Receives other stations which are not synchronised to the EUT also if the other station starts transmission when the EUT is already in operation, if the EUT is in sync mode 3. If the EUT is in sync mode 0, it does not received stations which are not synchronous to the EUT (accepted)	ok

2.1.2 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 2.4.3 14.4.3 Assigned reporting rates.

21.05.02	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 = 10 and slot increment parameter = 4 (increment = 125)			
Message type	Check that message type of position report is 2		ok
First message	Check that first message is sent after 10 slots	First Message is sent after 40 slots. We have decided that a minimum offset of 40 is required and accepted	ok
Alternating channels	Check that position report is sent alternating on channel A and B	Is only sent on the channel on which msg 16 is received 09.07.02 Retest: ok	ok
Reporting rate	Check that the reporting rate is 125 slots (18 msg/min) or 250 slots (9 msg/min) per channel	EUT uses the increment parameter directly as slot offset. The increment table should be used. See note) 27.05.02 Retest: now ok	ok
Record switch back time	Check that EUT reverts to SOTDMA msg 1 within 4 to 8 min	Time-out = 4, Time-out = 3	ok

Note) The IALA Technical clarifications to ITU-R M.1371 defines a table of slot increments to be used in msg 16 for 1=1125 slots to 6=45 slots increment (clarification 2.45 on page 43). The values of this table from 1 to 6 shall be used instead of the slot offsets directly.

21.05.02	Test details b)– Reporting rate		
Test item	**Check**	**Remark**	**Result**
Send an assignment message 16 with offset = reporting rate of 300msg/10 min, increment=0			
Message type	Check that message type of position report is 2 instead of msg 1		ok
Alternating channels	Check that position report is sent alternating on channel A and B		ok
Reporting rate	Check that the reporting is 30msg/frame = 2 s		ok
Record switch back time	Check that EUT reverts to SOTDMA msg 1 within 4 to 8 min		ok

Date	Result	Status

21.05.02 09.07.02	Some failures, see details Retest, ok now	 ok

2.1.3 14.1.3 Polled mode

(4.2.1 M.1371A2/3.3.2)

2.1.3.1 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.

22.05.02	**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,000001008,3,,,,,, modified 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,000001008,,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

22.05.02	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_1.sst: $AIAIR,000005002,5,,,,,, 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,000001008,,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

22.05.02	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_1.sst: $AIAIR,000002345,4/20/22,,,,,, 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,000002345,,15,,3	ok
Request msg 20	Check the VDO output on PI		ok
	Record and check the AIABK acknowledgement	$AIABK,000002345,,15,,3	ok
Request msg 22	Check the VDO output on PI		ok
	Record and check the AIABK acknowledgement	$AIABK,000002345,,15,,3	ok

22.05.02	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_2.sst: $AIAIR,000005002,3,,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,000005002,,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

Date	Result	Status
22.05.02	Test ok	ok

2.1.3.2 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.

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

22.05.02	**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	Slot offset about 29 and 36	ok
Response channel	Check that the response is transmitted on the request channel		ok

22.05.02	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"

Date	Result	Status
22.05.02	Test ok	ok

2.1.4 14.1.4 Addressed operation

(6.1 M1371 A2/3.3.8)

2.1.4.1 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 .

20/03/02	**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,1,1,2,000005002,1,6,06P0test,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	See 7.8	
Received by VDL Analyser	Check msg on VDL analyser		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)		ok
acknowledgement	Check AIABK or MKD for corresponding pos. and neg. ack.	Alarm on display if failed	ok

20/03/02	**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,1,1,2,000001005,1,12,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	See 7.8	
Received by VDL Analyser	Check msg on VDL analyser		Ok
RX of msg 13 (VDM)	Check that the ackn. msg 13 is received by EUT (VDM)		Ok
acknowledgement	Check AIABK or MKD for corresponding pos. and neg. ack.	Alarm on display if failed	Ok

Date	**Result**	**Status**
20/03/02	Transmit an addressed message	ok

2.1.4.2 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 .

20/03/02	**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

20/03/02	**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

Date	**Result**	**Status**
20/03/02	Receive addressed message	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

22.05.02	**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		ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,8,6,3	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		ok
Rx on other transponder (VDM)	Check the VDM output of an other transponder		Ok

22.05.2002	Test details - Safety related broadcast message 14		
Test item	**Check**	**Remark**	**Result**
Transmit a safety related broadcast messages 14 with 121 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 121 data bytes or 162 characters			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,14,6,3	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		Ok
Rx on other transponder (VDM)	Check the VDM output of an other transponder		Ok

Date	Result	Status
22.05.02	Test ok	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.

14.02.02	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_111.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		ok
AIABK acknowledgement	Record the AIABK output, check that type = 2 (could not be broadcast)	$AIABK,,,8,1,2	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.

14.02.02	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.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 output	ok
AIABK acknowledgement	Record and check the AIABK acknowledgements, type should be 3	$AIABK,,,8,1,2	ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		----
Message on VDL	Check the broadcast message on VDL analyser		----
Rx on other transponder (VDM)	Check the VDM output of an other transponder		----

Date	Result	Status
22.05.02	Test ok	ok

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. 2.1.1.1
Information content provided by internal GNSS receiver – if used as backup position source – and manual MKD inputs are tested here.

20/03/02	**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		ok
Navigational status	See below		
Position	Check the values of lat and lon and compare with MKD display	Internal GNSS in use	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	17.4.02	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

20/03/02	**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
			ok

Date	**Result**	**Status**
20/03/02	content of msg 1	ok
	msg17 not yet tested	

2.3.2 Information content of msg 5

22.05.02	**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		ok
AIS version indicator	Check that version is 0		Ok
IMO number	Check value in msg 5		Ok
Call sign	Check value in msg 5		Ok
Name of ship	Check value in msg 5		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		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 2.9.2.5 "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	DTE flag is set according to SSD sentence, but then changed according to the real connection of MKD	Ok
DTE off	Check that DTE flag = 1		Ok
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
Tx of msg 5	Check if msg 5 is transmitted at change of talker		Ok

Date	Result	Status
22.05.02	Test ok	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).

21.03.02	**Test details – Change of reporting rate**		
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	Row 48/49: 2 not allocated slots used for new allocation. Existing slots should be used Row 58: Slot 64 is allocated but used one frame later: 09.07.02 Retest: ok	ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions		ok
	Check that new rate is established within 1 minute		ok
	Check that new reporting rate is 6 s	10 msg /frame	ok
Speed = 25 kn	Check slot allocation using msg 3 for new reporting rate	Row 92,93: 2 not allocated slots are used for new allocation. Existing slots should be used 09.07.02 Retest: ok	ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions		ok

	Check that new rate is established within 1 minute		ok
	Check that new reporting rate is 2 s	30 msg/frame	ok
Speed = 25 kn Increase heading by 6 degr. steps sometimes	Check that no change		ok
Speed = 25 kn Stop Increasing heading	Check that no change		ok
Reduction of speed to Speed = 15 kn	Check slot allocation by deallocation of slots, Msg 3 not required for new reporting rate	changed 14.4.02	ok
	Check that new rate starts after 3 min and is established within 4 minutes	changed 14.4.02	ok
	Check that new reporting rate is 6 s	changed 14.4.02	ok
Speed = 15 kn Increase heading by 6 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	Row 466/467: msg 3 allocate slots which are already allocated: Slot offset should be set to 0 09.07.02 Retest: no change	Acc.
	Check that new rate is established immediately		ok
	Check that new reporting rate is 2 s		ok
Speed = 15 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	Reduced after 15 s 09.07.02 Retest: Reduced after 42 s	Ok ok
	Check that new reporting rate is 6 s again		ok
Speed = 10 kn	Check slot allocation using msg 3 for new reporting rate	Row 557,558: 2 not allocated slots are used for new allocation. Existing slots should be used 09.07.02 Retest: ok	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
Speed = 10 kn Decrease heading by 6 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	Row 586/589...: msg 3 allocate slots which are already allocated: Slot offset should be set to 0 09.07.02 Retest: no change	acc

	Check that new rate is established immediately		ok
	Check that new reporting rate is 3 1/3 s	18 msg/ frame	ok
Speed = 10 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	Established within 30 s	ok
	Check that new reporting rate is 10 s again		ok

07.02.02	**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	14.4.02 maintains RepRate according to 1371 until NavStatus changes	ok
	Check that new reporting rate is 10 s	10sec after next NAV-status change	ok

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

Date	**Result**	**Status**
21.03.02	In general ok but some failures in detail. See test details	
14.4.02	changed and retested	ok
09.07.02	Retest, some improvements	ok

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)

19/03/02	**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	If speed had been decreased from i.e. 15 kn, RepRate is 2/20 sec; see above 15.4.02 changed	ok
Nav. status = 1 (at anchor) Speed = 2 kn	Check that reporting rate is 3 min	RepRate is 0.5 s 15.4.02 changed 3min	ok
Nav. status = 1 Speed = 4 kn	Check that reporting rate is 10 s	RepRate is still 0.5 s 15.4.02 changed 10 s	ok
Nav. status = 5 (moored) Speed = 2 kn	Check that reporting rate is 3 min	RepRate is 0.5 s 15.4.02 changed 3 min	ok
Nav. status = 2 or other Speed = 2 kn	Check that reporting rate is 10 s	RepRate is still 0.5 s 15.4.02 changed 10 s	ok
		0.5 s RepRate is maintained also after power off (!) until speed is increased to i.e. 25 kn and reduced again	

Date	**Result**	**Status**
21/03/02	Reporting rate of 3 min at NavStatus anchored or moored is not established correctly	
16.4.02	changed and retested	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.

A basic test of assigned mode is made in 2.1.2 14.1.2 Assigned 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.

23.05..02	**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 = 10 and slot increment parameter = 3 (increment = 225 = 6 s)			
NavStatus = 0 (under way using engine) Speed = 10 kn	Check that slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
NavStatus = 1 (at anchor)	Check that Navstatus has no effect: slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
NavStatus = 0 Speed = 15 kn Course change	Check that reporting rate = 2 s and Msg type = 1/3 (msg 3 inserted between msg 1)	Does not increase reporting rate. 10.07.02: Retest: changed to autonomous mode with a reporting rate of 2 s by inserting msg 3. After end of heading change back to msg 2	ok
NavStatus = 0 Speed = 25 kn	Check that reporting rate = 2 s and Msg type = 1 (change with msg 3)	Does not increase reporting rate. 10.07.02: Retest: changed to autonomous mode with a reporting rate of 2 s	ok

23.05.02	**Test details b) – Designated reporting rate**		
Test item	**Check**	**Remark**	**Result**
Send an assignment message 16 with offset = reporting rate of 100 msg/10 min, increment=0			

NavStatus = 0 (under way using engine) Speed = 10 kn	Check that reporting rate is 6 s And msg type = 2		Ok
NavStatus = 1 (at anchor)	Check that navStatus has no effect: reporting rate = 6 s msg type = 2		ok
NavStatus = 0 Speed = 25 kn	Check that reporting rate = 2 s and Msg type = 1 (change with msg 3)	Reporting rate is increased to 2 s Message type is not changed to 1 (keeps type 2 after change using msg 3) 10.07.02: Retest: changed to autonomous mode with a reporting rate of 2 s with msg type 1	Ok Ok
NavStatus = 0 Speed = 15 kn Course change	Check that reporting rate = 2 s and Msg type = 1/3 (msg 3 inserted between msg 1)	Report rate = 2s by inserting msg 3. All msg 2 are changed to 3 during change. After end of heading change back to msg 2	ok

Date	Result	Status
23.05.02 10.07.02	Some failures, see details Retest, ok now	 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.

23.05.02	**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		Ok
Restart reporting rate of 6 min	Check that the next msg 5 is transmitted after 6 min		Ok
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 is transmitted within 1 min after of change of ref. point data		Ok

Date	Result	Status
23.05.2002	Test ok	ok

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.

20/03/02	**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	history on MKD	ok
Read out recorded data	Check that all switch off times are correctly recorded	Times recorded are UTC + time offset. The time offset can't be reproduced after a change. The History should store UTC only	Ok

		store UTC only. 16.4.02 time offset function deleted, now ok 30.04.02 Retest: see note) 10.07.02 Retest: Recording is now ok, but also switch off times < 15 min are recorded 30.09.02 Retest: switch off times < 15 min are not recorded There is still a problem in recording the switch off times: There was a short switch off time (maybe more than 15 min), then the EUT was on for 1 hour and then switched of 2 times for about 1 minute. The complete time from the first switch off until the last switch on was recorded as a switch off time. In addition the last switch on time is not displayed. 24.10.02 Retest: ok	ok

Note)
On 29./30 may 2002 the following history is recorded:

On/off	Date	Time	Remark
Pwr-on	30/May/2002	05:54:16	Checked, ok
Pwr-off	29/May/2002	09:04:23	
Pwr-on	29/May/2002	09:08:30	
Pwr-off	29/May/2002	09:04:23	
Pwr-on	29/May/2002	09:05:42	
Pwr-off	29/May/2002	09:04:23	
Pwr-on	29/May/2002	09:04:36	
Pwr-off	29/May/2002	09:04:23	

The power on time is 4 times the same time. This seems not to be correct. Please check this.
Short switch-off times of some seconds are recorded. This is not necessary but may fill the memory so that the longer switch-off times may be deleted.

The requirement is to records 10 switch-off periods of more than 15 minutes. It should not be possible to delete a switch-off time in the history by simply switch on and off 10 times in a short time.

Date	Result	Status
20/03/02	Times recorded are UTC + time offset. The time offset can't be reproduced after a change. The History should store UTC only.	
16.4.02	time offset function (local time) deleted	ok
20/03/02	It is possible to set the power to "0", which also results in "AIS inoperative" because no transmissions. This needs to be included to the history.	
16.4.02	power = "0" added to history table	ok
30.05.02	See note	
10.07.02 30.09.02	Recording is ok now. We need a description how it is guaranteed that the last switch off times of more than 15 minutes can not be deleted or overwritten by fast switching on and off the unit considering the memory is not unlimited. Retest: switch off times < 15 min are not recorded	 ok

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.

19/03/02	**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	1:36min msg 3 2:45min msg 1	ok
b) Switch off EUT for approx. 0.5 s	Check that EUT starts transmission within 2 min	As above	ok

Date	Result	Status
19/03/02	Initialisation period	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.

08.02.02	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	Could not enter a new regional setting 20.07.02 Retest: ok	ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok
	Check ACA output at PI		ok
b) Enter by using msg 22: 1 duplex channel 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		Ok

	Check that Transitional zone in ACA output = value of msg 22 + 1		Ok
c) Enter by ACA sentence: 1 duplex channel 25 kHz spacing 12.5 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth	TX bandwidth is 25 kHz 10.07.09 Retest: TX bandwidth seems to be 12.5 kHz but difference in modulation is very small	ok
	Check TXT output at PI		Ok
	Check ACA output at PI		Ok
d) Enter by DSC 2 simplex channels 12.5 kHz spacing 12.5 kHz bandwidth File name: sel_set_region_in.sst	Check that channels are used		ok
	Check bandwidth	TX bandwidth is 25 kHz 27.08.02: ACA shows 0=25 kHz bandwidth 08.10.02 Retest: ACA shows = 12.5 kHz bandwidth	ok
	Check TXT output at PI		ok
	Check ACA output at PI		ok

Date	Result	Status
23.05.2002	Transmitter modulation is always according to 25 kHz bandwidth	
10.07.2002	TX bandwidth seems to be 12.5 kHz but difference in modulation is very small. It is the same difference as in the previous test, but using DSC bandwidth seems to be still 25 kHz	Ok
08.10.2002	Retest: ACA shows 12.5 kHz bandwidth	ok
23.05.2002	Could not enter an area manually, only modify existing areas	
10.05.2002	Retest: Entering new areas is now possible	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.

18.4.02	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

Date	Result	Status
18.4.2002	passed	ok

2.9 14.9 Alarms and indicators, fall-back arrangements

(6.10)

21/03/02	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	AIALR and AITXT status indications are sent every 10s 16.4.02 ALR 006 “healthy” every 2 min; AITXT only if status changed	ok
		It would be enough and would reduce PI load if only 1 ALR for “general failure” no.006 with “V” is sent i.e. every 2 min	rec done see above

Date	Result	Status
21/03/02	Status indications AITXT shall only be sent on change of	

	parameters. A "healthy alarm" ALR should be sent continuously. It would be enough and would reduce PI load if only 1 ALR for "general failure" no.006 with "V" is sent i.e. every 2 min	
16.4.02	**changed;** ALR 006 "healthy" every 2 min; AITXT only if status changed	**ok**

2.9.1.1 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".

21/03/02	**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.

18.4.02	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	verified by documentation	
ALR output	Check that ALR sentence ID 001 is output at PI		ok
ALR output repetition	Check that the ALR sentence is repeated with a rate of 30 s		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		ok
	Check that ALR sentence is updated		ok
	Check that alarm display on the MKD is updated		ok
Reconnect VHF antenna	Check that ALR sentence is updated		ok
	Check that alarm display on the MKD is updated		ok

Date	Result	Status
18/04/02	internal controller compares TX power sensor input and modem control output for scheduled slots. ALR 001 is given if mismatch detected.	**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.

17.4.02	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 18.4.02 difficult to establish reproducable 3:1; results are for VSWR-sensor above threshold of 60:			
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	pop-up window to be deleted, will be changed 10.07.09 Retest: pop-up window is deleted	ok
MKD acknowledge (applies to all alarms) note: NEW	ack on MKD should clear display and update ALR sentence	clr button used to clear pop-up window, but no ALR update; will be changed to ack the ALR also 10.07.09 Retest: ALR sentence is updated	ok
Connect VHF antenna	Check that ALR sentence is updated		ok

note: VSWR-sensor AD output was
30 antenna connected
44 150 ohm
40 250 ohm
5C 150 ohm
C8 open
70 short
To avoid false alerts threshold of 60 seems reasonable, but could possibly be improved.

Date	Result	Status
17.4.02	VSWR threshold should be improved	**rec**
17.4.02 10.07.02	Acknowledgment by ACK and MKD needs to update ALR sentence Update of Alarm is now ok	 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.

06.11.02	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	Documentation is included in the "Operator's Manual"	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.

08.02.02	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	Sync state remains on 0 = UTC direct 10.07.02 Retest: ok	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

Date	Result	Status
23.05.2002	Sync state remains on 0 = UTC direct when GPS	

	antenna is disconnected, Should switch to 1 = UTC indirect	
29.05.2002	Retest waiting for a longer time for new sync state Sync state changes to 1 (UTC indirect) after about 5 min. Should change to 1 as soon as it synchronises to another transponder instead of UTC.	
10.07.02	Retest: Switches to sync state 1 within 20 s	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.

08.02.02	**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 because of internal MKD	
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		

Date	**Result**	**Status**

16.01.2002	Not applicable (internal MKD)	ok

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.

08.02.02	**Test details - Position priority – changing downwards**		
Test item	**Check**	**Remark**	**Result**
Connect sensor inputs and correction data according to the test items			
a) • External DGNSS • Internal DGNSS if available, else internal GNSS	Check that external position is used	17.4.02	ok
	Check that position accuracy flag = 1	17.4.02	ok
	Check that RAIM flag is set according to sensor input data		
b) Change from a: • External sensor mode from DGNSS to GNSS	Check that internal position is used	17.4.02	ok
	Check that position accuracy flag = 1	17.4.02	ok
	Check that RAIM flag is set according to documentation of internal GPS	not used	

• Internal DGNSS by msg 17	Check that msg 5 is output with new ref. point		
	Check that TXT sentence with ID 024 is output on PI		
	Check that status display of MKD is updated according to TXT sentence		
c) Change from b: • Internal DGNSS by beacon • External sensor mode is GNSS	Check that internal position is used	17.4.02	ok
	Check that position accuracy flag = 1	17.4.02	ok
	Check that TXT sentence with ID 023 is output on PI		
	Check that status display of MKD is updated according to TXT sentence		
d) Change from c: • Remove correction data for Internal GNSS • External GNSS input	Check that external position is used	17.4.02	ok
	Check that position accuracy flag = 0	17.4.02	ok
	Check that RAIM flag is set according to documentation of internal GPS		
	Check that msg 5 is output with new ref. point		
	Check that TXT sentence with ID 022 is output on PI		
	Check that status display of MKD is updated according to TXT sentence		
d) Change from a: • Change external sensor mode to GNSS • Internal GNSS available	Check that external position is used	17.4.02	ok
	Check that position accuracy flag = 0	17.4.02	ok
	Check that RAIM flag is set according to documentation of internal GPS		
	Check that msg 5 is output with new ref. point		
	Check that TXT sentence with ID 022 is output on PI	No output of msg 022 28.10.02 Retest: msg 022 is output	ok
	Check that status display of MKD is updated according to TXT sentence	No change of MKD status, remains on “ external **D**GNSS” 28.10.02 Retest: status display is changed	ok
e) Change from d: • Remove external GNSS input • Internal GNSS available	Check that internal position is used	17.4.02	ok
	Check that position accuracy flag = 0	17.4.02	ok
	Check that RAIM flag is set according to documentation of internal GPS	not used	----
	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 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: • Disable internal GNSS • No external GNSS input	Check that default position is used	17.4.02	ok
	Check that position accuracy flag = 0	17.4.02	ok
	Check that RAIM flag is set according to documentation of internal GPS		---
	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 is changed after 5 s	17.4.02	ok

08.02.02	**Test details - Position priority – changing upwards**		
Test item	**Check**	**Remark**	**Result**
Connect sensor inputs and correction data according to the test items			
f) Start with: • No external GNSS input • No Internal GNSS	Check that default position is used	17.4.02	ok
	Check that position accuracy flag = 0	17.4.02	ok
	Check that RAIM flag = 0		
	Check that ALR message with ID 026 (No sensor position) is output on PI every 30 s		Ok
e) Change from f: • Activate internal GNSS • No external GNSS input	Check that internal position is used	17.4.02	Ok
	Check that position accuracy flag = 0	17.4.02	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 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		Ok
d) Change from e: • Apply external GNSS input • Internal GNSS is available	Check that external position is used	17.4.02	Ok
	Check that position accuracy flag = 0	17.4.02	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 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		Ok

c) Change from d: • Apply correction data for DGNSS by beacon • External mode is GNSS	Check that internal position is used	17.4.02	Ok
	Check that position accuracy flag = 1	17.4.02	Ok
	Check that msg 5 is output with new (internal) ref. point		
	Check that TXT sentence with ID 023 is output on PI		
	Check that status display of MKD is updated according to TXT ID 023		
b) Change from c: • Apply correction data for DGNSS by msg 17 • External mode is GNSS	Check that internal position is used	17.4.02	Ok
	Check that position accuracy flag = 1	17.4.02	Ok
	Check that TXT sentence with ID 024 is output on PI		
	Check that status display of MKD is updated according to TXT ID 024		
a) Change from b: • Change external mode to DGNSS • Internal DGNSS	Check that external position is used	17.4.02	Ok
	Check that position accuracy flag = 1	17.4.02	Ok
	Check that TXT sentence with ID 021 is output on PI		
	Check that status display of MKD is updated according to TXT ID 021		
b) Change from d: • Change external mode to DGNSS • Internal GNSS	Check that external position is used	17.4.02	Ok
	Check that position accuracy flag = 1	17.4.02	ok
	Check that msg 5 is output with new (external) ref. point		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 is changed after 30 s	17.4.02	ok

Date	Result	Status
19.4.2002	Not yet complete	
24.10.2002	Completed as far as possible (no internal differential mode) At change of external position from autonomous mode to differential mode an alarm ID 25 (external GNSS lost) is generated, and position is changed to internal GPS receiver. After about 30 seconds the alarm is inactivated, and the position is switched to external sensor in differential mode. 30.10.02 Retest: ok	ok
24.10.2002	When the external sensor changes from differential mode to autonomous mode no TXT message 22 is output, and the status display on MKD is not	

	changed to “external GNSS”. 30.10.02 Retest: ok	ok

2.9.3.2 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.

23.05.02	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	Not active 10.07.02 Retest: Alarm relay is activated until acknowledgement or heading valid again	ok
	Check that an alarm according to ID 032 is displayed on MKD		Ok
	Check that an alarm according to ID 035 is displayed on MKD		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		----
	Check that the alarm display on MKD is updated		ok
	Check that the status display on MKD is updated (heading and ROT valid)	No Heading/Rot status display available 10.07.02 Retest: Sensor status available	ok
c) Change ROT talker • Valid heading • ROT, talker not TI	Check that ROT in VDL is + 127 for ROT > 10 °/min, turning right		ok
	Check that ROT in VDL is + 127 for ROT < -10 °/min, turning left		Ok

	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
c) Disconnect ROT • Valid heading • No ROT Change heading > 5 °/30s	Check that ROT in VDL is + 127 for increasing heading	Default is used, differentation of heading is not implemented	ok
	Check that ROT in VDL is - 127 for decreasing heading		----
	Check that TXT message with ID 034 (other ROT in use) is output on PI		----
d) Reconnect ROT • Valid heading • Valid ROT from TI	Check that ROT in VDL ok		----
	Check that TXT message with ID 033 (ROT in use) is output on PI		----

Date	Result	Status
23.05.2002 10.07.2002	Alarm relay not active, Retest: Alarm relay is activated until acknowledgement or heading valid again	ok
23.05.2002 10.07.2002	No display of heading/ROT status Retest: Sensor status available	ok

2.9.3.3 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.

23.05.02	**Test details - Speed sensor**		
Test item	**Check**	**Remark**	**Result**
Connect external speed sensor input according to test items. Internal GPS is available			
a) Connect external position and speed • External Position • External speed	Check that external SOG is used in VDL message 1,2,3	17.4.02	ok
	Check that external COG is used in VDL message 1,2,3	17.4.02	ok
	Check that TXT message with ID 027 (external speed in use) is output on PI		ok
	Check that alarm relay is inactive	17.4.02	ok
	Check that the status according to TXT msg ID 027 is displayed on MKD		Ok
b) Disconnect external position • No external Position • External speed	Check that SOG from internal GPS is used in VDL message 1,2,3	17.4.02	ok
	Check that COG from internal GPS is used in VDL message 1,2,3	17.4.02 (external only used if both POS and SOG/COG valid)	ok
	Check that TXT message with ID 028 (internal speed in use) is output on PI		ok
	Check that alarm relay is inactive		ok
	Check that the status according to TXT msg ID 028 is displayed on MKD		ok
b) From a: Disconnect external position and speed • No external Position • No external speed	Check that SOG from internal GPS is used in VDL message 1,2,3	17.4.02	ok
	Check that COG from internal GPS is used in VDL message 1,2,3	17.4.02	ok
	Check that TXT message with ID 028 (external speed in use) is output on PI		ok
	Check that alarm relay is inactive		ok
	Check that the status according to TXT msg ID 028 is displayed on MKD		ok

Date	**Result**	**Status**
23.05.2002 10.07.2002	No status display of speed Retest: Sensor status display	 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

20/03/02	**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

20/03/02	**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	Check that received target is displayed		
	MMSI	Recommended	Ok
- required -	Position (RNG, BRG); Check values	required	Ok
	Position (Lat,Lon)	Unavailable Pos is not indicated, last position continuously displayed 16.4.02 changed, now ----	ok
	Time	Not required	-
	PA (Position accuracy) flag	Not required	-
	SOG and COG	Recommended	Ok

	True heading	Recommended	-
	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	Ok
	Call sign	Recommended	Ok
	Name of ship	Required	Ok
	Type of ship and cargo	Recommended	Ok
	Dimension/Reference for position	Length recommended	Ok
	Type of EPFD	Not required	-
	Estimated time of arrival	Not required	-
	Maximum present static draught	Not required	-
	Destination	Not required	-
	DTE flag	Not required	-
MSG 4 Base station report - Recommended -	MMSI	recommended	-
	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	Ok
	RAIM flag	Not required	-
	DTE flag	Not required	-
MSG 12/14 Safety related text message - Required -	MMSI	Required	Ok
	Text content	Required	Ok
	Broadcast or selective	Recommended	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	-
	RAIM flag	Not required	-
	Name	Recommended	Ok
	Type of ship and cargo	Recommended	Ok
	Dimension/Reference for position	Length recommended	Ok
	Type of EPFD	Not required	-
	DTE flag	Not required	-

MSG 21 Aids to navigation report - recommended -	MMSI	Recommended	Ok
	Type of Aids to navigation	Recommended	-
	Name of Aids to navigation	Recommended	Ok
	Position (RNG, BRG); Check values	Recommended	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	-
	PA flag	Not required	-
	RAIM flag	Not required	-
	Type of ship and cargo	Recommended	-
	Dimension/Reference for position	Length recommended	Ok
	Type of EPFD	Not required	-
	Off position indicator	Recommended	-
	SOG, COG shows default values	Should be ---------- 16.4.02 changed, now -----	ok
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

20/03/02	**Test details d) – Input of data**		
Test item	**Check**	**Remark**	**Result**
MMSI number	Check that number can be input		Ok
	Check that input is protected	Password is set to 123	Ok
IMO number	Check that number can be input		Ok
	Check that input is protected		Ok
Call sign	Check that Call sign can be input		Ok
	Check that input is protected		Ok
Name of ship	Check that name can be input		Ok
	Check that input is protected		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	Recommended, but not required	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		Ok

Date	Result Data input/output facilities	Status
20/03/02	MSG 21 SOG, COG shows default values (should be ---------)	
20/03/02	MSG 1,2,3 Unavailable Pos is not indicated, last position continuously displayed (should be ---------)	
17.4.02	changed, now ----	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.

08.02.02	Test details) – Message transmission		
Test item	**Check**	**Remark**	**Result**
Transmission of safety related broadcast message	Check selection between broadcast and addressed message		ok
	Check selection of TX channel		Ok
	Check data input		Ok
	Check if prepared text blocks are available	Not required	-
	Check if input of invalid characters (e.g. lower case letters) are inhibited		Ok
	Check display of transmission status (indication that massage 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	Not required	-
	Check display of transmission status (indication that massage 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.		ok

Date	Result	Status
20/03/02	Message transmission	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.

24.05.02	**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	No display of bandwidth	Rec
	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 changing an existing area is possible 10.07.02 Retest: A new area can be entered	ok
	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		Ok
Enter invalid channel	Check that entry is refused	Spelling error in error message: "Dosen't" should be changed to "doesn't" but function ok 25.09.02 Retest: ok, changed to "doesn't"	ok
Enter too small area (<20 nm)	Check that entry is refused	Changing an area to an too small size is accepted Area: 53°20, 010°32 53°12, 010°30 10:07.02 Retest: Now error message if size in 1 or 2 directions to small	ok
Enter too large area (> 200 nm)	Check that entry is refused	Changing an area to an too large size is accepted Area: 53°20, 010°32 40°00, 009°00 10:07.02 Retest: Now error message if size in 1 or 2 directions to large	ok
Enter a region according to M.1371-1 A2/4.1 figure 4.1.5A (4 adjacent areas)	Check that entry is refused	Area was not accepted	ok
Changing an existing area	Check that existing area for changes can be selected		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	Default values can be changed	
	Check change of RX/TX mode	Default values can be changed	
	Check change transmission power	Default values can be changed	
	Check that change of default values are protected	Change of default values is not protected 25.09.02 Retest: ok, change is password protected	ok

Date	Result	Status
20/03/02	Regional area entry not yet implemented	
24.05.02	Regional areas are implemented now, area size is not checked, It is not possible to enter new areas	
10.07.02	New regional areas can be entered and area size is checked	ok
10.07.02 25.09.02	Change of the default values should be protected Retest: Is now password protected	 ok

24.05.02	**Test details - Alarms display**			
ID	**Test item**	**Check**	**Remark**	**Result**
001	Tx malfunction	Check is done in 2.9.2.1	Could not be tested	----
002	Antenna VSWR exceeds limit	Check is done in 2.9.2.2		ok
003	Rx cannel 1 malfunction	Check documentation	Documentation required	Ok
004	Rx cannel 2 malfunction	Check documentation	Documentation required	Ok
005	Rx cannel 70 malfunction	Check documentation	Documentation required	ok
006	General AIS failure	Check documentation	17.4.02	Ok
008	MKD connection lost	Check is done in 2.9.2.5	Internal MKD, no disconnection for test possible	----
025	External EPFS lost	Check is done in 2.9.3.1		Ok
029	No valid SOG information	Check is done in 2.9.3.3		Ok
030	No valid COG information	Check is done in 2.9.3.3		Ok
032	Heading lost/invalid	Check is done in 2.9.3.2		Ok
035	No valid ROT information	Check is done in 2.9.3.2		Ok

24.05.02	Test details - Status display			
ID	**Test item**	**Check**	**Remark**	**Result**
007	UTC clock lost		GPS status (->no fix) is implemented. 10.07.02 Retest: UTC clock lost	ok
021	External DGNSS in use	Check is done in 2.9.3.1	Only GPS status (->no fix) is implemented. See note) 10.07.02 Retest: Extrl DGNSS	ok
022	External GNSS in use	Check is done in 2.9.3.1	10.07.02 Retest: Extrl GNSS	Ok
023	Internal DGNSS in use (beacon)	Check is done in 2.9.3.1		
024	Internal DGNSS in use (msg 17)	Check is done in 2.9.3.1		
025	internal GNSS in use	Check is done in 2.9.3.1	10.07.02 Retest: Intrl DGNSS	Ok
027	External SOG/COG in use	Check is done in 2.9.3.3	10.07.02 Retest: Exterl SOG/COG	Ok
028	Internal SOG/COG in use	Check is done in 2.9.3.3	10.07.02 Retest: Intrl SOG/COG	Ok
031	Heading valid	Check is done in 2.9.3.2	10.07.02 Retest: HDT valid	Ok
033	Rate of Turn indicator in use	Check is done in 2.9.3.2	10.07.02 Retest: ROT valid	Ok
034	Other ROT source in use	Check is done in 2.9.3.2	10.07.02 Retest: Other ROT	Ok
036	Channel management parameters changed	Check that status change is displayed if channel management parameters are changed.	10.07.02 Retest: CH Management Displayed for 30 s	Ok

Note) We interpret the requirement of a status indication on the MKD in that way that all status values which have to be output on PI as TXT messages shall be displayed on an status display of the MKD, in addition to the display of the alarm list.

Date	Result	Status
24.05.2002 10.07.2002	No status display, Retest: Status display now ok	 Ok
24.05.2002	Documentation of receiver and transmitter supervision required	

2.10.4 Ergonomic aspects

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

Topic	Description
Changing regional areas	There is no way for to go back to previous items when entering regional area settings. This is required especially when invalid values have been entered. The way back can be done with SHT+NEXT.

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

24.05.02	Test details - TDMA Synchronisation		
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	Sync state changes to 1 (UTC indirect) after 5 min Time of 5 min is too long 10.07.02 Retest: Sync state changes within 20 s to 1	Ok ok
• Disable GPS by disconnection of GPS antenna, • Switch off the other AIS transponder with UTC direct	Check that sync state is changed to 3 (internal clock)	EUT remains at sync state 1 for more than 20 minutes 28.10.02 Retest: Sync state is changed back to 3 within 1 min after end of msg 4	 ok

• Disable GPS, • One base station with UTC direct within range	Check that sync state is 1 (UTC indirect)	Sync state changes to 1 (UTC indirect) after about 5 min. Time of 5 min is too long <u>10.07.02 Retest:</u> Sync state changes within 20 s to 2, should be changed to 1 (There was an error in a older version of the test protocol requiring sync state 2) <u>25.09.02 Retest:</u> EUT switches after 4 min to sync state 1 (ok) Switching is done by an complete new network entry. In a second test the switching was done without a new network entry. The slots made a jump of 8 slots <u>11.10.02 Retest:</u> Switching is done within 2 minutes by recalculation of slots During this recalculation there is an error in offset calculation. There is an jump of 5 slots in the use of transmission slots (see Excel sheet). The same problem occurred in item 16.1.3 at change of sync source from internal clock to base station. There was a jump or 21 slots. The slot numbering in the position reports after change of sync source is correct. The position reports with even timeout contain the correct slot numbers. <u>20.10.02 Retest:</u> ok now, no jump in slots	ok Ok Ok ok

	Check that report rate is 10 s	10.07.02 Retest: Reporting rate is changed to 2 s 25.09.02 Retest: Reporting rate is 10 s directly after changing sync state. After about 6 ..12 min the EUT changes reporting rate to 2 s for some minutes. No other transponder on air. 11.10.02 Retest: There was no change of reporting rate to 2 s within the next 27 minutes	ok
Note	Like in other cases when the sync source is changed the change is done by a complete new network entry .		
Note	After end of msg 4 the sync state did not switch back to sync state 3 11.10.02 Retest: EUT switched back to sync state 3 within 40 s after end of msg 4		ok

Date	Result	Status
29.05.2002 10.07.2002	Sync state changes to 1 (UTC indirect) after about 5 min. Should change to 1 as soon as it synchronises to another transponder instead of UTC. Retest: Sync state changes within 20 s to 1 if other AIS transponder with UTC in range	 ok
10.07.2002 26.09.2002	Retest: New error: If a base station with UTC is in range, sync state is changed to 2 (should be changed to 1) Retest: Sync state is 1 as required	 ok
10.07.2002 25.09.2002 11.10.2002	Retest: New error: If a base station with UTC is in range, Reporting rate is changed to 2 s. Should not be changed Retest: no change Retest: no increase of reporting rate	 ok
10.10.2002 23.10.02	At change of sync source there is no TX gap now. In case of Network entry the transmission was continued in the same physical slots, and slot numbering in position reports was adjusted to UTC correctly as soon as it is switched to sync state 0 (in case of change from internal clock to UTC). In case of changing source from internal clock to base station with and without UTC there was a jump in transmission slots of about 5 and 21 at change of sync source. Retest: ok, no jump	Ok 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.

29.05.02	Test details - TDMA Synchronisation		
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 • Other Transponders all without GPS, • Semaphore 1)	Check that sync state is 3	Changes to sync state 3 after 5 min Sync state = 3 10.07.02 Retest: Transmission is stopped for about 2min30s, then sync state = 3 (ok) 26.09.02 Retest: ok Reporting rate of 2 s starts 30s after RX of other transponder, and no stop of transmission	ok
	Check that report rate is 2 s	Other transponder MMSI 8001, own MMSI 3005 Report rate remains at 10 s 10.07.02 Retest: Reporting rate is changed to 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.

Date	Result	Status
29.05.02	Does not become semaphore within 10 min (Other transponder MMSI 8001, own MMSI 3005, number of received station 1 for both transponders)	
10.07.02	Retest: Becomes semaphore, sync state and reporting rate is ok now	ok
10.07.02 26.09.02	Retest: Transmission is stopped for about 2min30s when GPS is disconnected Transmission is also stopped for 2min30s when GPS is reconnected. Starting after 2min30s with reporting rate of 2 s, is then reduced to 10 s. Retest: when GPS is disconnected not stop of transmission. (ok). When GPS is connected: 1 min stop of transmission and network entry (accepted). No change of reporting rate to 2 s (ok)	ok
14.08.02	No retest. Test without UTC (not semaphore) shows shows similar behaviour in retest.	

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

29.05.02	Test details - TDMA Synchronisation		
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)	Sync state is 3, should be 2 if synchronised to a base station without GPS 11.07.02 Retest: Sync state is changed to 2	ok
	Check that report rate is 10 s	11.07.02 Retest: Reporting rate is changed to 2 s 14.07.02 Retest: Msg 4 is available at start of EUT: EUT starts with 2 s update rate (speed = 10 kn) 27.09.02 Retest: ok, reporting rate is 10 s 23.10.02 Retest: again reporting rate of 2 s (semaphore mode) There is not other station with mode 3, and the MMSI of EUT is higher than the MMSI of the base station. Therefore EUT should not become a semaphore. After about 6 minutes the reporting rate is changed back to 10 s (see diagram) 28.10.02 Retest: Switches to sync mode 2 after about 2min30s, without changing reporting rate. At 1 minute after end of msg 4 the EUT switches back to sync mode 3	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 • Other Transponders all without GPS,	Check that sync state is 0	14.08.02 Retest: EUT remains at sync state 2 and changes sync state to 3 after end of msg 4 (internal GPS: STS=A Mode=3D). After stop of transmisssion for 3min14s it reschedules with sync state 0 and 10 s reporting rate (ok) This is similar to the behaviour in semaphore mode (see 4.1.2 16.1.2) 27.09.02 Retest: Switching back to sync state 0 is done at the end of msg 4, not after reconnection of GPS. The switching is done correctly (ok) 11.10.02 Retest: Switched back to sync state 0 at 1 min after reconnection of GPS antenna	ok ok
	Check that report rate is 10 s	Changes to 2 s reporting rate when GPS is reconnected, back to 10 s at 30 s after end of msg 4 11.07.02 Retest: EUT remains at 2 s update rate 27.09.02 Retest: ok, reporting rate is 10 s	ok

Date	Result	Status
29.05.02	Sync state is 3, should be 2 if synchronised to a base station without GPS Changes to 2 s update rate if connected to GPS and receiving base station without GPS	
14.08.02 28.10.02	Retest: EUT starts with 2 s update rate (speed = 10 kn) if msg 4 is available at start of EUT and keeps this reporting rate. If msg 4 starts when EUT is in operation it does not receive msg 4 Retest: ok	 ok
27.09.02 11.10.02	Sync state is now 2 if synchronised to a base station without UTC. When the EUT is receiving msg 4 it does not switch back to sync state 0 (UTC direct) when GPS is reconnected. It switches back to sync state 0 about 2 min after end of msg 4. Retest: Switched back to sync state 0 at 1 min after reconnection of GPS antenna	 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.

28.05.02	Test details - TDMA Syncronisation		
Test item	**Check**	**Remark**	**Result**
Check the data recorded in 2.4.1 "14.4.1 Speed and course change" 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	How to check???	-----

Date	Result	Status
28.05.02	Test ok	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 .

08.02.02	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 323 to 343	Jitter value is between 372 and 378 24.04.02 Retest: value is in the range of 330 to 340	ok

UTC indirect	Check that T2 is in the range of 302 to 364	Jitter value is between 372 and 376, synchronised to a station with jitter value about 346-350 24.04.02 Retest: value is in the range of 470 to 490 depending on the sync source 28.10.02 Retest: Value is now in the range of 340 to 360	ok

08.02.02	**Test details - Synchronisation jitter**		
Test item	**Check**	**Remark**	**Result**
Operate device at 12.5 kHz bandwidth at a reporting rate of 2 s (speed = 25 kn). Check the slot start time T2 using the VDL analyser.			
UTC direct	Check that T2 is in the range of 323 to 343		
UTC indirect	Check that T2 is in the range of 302 to 364		

Date	**Result**	**Status**
16.01.2002	Not yet tested	

4.4 16.4 Data encoding (bit stuffing)

Method of measurement

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

27.05.02	**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 to the 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		ok
	Check that VDM sentence of RX is according to VDO of TX		ok

Date	**Result**	**Status**
27.05.02	Test ok	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.

27.05.02	**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

Date	Result	Status
27.05.02	Test ok	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 3 frames after switching on the EUT. Generate a table and diagram from that data and check the following test items using the recorded data.

02.03.02	Test details – Network entry		
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	With other transponder (with UTC) 2 min 02, Next start: 2min55s (1 min after first RX of other transponder!) With UTC, but no other AIS available: start of TX after 8 min. 11.07.02 Retest: With UTC: start of TX after 1:50 Without UTC, but other transponders : start of TX after 1:20 Without UTC: start of TX after 2:10	Ok Ok acc
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 375 +/- 75 = 300 ... 450		ok
Slot use	Check that the allocated slots are used in the next frame	The first msg 3 on channel 2 is not used in the following frames. It is only used to allocate the next msg 3 on the same channel. The keep flag is set correctly to 0 11.07.02 Retest: No change 30.09.02 Retest: The first msg 3 on channel 2 is removed	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)		ok

Date	Result	Status
27.05.2002	Time to first transmission to long. One unnecessary msg 3, used to allocate the next msg 3 only.	

30.09.02	Retest: unnecessary msg 3 has been removed	ok
11.07.02	Time to first transmission with UTC or other transponder available is ok. Time to first transmission without UTC or other transponder is a little bit to high (about 2:10), but this can be accepted.	Ok Acc.

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.

02.03.02	**Test details – Change of reporting rate**		
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		Ok

Date	Result	Status
25.05.02	Test ok	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.

02.03.02	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	Not yet tested	

Note 1) Simulation of channel load with the test system:
90% channel load is derived by transmitting 45 different targets from the test system. The information content on both channels is the same.
The transmission schedule for test system is built up by a block of 9 consecutive slots with target information (msg 1, time out value 2) and 1 free slot. These blocks are repeated consecutively. After 50 transmission the target IDs are repeated

02.03.02	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: AIABM_BBM_25.sst			
Maximum transmissions per frame	Check that only 20 msg are transmitted in one frame. Msg 21 ... have to be rejected	There is limitation of transmissions in 1 frame, but up to 22 msg transmitted in one frame 14.08.02: Retest: ok	ok
ABK output	Check that ABK sentence is output with acknowledgement type = 2 for the rejected sentences.		ok

Date	Result	Status
27.05.02 14.08.02	There is limitation of transmissions in 1 frame, but up to 22 msg transmitted in one frame Retest: Now not more then 20 msg in one frame	 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 2.1.2 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.

28.05.02	**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		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
Check, that the reporting rate is increased if speed requires a higher reporting rate than that directed by the message 16. Apply a sensor speed input of 10 kn.			
Send a msg 16 with slot increment = 3 (225 = 6 s)	Check that slot offset is 225 slot and reporting rate is 6 s		Ok
Increase speed to 15 kn	Check that reporting rate is not changed		Ok
Increase speed to 25 kn	Check that the reporting rate is changed to 2 s	Reporting rate is not changed. 20.08.02: Retest: ok	ok

Date	Result	Status
28.05.02 20.08.02	Reporting rate is not increased if required by speed higher than 25 kn. Retest: Ok, reporting rate is increased to 2 s	 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).

21.05.02	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 timeout 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	If offset > 50 first message is ok, if offset = 10 or 20, slot offset of 40 is used We have decided, that we require a minimum slot offset of 40 slots for the first msg 2. This requirement is fulfilled	ok
Message type	Check that message type of position report is 2	20.08.02 Retest: For 2 slots in the first assignment mode frame msg type 3 is used 25.08.02 Retest: ok, no msg 3 in the first frame	 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	Position report is sent only on the channels on which msg 16 has been received 20.08.02: Retest: position report is sent on alternating channels	ok
Increment	Check that the increment is 125 slots	Slot offset of 125 is used only if the value 125 is in the msg 16. The index value defined in the IALA clarifications to ITU-R M.1371 shall be used 20.08.02: Retest: ok, index number is used	ok
Timeout	Check that all slots of the first msg2 frame have the same timeout	20.08.02 Retest: one slot has a different timeout (6 instead of 3) 25.08.02 Retest: ok, all slots have the same timeout	ok
	Check that the timeout is between 3 and 7		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 deallocates all msg 2 slots with timeout 0	Reverts to autonomous mode after a complete frame with time-out 0	ok
	Check that the EUT changes slots with timeout 0 on each channel to ITDMA slot msg 3 to start autonomous mode	A not allocated slot is used to start autonomous mode 20.08.02 Retest: ok	ok
	Check that EUT initialises autonomous mode like network entry		ok

22.05.02	**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	Starts after 123 slots	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 time-out is between 4 and 8, (in the first msg 2 frame between 2 and 6)	Different time-out of the different selection intervals	ok
Assignment repetition	Check that the time-out is extended by repetition of msg 16: Switch back is between 3 and 7 minutes after last repetition	Time after last msg 16 is less than 3 min, see note) 21.08.02 Retest: ok End of assigned mode is 5min20s after last msg 16	ok
Switch back to autonomous mode	Check that the EUT reverts to normal reporting rate between 4 and 8 minutes after last msg 16	Reverts to normal reporting rate after 5 minutes. After (5) minutes all msg 2 are set to msg 1 the no longer used slots to time-out=0, other to random time-out.	ok

Note)

Test 1	**Test 2**	**Test 3**	**Test 4**	**Test 5**
8:34:55 msg 16	8:42:34 msg 16	8:58:36 msg 16	9:05:37 msg 16	9:13:03 msg 16
8:38:32 msg 16	8:44:49 msg 16	9:01:03 msg 16	9:08:01 msg 16	9:15:52 msg 16
8:39:50 end	8:47:14 msg 16	**9:03:35 end**	**9:10:36 end**	9:18:04 msg 16
	8:50:21 msg 16			9:20:23 msg 16
	8:52:35 end			**9:23:03 end**

All msg 16 are verified by VDM output of EUT.

It seems that an potential end point of assigned mode is every 5 min. In Test 1, 3 and 4 the end is 5 min after the first msg 16, but less than 3 min after the last msg 16. The second msg 16 does not retrigger the time-out.

In test 2 and 5 the end is 10 min after the first msg 16. One of the following msg 16 retriggers the time-out, but the end is less than 3 min after the last msg 16.

Date	**Result**	**Status**
22.05.02 21.08.02	Some failures in slot assignment, see details Retest: Errors of previous test are ok now, but new errors detected, see details	

25.09.02	Retest: ok now	ok
22.05.02 21.08.02	EUT receives only every second msg 16, if transmission channel is not alternating. It receives every msg 16, if transmission channel is alternating Retest: Receives now every message 16, also if transmitted on 1 channel	 ok

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.

22.05.02	**Test details b)– Rate assignment**		
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

Date	**Result**	**Status**
22.05.02	Test ok	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.

28.05.02	**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: Tx slot: 0, offset=73, no of slots: 5, increment: 70 Send a message 16 from VDL Generator assigning one or more of these reserved slots Tx slot: 0, offset=75, incr. = 5 (75slots)			
	Check that slots assigned by the msg 16 are used by the EUT		ok

Date	**Result**	**Status**
28.05.2002	Test ok	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.

28.05.02	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			
Record VDL messages	Check that the reserved slots are not used by the EUT within a time-out of 4-8 minutes	All slots are used for new allocation 21.08.02 Retest: Slots are reserved now, but always on channel 2, independent of the channel on which msg 20 was transmitted 27.09.02 Retest: After transmission on channel A slots are reserved on channel A and on channel B. A transmission on channel A should affect only the slot selection on channel A, not on channel B! 24.10.02 Retest: see note 28.10.02 Retest: ok, time-out on channel A is forced to 0 to allocate free slots.	ok

Note:
At start of slot reservation the messages using slots reserved by the base station are immediately changed to free slots following frame, **without any allocation**. This is not ok. It is necessary to add an additional frame for announcement of the new slots.

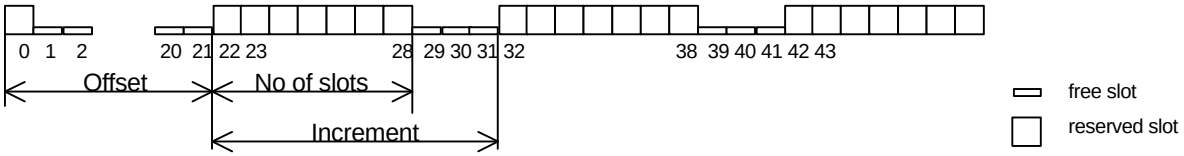
During the frame after start of reservation the position reports allocated to reserved slots should be forced to time-out 0 and allocate new, not reserved slots in the SI for the next frame. Then in the next frame only slots not reserved by the base station are in use.

On the other channel (B) at regular time-out slots which are reserved on channel A are not used. This is ok because slots which are reserved on the other channel by a base station get the lowest priority for selection of candidate slots(case 8 in Technical clarification of 1371, 4.4.1), and there is a sufficient number of free slots.

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: 22
- Time out 1: 1
- Number of slots: 7
- 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.

A table for each of the 22 messaged has to be checked. At the end a table with an overview of all messages has to be filled.
The field contents of PI output are checked using the AIS monitor program

11.02.02	**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.			
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		ok

	The communication state is checked in 4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)		

11.02.02	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.			
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		ok
	The communication state is checked in 4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)		

07.02.02	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.			
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

20/03/02	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.			
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

20/03/02	**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.			
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
		10.05.2002: Call is not received if own MMSI is ID 4. For ID 1-3 ok 21.08.02 Retest: ok, msg is received	ok

20/03/02	**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.			
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

20/03/02	**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.			
Message id	Check the field content		ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Altitude			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

20/03/02	**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.			
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
		Msg10 also on PI if not addressed to own station 21.08.02 Retest: No PI output if not addressed	ok
Msg11 response	Check for response with msg 11 if EUT is addressed		ok
Msg11 response	No reponse if addressed to other station		ok

20/03/02	**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.			
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

20/03/02	**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.			
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

20/03/02	**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.			
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

		Msg13 is output on PI if not addressed to own station; should only be output if own station addressed 21.08.02 Retest: no output if not addressed	ok

20/03/02	**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.			
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check the field content		Ok

20/03/02	**Test details – Content of msg 15 Interrogation**		
Test item	**Check**	**Remark**	**Result**
Transmit a message 13 from other AIS transponder or VDL generator . Response on this msg is tested under .			
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
		Msg13 is output on PI if not addressed to own station; should only be output if own station addressed 21.08.02 Retest: no output if not addressed	ok

20/03/02	**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.			
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
		Msg13 is output on PI if not addressed to own station; should only be output if own station addressed 21.08.02 Retest: no output if not addressed	ok

20/03/02	**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.			
Message id	Check the field content	17.4.02	Ok
Skource ID (MMSI)	Check the field content	17.4.02	Ok
Longitude	Check the field content	17.4.02	Ok
Latitude	Check the field content	17.4.02	Ok
Binary correction data	Check the field content	17.4.02	Ok

20/03/02	**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.			
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
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

20/03/02	**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.			
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 carge	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

20/03/02	**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.			
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

20/03/02	**Test details – Content of msg 21 ATON report**		
Test item	**Check**	**Remark**	**Result**
Transmit a msg 18 from VDL generator. Check the field content of the fields listed under Test item.			
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

20/03/02	**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.			
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		
Station ID 2 (MMSI)	Check the field content		
Addressed or broadcast flag	Check that flag = 1		
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	(2.1.4.1)
Msg 8	yes	ok	No	
Msg 9	yes		No	
Msg 10	yes	ok	Tx of msg 11 UTC/date response	
Msg 11	yes		No	
Msg 12	yes	ok	Tx of ackn. msg 13, Display on MKD	(6.2)
Msg 13	yes	ok	ABK output, no further repetitions	(2.1.4.1)
Msg 14	yes	ok	Display on MKD	(2.10.1)
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	
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		no	
Msg 22	yes	ok	Addition of new area to the regional area table	5.2

Date	Result	Status
15.05.2002 21.08.02	Msg 7 is not output on PI if own MMSI is ID 4. For ID 1 – 3 ok Retest: ok, msg 7 is output if ID 4	 ok

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.

11.02.02	**Test details – Message 1,2,3 Position report**		
Test item	**Check**	**Remark**	**Result**
The message content of message 1,2,3 is checked in 2.3.1 Information content of msg 1			

11.02.02	**Test details – Message 5 Static data**		
Test item	**Check**	**Remark**	**Result**
The message content of message 5 is checked in 2.3.2 Information content of msg 5.			

07.02.02	**Test details – Content of msg 6 Addressed binary message**

Test item	Check	Remark	Result
This test can be done in combination with test 2.1.4.1 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.			
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

07.02.02	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.			
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		

07.02.02	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.			
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

15.4.02	Test details – Content of msg 10 UTC and date inquiry		
Test item	**Check**	**Remark**	**Result**
activate transmission of msg 10 if implemented (not required)			
msg 10	Check the field content	not implemented	ok

11.02.02	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.			
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

07.02.02	Test details – Content of msg 12 Addressed safety related message		
Test item	**Check**	**Remark**	**Result**
This test can be done in combination with test 2.1.4.1 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.			
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 text = “TEST”		Ok

07.02.02	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.			

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		

07.02.02	**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.			
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check text = “TEST”		Ok

07.02.02	**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.			
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

Date	**Result**	**Status**

16.05.2002	Content of all transmitted messages ok	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.

	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

Date	**Result**	**Status**
30.05.02	Test ok	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*

22.08.02	**Test details – 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. 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

MKD display defined area	Check that the defined area is correctly displayed on MKD	Only one message can by entered by VDL message. The following message overwrites the previous message. Test can only be done by entering one area by VDL msg and one by ACA sentence on PI 22.08.02 Retest: does still not store 2 area settings by msg 22 27.09.02 Retest: ok, 2 regions are stored	ok
ACA output	Check that ACA output indicate the settings of R1 and R2	The actually entered new area is output as ACA sentence on PI port No ACA output on request by ECAIQ,ACA sentence 27.09.02 Retest: no ACA output. 30.09.02 Retest: ACA output on request by ECAIQ,ACA sentence	Ok ok
Item 1:	Check that channels AIS1 and AIS2 are in use		ok
Item 2: Move position into transitional area of region 2	Check that EUT keeps old channels for 1 min. timing out the transmissions of AIS2		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 that EUT keeps transtional channels for 1 min. timing out the transmissions of AIS 1		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

Date	Result	Status
22.08.02 27.09.02	Entering of 2 different regions by msg 22 does not work. The second area setting overwrites the first setting instead of adding a second area setting 2 different regions by msg 22 are stored now	 ok
22.08.02	After entering the second area setting manually the operation moving from east to west through the 2 adjacent areas is ok	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.

22.08.02	**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			
MKD display defined area	Check that the defined area is correctly displayed on MKD or output on PI in ACA sentence on request	Display on MKD	ok
Item 1:	Check that channels AIS1 and AIS2 are in use		Ok
Item 2: Move position into transitional area of region 2	Check that EUT keeps old channels for 1 min. timing out the transmissions of AIS2		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 that EUT keeps transitional channels for 1 min. timing out the transmissions of AIS 1		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	Remark: at 2 min out of area 1 an ACA sentence was output indicating default channels, but A1/AIS1 and double reporting rate was kept. At 5 min out of area 1 it was changed to default as required.	ok
	Check that reporting rate is changed back to normal reporting rate		ok

Date	Result	Status
22.08.02	At the outer border of the 2 areas the transitional zone outside the area seems to be about 5 nm. The transitional zone between area 1 and 2 and the transitional zone at the outer border, but inside the area are 1 nm In case of 2 adjacent areas with different transitional zones the transitional zones the zones extend from the border into the 2 areas according to the different transitional zones (ok) It seems that the high sea is handled like an area with transitional zone of 5 nm. So in case of an area with a transitional zone of 1 nm it extends 1 nm into the area and 5 nm (trans. Zone of high see) out of	Acc

	the area.	

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.

22.08.02	**Test details – Power setting by msg 22**		
Test item	**Check**	**Remark**	**Result**
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		Ok
Power low	Check that the transmitting power is changed from high to low		Ok
MKD	Check the low power settings are displayed on MKD		Ok
Transmit the same message 22, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power		ok

	Test details – Power setting by ACA		
Test item	**Check**	**Remark**	**Result**
Apply the following message at PI: File name = AIACA_region_in.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
MKD	Check the low power settings are displayed on MKD		Ok
Transmitt the same ACA sentence, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power		Ok

22.08.02	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		Ok
Set power level back to high power.			
Power high	Check that EUT reverts to high power		Ok

Date	Result	Status
22.08.02	Test ok	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).

24.10.02	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	Msg 12 is transmitted first	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.

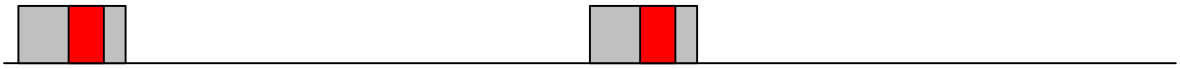
Required results

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. 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 grey 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.

26.08.02	**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 numbered slots are used: Ch. 1: 44, 46, 42, 46, 51, 46, 51, 46 Ch. 2: 38, 46, 51, 44, 46, 51, 42, 24.10.02 Retest: only odd ID numbers are used. In some cases even numbers are used. In this case the target has not been received in the previous slot, and regarding the time-out the slot is free for use.	ok
	Check that a the slot of a target is not used twice in a frame	Slots are used sometimes twice in a frame 24.10.02 Retest: It is ok that the slot of the same target is used twice in a frame if the time-out of the first use of the slot has already been decreased to 0. In this case the slot is free and not subject of slot reuse, and the target can be again subject of slot reuse for a new selection.	ok
Reserved Slot	Check that slots reserved by msg 20 are not used	Not checked	----

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.

23.08.02	**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	Check that area 1...7 are displayed on MKD		ok
• 7 areas not overlapping, not including own position File name: AIACA_8_regions_17_7_1.sst	Check that all 8 areas are output on PI after request by sentence xxAIQ,ACA	No output of ACA	Acc
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) <u>Erasure by distance</u>: 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

Date	Result	Status
23.08.02	Test ok	ok

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.

	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 Change the settings of the area of a)	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 does not accept incomplete or invalid regional operating settings.	Lat and lon < 20 nm and > 200 nm are refused Invalid channel is refused	ok
	Check, that the EUT accepts a complete and valid regional operating setting.		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
	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
e) Area setting by VDL Send DSC message 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 DSC message		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

Date	Result	Status
23.08.02	Test ok	ok

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.

23.08.02	Test details – Test of addressed telecommand		
Test item	**Check**	**Remark**	**Result**
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
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		Ok
Send an addressed msg 22 to the EUT with different regional operating settings	Check, that the EUT uses the regional operating settings commanded to it		Ok
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
Move the EUT out of the regional operating area defined by the previous addressed telecommand	Check, that the EUT reverts to default		ok

Date	Result	Status
22.08.02	Test ok	ok

5.7.4 17.7.4 Test for invalid regional operating areas (three regional operating 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.

23.08.02	**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		Ok
b) Move own position to the first 2 areas	Check, that the EUT uses the operational settings of these areas		Ok

Date	**Result**	**Status**
23.08.02	Test ok	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**
23.08.02	No Self-Certification required.	ok

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.

23.08.02	**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	Rate assignment command is executed 27.09.02 Retest: ok, assignment is ignored	ok
Slot assignment command in a transitional zone	Check that an slot assignment command is ignored in a transitional zone	Slot assignment command is executed as a rate assignment with an reporting rate according to the requested slot increment 27.09.02 Retest: ok, assignment is ignored	ok

Date	Result	Status
23.08.02 27.09.02	Rate and slot assignment are executed as a rate assignment Retest: ok, assignment is ignored	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 **2.1.4.1 "**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.

28.05.02	**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	Rx on A -> Tx on A Rx on B -> Tx on B Channel seems to be alternating between A and B	Acc
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

28.05.02	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	Rx on A -> Tx on A Rx on B -> Tx on B Channel seems to be alternating between A and B	Acc
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

28.05.02	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 1. PI sentence: File AIABM_4_bin.sst: A response is automatically transmitted by the addressed transponder ID 1008			
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,000001008,A,7,3,0 $AIABK,000001008,B,7,0,0 $AIABK,000001008,A,7,1,0 $AIABK,000001008,B,7,2,0 Message type should be 6, the type of the ABM sentence 21.08.02 Retest: msg type in ABK is now 6	ok

Date	Result	Status
28.05.02 21.08.02	The message type in the ABK acknowledgement of message 6 should be 6, not 7 (message type of the ackn message) Retest: msg type in ABK is now 6	 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 2.1.4.2 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.

28.05.02	**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	2 msg 6 on the same channel are acknowledged in 1 msg 7 (very good)	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

Date	Result	Status
28.05.02	Test ok	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 **2.1.4.1 "**14.1.4.1 Transmit an addressed message**"**

28.05.02	**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	4 transmissions (3 rep)	ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s	Time between transmissions is: 5,5,5 and 5,5,5	ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	$AIABK,000001005,,6,2,1	ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		ok

28.05.02	**Test details - Addressed binary 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	4 transmissions (3 rep)	ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s	Time between transmissions is: 5,5,5 and 5,5,5	ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	$AIABK,000001005,,12,2,1	ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		ok

Date	Result	Status
28.5.02	Test ok	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

28.05.02	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

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

Date	Result	Status
28.05.02	Test ok	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 2.1.3.2 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.

28.05.02	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

28.05.02	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

28.05.02	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 RUT			
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

28.05.02	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

28.05.02	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		Ok

Date	Result	Status
28.05.02	Test 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 2.2 14.2 Multiple slot messages

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

28.05.02	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_bin_5.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 $AIABK,,,8,8,3 $AIABK,,,8,9,3 $AIABK,,,8,0,3 $AIABK,,,8,1,3	ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		ok
MMSI	Check Transmitter MMSI		ok

28.05.02	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_bin_5.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		
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,14,6,3 $AIABK,,,14,7,3 $AIABK,,,14,8,3 $AIABK,,,14,9,3 $AIABK,,,14,0,3	ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		ok
MMSI	Check Transmitter MMSI		ok

Date	Result	Status
28.05.02	Test ok	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.

23.05.02	**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

Date	**Result**	**Status**
23.05.02	Test ok	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 is not a check of the documentation but a check of the interfaces by help of the documentation

26.08.02	**Test details - Check of manufacturers documentation**		
Test item	**Check**	**Remark**	**Result**
Approved sentences	Check approved sentences against IEC 61162	Check is done in the functional tests of the interfaces	----
Proprietary sentences	Check proprietary sentences against IEC 61162	No proprietary sentences	----
Usage of Fields	Check usage of fields	No information about usage of fields 08.10.02 Retest: ok	ok
Transmission intervals	Check transmission intervals	Not applicable	----
Hardware configuration	Check hardware configuration		
Output drive capability	Check output drive capability	Not found 08.10.02 Retest: No output drive capability found but type of output drive circuit is shown.	ok
Input load	Check input load	Not found 08.10.02 Retest: ok	ok
Electrical Isolation	Check electrical isolation	Not found 08.10.02 Retest: Documentation shows that there is no electrical isolation 24.10.02 Retest: Documentation is provided which shows the electrical isolation. The hardware has to be changed according to this documentation	ok

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.

14.02.02	Test details - Electrical test of inputs		
Test item	**Check**	**Remark**	**Result**
Minimum voltage	Check that input works with minimum input voltage		ok
Maximum voltage	Check that input is not damaged by maximum input voltage	Not checked	
Input current	Check the input current against the IEC 61162-1 or IEC 61162-2	Not checked	

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

14.02.02	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			
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

Date	Result	Status
28.05.02	Test ok	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 (see 2.9.3 - 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 2.3.1 "Information content of msg 1" at the end of this test

7.5.1 GLL sentence

10.04.02	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	No display of PA-Flag	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	No display of differential mode	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 = "-----"	The default value 91 ° is displayed. A display like "----" would be better 09.07.02 Retest: ok, "----" is displayed	Ok
	Check longitude = "-----"	The default value 181 ° is displayed. A display like "----" would be better 09.07.02 Retest: ok, "----" is displayed	ok
	Check PA-Flag = 0	No display of PA-Flag	Ok
Set status/mode to A,A Change for latitude the number of digits after decimal point from 2 to 6	Check that latitude on VDL is correct for all numbers		Ok
Set status/mode to A,A Change for longitude the number of digits after decimal point from 2 to 6	Check that longitude on VDL is correct for all numbers		Ok
No GBS sentence applied	Check that RAIM-Flag = 0		Ok

Enter Position input results in 2.3.1 "Information content of msg 1".

7.5.2 GGA sentence

10.04.02	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	PA-Flag = 1 Mode 3 is not a differential mode with high accuracy 16.4.02 changed	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	Last data of valid mode 16.4.02 changed invalid	ok
Set mode = 7 (manual) Check on VDL	Short check default data	Last data of valid mode 16.4.02 changed invalid	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

note: GGA and VTG need same (valid) status to be accepted (same sensor)

7.5.3 GNS sentence

10.04.02	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	Default value, Position is valid GLONASS position 16.4.02 changed, now accepted	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	PA-Flag = 0 16.4.02 changed, now PA=1	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

10.04.02	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

7.5.5 DTM sentence

10.04.02	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	Last valid data, should be default value; 19.4.02 changed, now -------	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	Last valid data, should be default value; 19.4.02 changed, now -------	ok
Set Datum = WGS 84	To get valid data for further tests		Ok

7.5.6 GBS sentence

10.04.02	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			
	Check that RAIM-Flag = 1		Ok

Enter RAIM flag results in 2.3.1 “Information content of msg 1”.

7.5.7 VTG sentence

10.04.02	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 SOG		Ok
Check on VDL	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	During the switch over from A to D the SOG/COG values are set to default for about 10 s 09.07.02 Retest: ok	ok
Set mode to **N (**invalid)	Check SOG = 102.3 (default)		Ok
Check on VDL	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	Last valid data 09.07.02 Retest: ok	Ok
Set mode to M (manual)	Short check SOG/COG default	Last valid data 09.07.02 Retest: ok	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	Default value	Ok

Enter Speed results in 2.3.1 “Information content of msg 1”.

7.5.8 VBW sentence

10.04.02	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		Ok
	COG = calculated from SOG vector and heading	10.4.02 COG is taken from VTG sentence 18.4.02 COG is calculated from VBW and HDT, but only pos. values 19.4.02 changed, ok	ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	COG is taken from VTG sentence 19.4.02 see above	ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	COG is taken from VTG sentence 19.4.02 see above	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	09.07.02 Retest: ok	Ok
	COG from VTG	Is only relevant if COG is calculated from SOG vector and heading 09.07.02 Retest: ok	ok

note: 19.4.02 : priority of sensor sentences is VBW>RMC>VTG
will be changed to RMC>VTG>VBW
(both acceptable)

10.04.02	Test details – VBW log input without valid VTG sentence		
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	10.4.02 Default value 18.4.02 calculated from VBW and HDT, but only pos. values 19.4.02 changed, ok	ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	Default value 19.4.02 see above	ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	Default value 19.4.02 see above	ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG = default		Ok
	COG = default	Is default value anyway (see above) 09.07.02 Retest: ok	Ok
Check on VDO output of PI	SOG = default		Ok
	COG = default	Is default value anyway (see above) 09.07.02 Retest: ok	Ok
Check on MKD	SOG = default		Ok
	COG = default	Is default value anyway (see above) 09.07.02 Retest: ok	Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG from VBW	Default value. Using the log speed is also ok	Ok
	COG = default		OK
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VBW		OK
	COG = default		OK

Remark: During this test the complete transmission and receiving function failed. After switching off and on the EUT the transmission and receiving function worked again.

19.4.02 this was not reproduced during tests 15.4. – 19.4.02

7.5.9 OSD sentence

10.04.02	Test details – OSD own ship data input		
Test item	**Check**	**Remark**	**Result**
Apply simulated OSD sentence to the sensor input File name is ais07_osd.sst			
Heading status = A (valid) Speed reference = B (bottom) Check on VDL	Check SOG from OSD	Not implemented, Not required Is implemented, is only evaluated if external position is available, needs retest.	ok
	Check COG from OSD		
	Check heading from OSD		
Check VDO output on PI	Check SOG from OSD		
	Check COG from OSD		
	Check heading from OSD		
Check Display on MKD	Check SOG from OSD		
	Check COG from OSD		
	Check heading from OSD		
Set speed reference to P (Positioning system)	Check SOG and COG from OSD		
Set speed reference to R Radar tracking	Check SOG and COG from OSD		
Set speed reference to W (Water speed)	Check SOG = default		
	Check COG = default		
	Check heading from OSD		
Set speed reference to M (Manual)	Check SOG = default		
	Check COG = default		
	Check heading from OSD		
Set speed reference to P (Positioning system)	Check SOG and COG = default		
Set speed reference to P (Positioning system) Set **heading status = V** (invalid)	Check SOG from OSD		
	Check COG from OSD		
	Check heading = default		
Change speed reference from N (kn) to K (km/h)	Check SOG value in VDL It has to be converted into knots		

7.5.10 HDT sentence

10.04.02	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**	Value is 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

Enter Heading results in 2.3.1 “Information content of msg 1”.

7.5.11 ROT sentence

10.04.02	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		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)	Value = 177.2	Ok
	360 converted to 361.6 (90)		Ok
	720 converted to 708.7 (126)	On MKD the value 708 is displayed too	Ok
	-20 converted to 19.7 (-21)		Ok
	-720 converted to –708.7 (-126)	On MKD the value -708 is displayed too	Ok
Set ROT status = **V** (invalid)	Check that ROT = default on VDL (default = -731.4 = 511)		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	Value = 8.7, see remark 2 18.4.02 changed 0	ok
	11 converted to 720	Value = 11.7 18.4.02 changed 720	ok
	- 9 converted to 0	Value = -8.7 18.4.02 changed 0	ok
	-11 converted to -720	Value = -11.7 17./18.4.02 changed -720	ok

Remark 1: On the MKD the original value of the ROT is displayed, not the quantified value which is sent via VDL (ok).

Remark: During this test the complete transmission and receiving function failed. After switching off and on the EUT the transmission and receiving function worked again.

19.4.02 this was not reproduced during tests 15.4. – 19.4.02

Enter ROT results in 2.3.1 “Information content of msg 1”.

7.5.12 Additional Tests

10.04.02	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		Ok
	Check SOG/COG		Ok
	Check heading		Ok
	Check ROT		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 Check of different inputs

10.04.02	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 = default		Ok
	Check SOG/COG = default		Ok
	Check heading = default		Ok
	Check ROT = default		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

Date	Result	Status
10.04.02 09.07.02	Mainly ok, but some failures in detail. See test details. Retest ok	 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.

Date	Format	Result	Status
28.05.02	**VDM**	See test details below	Ok
28.05.02	**VDO**	See test details below	Ok
	ALR	Test is done in 2.9 Alarms and indicators	
	ABK	Test is done in 2.1.4.1 and 6.1 Addressed operation and in 2.2 and 6.4 Broadcasts messages	
	ACA	Test is done in 5.3 Management of regional area settings	
	TXT	Test is done in 2.9 Alarms and indicators	

04.04.2002	**Test details - Message content of VDM messages**		
Test item	**Check**	**Remark**	**Result**
Transmit a position report from VDL analyser or another AIS transponder Check the following items on VDO output on PI compared with the transmitted values			
VDM Header	Check the total number of sentences = 1		Ok
	Check the sentence number = 1		Ok
	Check the Sequential message identifier = Null field		Ok
	Check the AIS channel = A, B		ok
	Check the number of fill bits = 0		Ok
Message ID	Check the message ID = 1		Ok
MMSI	Check MMSI		Ok
Navigational status	Check the navigational status		Ok
ROT	Check the rate of turn		Ok
SOG	Check the Speed over Ground		Ok
Position accuracy	Check the Position accuracy		Ok
Position Longitude	Check the Position Longitude		Ok
Position Latitude	Check the Position Latitude		Ok
COG	Check the COG		Ok
Heading	Check the Heading		Ok
Time stamp	Check the Time stamp		Ok
RAIM flag	Check the RAIM flag		Ok
Communication state in SOTDMA (msg 1)	Check the sync state		Ok
	Check the Slot time-out		Ok

	Check the received stations		Ok
	Check the slot number		Ok
	Check the UTC hour		Ok
	Check the Slot offset		Ok
Communication state in ITDMA (msg 3)	Check the sync state		Ok
	Check the Slot increment		Ok
	Check the number of slots		Ok
	Check the keep flag		Ok

04.04.2002	**Test details - Message content of VDO messages**		
Test item	**Check**	**Remark**	**Result**
Check the following items of msg 1,3 on VDO output on PI compared with the transmitted values of the own transmission according to the sensor input data			
Output rate	Check that the output rate = 1 s According to IEC 61993-2 §7.6.3.4 the output rate shall be 1 s	VDO only sent if msg transmitted 28.05.02 Retest: Output rate of VDO = 1s	ok
VDO Header	Check the total number of sentences = 1		Ok
	Check the sentence number = 1		Ok
	Check the Sequential message identifier = Null field		Ok
	Check the AIS channel = A, B if transmitted, else empty		Ok
	Check the number of fill bits = 0		Ok
Message ID	Check the message ID = 1		Ok
MMSI	Check MMSI		Ok
Navigational status	Check the navigational status		Ok
ROT	Check the rate of turn		Ok
SOG	Check the Speed over Ground		Ok
Position accuracy	Check the Position accuracy		Ok
Position Longitude	Check the Position Longitude		Ok
Position Latitude	Check the Position Latitude		Ok
COG	Check the COG		Ok
Heading	Check the Heading		Ok
Time stamp	Check the Time stamp		Ok
RAIM flag	Check the RAIM flag		Ok
Communication state in SOTDMA (msg 1)	Check the sync state		Ok
	Check the Slot timeout		Ok
	Check the received stations		Ok
	Check the slot number		Ok
	Check the UTC hour		Ok
	Check the Slot offset		Ok
Communication state in ITDMA	Check the sync state		Ok

(msg 3)	Check the Slot increment		Ok
	Check the number of slots (0 = 1 slot)		Ok
	Check the keep flag		Ok

Date	Result		Status
28.05.02	Test ok		ok
30.10.02	VDO output	If the internal GPS receiver is in use the VDO outputs without channel do not update the position. Only when the position report is transmitted the position data are updated 11.11.02 Retest: ok	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
24.10.02	Test ok	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
22.05.02	**VSD**	See test details below	Ok
22.05.02	**SSD**	See test details below	Ok
	ABM	Test is done in 2.1.4.1 and 6.1 Addressed operation	
	BBM	Test is done in 2.2 and 6.4 Broadcasts messages	
	ACA	Test is done in 5.3 Management of regional area settings	
	ACK	Test is done in 2.9 Alarms and indicators	
	AIR	Test is done in 2.1.3.1 Interrogation	

14.12.01 - Test details – SSD sentence

22.05.02	**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		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		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

22.05.02	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 call type 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	Has not been tested	---
Persons on board	Check if the persons on board are displayed on MKD Not required		Ok

Date	Result	Status
22.05.02	Test ok	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.

21.03.02	**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	MMSI coding is wrong: a 0 is added at beginning of 9digit MMSI, should be added at the end 16.4.02 changed see protocol	ok Rx with changed MMSI 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		Ok

29.01.02	**Test details (b) – Sequence of 5 calls**		
Test item	**Check**	**Remark**	**Result**
Set reporting interval to 2 s and record VDL			
Start DSC transmission of test sentence File name is "\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	17.4.02 VDO and audible TX check ok; see protocol	ok
Increase the channel load so that there are no 20 free succeeding slots.	Check that no responses are transmitted by the EUT		

21.03.02	**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	No answer with correct course Maybe because of interpretation of course in 1/10 kn. 18.4.02 changed and window of +-2° applied	ok
Change course to a value differing > 2 degrees	Check that call is not answered		-----
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
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	Check that EUT does not transmit a response	19.4.02	ok
Sel. Call with symbols: 104+03+01+127	Check that EUT does not transmit a response	19.4.02	ok
all ships call 116 with EOS 117	Check that EUT does not transmit a response	19.4.02 did TX response 21.08.02 Retest: no response	ok

Date	Result	Status
21.03.02 19.4.02	Area addressing with course not ok. This may be caused by the interpretation of course in 1/10 kn. changed see above	ok
21.03.02 19.4.02	Wrong MMSI coding: A 0 is added at beginning of the 9 digit MMSI, should be added at the end according to ITU-R M changed see above.394	ok
19.4.02 21.08.02	EUT may not respond on all ships calls Retest: No response on all ships call	 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.

27.08..02	Test details – Regional area designation		
Test item	**Check**	**Remark**	**Result**
Send a selective region setting call File name “eut\sel_set_region.ss*t”	Check that an acknowledgement is received	No acknowledgement received, is not transmitted by EUT (Reporting rate 10 s, no other transponders on the air, EOS = RQ, Ack. of polling is ok) 27.09.02 Retest: Ackn. is transmitted, content is symbol 110 (message acknowledged)	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	No acknowledgement received, is not transmitted by EUT 27.09.02 Retest: Ackn. is transmitted, content is symbol 110 (message acknowledged)	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	The new area setting is stored in the regional entries list, however it is not added to the list but the previous entry is overwritten and deleted 27.09.02 Retest: New area is added to the entry list	ok
Send a selective region setting call File name "all_ship_set_region.sst"	Check that an ACA sentence is output at PI port		ok
	Check that new region is stored in the region list of the EUT	The new area setting is stored in the regional entries list, however it is not added to the list but the previous entry is overwritten and deleted 27.09.02 Retest: New area is added to the entry list	ok
Send a selective call with channel setting in the area in use. File name"eut\sel_set_ais_channel.sst"	Check that an acknowledgement is received	No acknowledgement received, is not transmitted by EUT 27.09.02 Retest: Ackn. is transmitted, content is symbol 110 (message acknowledged)	ok
	Check that AIS channels are set according to the call content	ACA ok, Entry in area list has been changed	ok
	Check that new AIS channels are used for transmission and reception		ok

Date	Result	Status
14.03.02	Could not be tested because regional area function is not yet implemented	
27.08.02	Retest: no DSC acknowledgement, but area setting ok	
27.09.02	Retest: DSC acknowledgement with symbol 110	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.

29.01.02	**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	18.4.02 see protocols	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	Answer is always transmitted directly, without random delay 19.4.02 changed, random	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	19.4.02 see protocol	ok

Date	**Result**	**Status**
14.03.02 19.4.02	Answer to area addressed call is always transmitted directly, without random delay Changed, ok now	 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.

21.03.02	**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)	Check that direct answer on channel xx		Ok
	Check if following answers on channel xx		Ok
Request automatic position report (102+xx)	Check automatic reporting rate		Ok
Send message with 102+00	Check that the automatic position report is finished		Ok
End of automatic position report at missing ackn. Request again automatic position report (102+xx)	Check that the 2nd and following position reports are transmitted with EOS = RQ (117)	EOS = BQ (122), should be RQ (117) 21.08.02 Retest: EOS = RQ now	ok
	Check that the automatic position report is finished after 5 transmissions (without ackn. by base station)		ok
Request position (103)	Check position in response		Ok
	Check time		Ok
	Check type of ship	Type of ship is not included	Ok
Request length of ship (108) (6C)	Check length of ship (124)		Ok
Request course (109)	Check course (119)	Course is in 1/10 degrees, not in degrees as required 18.4.02 changed	ok
Request ships name (111)	Check name (115)		Ok
Request ackn. (112)	Check ackn. (110)	Is acknowledged with 122+73 (7Ah+49h), not with 110 as required 18.4.02 changed 110,122	ok
Request speed (116)	Check speed (120)		Ok
(C) Request test signal 1 (pos, name request) + 109 + 116	Check automatic response submitting name, position,		Ok

(6F 67 6D 74))	course and speed		
Send test signal 1 (101+72) (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 test signal 1 (101+60) (set DSC channel to a duplex channel) + Geographically addressed call.	Check that the communication on selected duplex channel is working	Transmission on Coast station frequency of the channel (Ch 60, 160.625 kHz) 21.08.02 Retest: Transmission now on ships frequency (156.025 kHz)	ok

21.03.02	**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)	Check position in response	1x 126, should be 100+126	
Request length of ship (108)	Check length of ship (124)	124+00+00, should be 124+126	
Request course (109)	Check course (119)	1x126, should be 119+126	
Request ships name (111)	Check name (115)	115, should be 115+126	
Request speed (116)	Check speed (120)	1x126, should be 120+126	
		18.4.02 all positions above changed and retested ok	ok

21.03.02	**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)	Check that response is transmitted on channel 70		Ok
Set channel (101+88) (65 58)	Check that response is transmitted on channel 70		Ok
Set channel (104+00+2087) (68 00 14 57)	Check that response is transmitted on channel 70	No response on ch. 70, see note No response on ch 2087	ok
Set channel (104+00+2088) (68 00 14 58)	Check that response is transmitted on channel 70	No response on ch. 70, see note No response on ch 2088	ok

note: This is a non regular operation by base station. As base station expects response on another channel, "no response" on ch.70 is accepted.

	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.		
ON CH5 = Pilot port	Check that the EUT does not transmit a DSC message.		

21.08.02	**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)	Check that response is transmitted with low power	Transmits response with high power 27.09.02 Retest: ok, transmission with low power	ok
Ad symbols to set power = 12.5 watt (high power) (Symbols 104+ 01+ 12)	Check that response is transmitted with high power	Transmits response with high power	ok

Date	**Result**	**Status**
21.03.02 21.08.02 27.09.02	See test details Retest: Errors of previous tests ok now, but power setting of DSC response is not ok Retest: Transmission is according to the DSC command	 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*

22.08.02	**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	Displayed, but too short 22.08.02 Retest: Request is displayed until <ENT> or 30 s spelling “recive” should be replaced by the correct word "receive”	Ok rec
	Check that replay status is displayed on MKD	Displayed, but too short 22.08.02 Retest: Status is not displayed on MKD, but different displays for automatically answered and manual request.	acc
PI output	Check that LR interrogation and response is output on PI	no PI output 22.08.02 Retest: Response is output on PI (auto and manual mode). Request is not output	acc

Contents of LRF response	Check output of LRF sentence	LRF is output	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.)	In the LRF output there is only one “2” indicating info status. There must be one status character for each requested information, in this case 10 times a "2” for 10 requested information items 27.09.02 Retest: ok, all status values available	ok
Contents of LR1 response	Check output of LR1 sentence		Ok
	Check that sequence number = request = LRF		Ok
	Check own MMSI		Ok
	Check MMSI of requestor = request		Ok
	Check ship’s name		Ok
	Check Call sign		Ok
	Check IMO number	Empty field, no IMO number entered in transponder	ok
Contents of LR2 response	Check output of LR2 sentence		ok
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder		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		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

22.08.02	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	LR2 and LR3 are also output with empty fields: Recommendation, not to output LR2 and LR3 to minimise interface load 27.09.02 Retest: ok, only requested sentences are output	ok
	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	LR3 is also output 27.09.02 Retest: ok, only requested sentences are output	Ok
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability	Only one “2”, should be “222” 27.09.02 Retest: ok, status values of all requested information available	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	LR1 and LR3 are also output 27.09.02 Retest: ok, only requested sentences are output	ok
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability	Only one “2”, should be “222” 27.09.02 Retest: ok, status values of all requested information available	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	LR1 and LR2 are also output 27.09.02 Retest: ok, only requested sentences are output	ok
	Check that function request field = request		ok
	Check that function reply status field matches request and data availability	Only one "2", should be "22" 27.09.02 Retest: ok, status values of all requested information available	ok
	Check that requested fields are provided		ok
	Check that only requested fields are not empty		ok

19.4.02	**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	19.4.02	ok
	Check that response is transmitted after manual confirmation on MKD	19.4.02	ok

19.4.02	**Test details – Confirmation via PI**		
Test item	**Check**	**Remark**	**Result**
Set EUT to external response if implemented (not required). 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	19.4.02 not implemented	ok
	Check that response is transmitted after external confirmation via PI	19.4.02 not implemented	ok

note: if not confirmed, no transmission is performed (could be response with data=unavailable); ok

Date	Result	Status
22.08.02 27.09.02	Function reply status: no status for each requested information Retest: Function reply status is now supplied for all requested information	 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.

22.08.02	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	Request is displayed on MKD	Ok
	Check that the request and response is output on PI	Only response is output on PI	???
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

22.08.02	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	Request is displayed and an acoustic alarm is output	ok
	Check that response is transmitted on confirmation on MKD		ok
	Check that the request and response is output on PI	The request is not output on PI. So an external confirmation is not possible The response is output.	acc
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

Date	Result	Status
22.08.02	Test ok	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.*

22.08.02	**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

Date	**Result**	**Status**
22.08.02	Test ok	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:

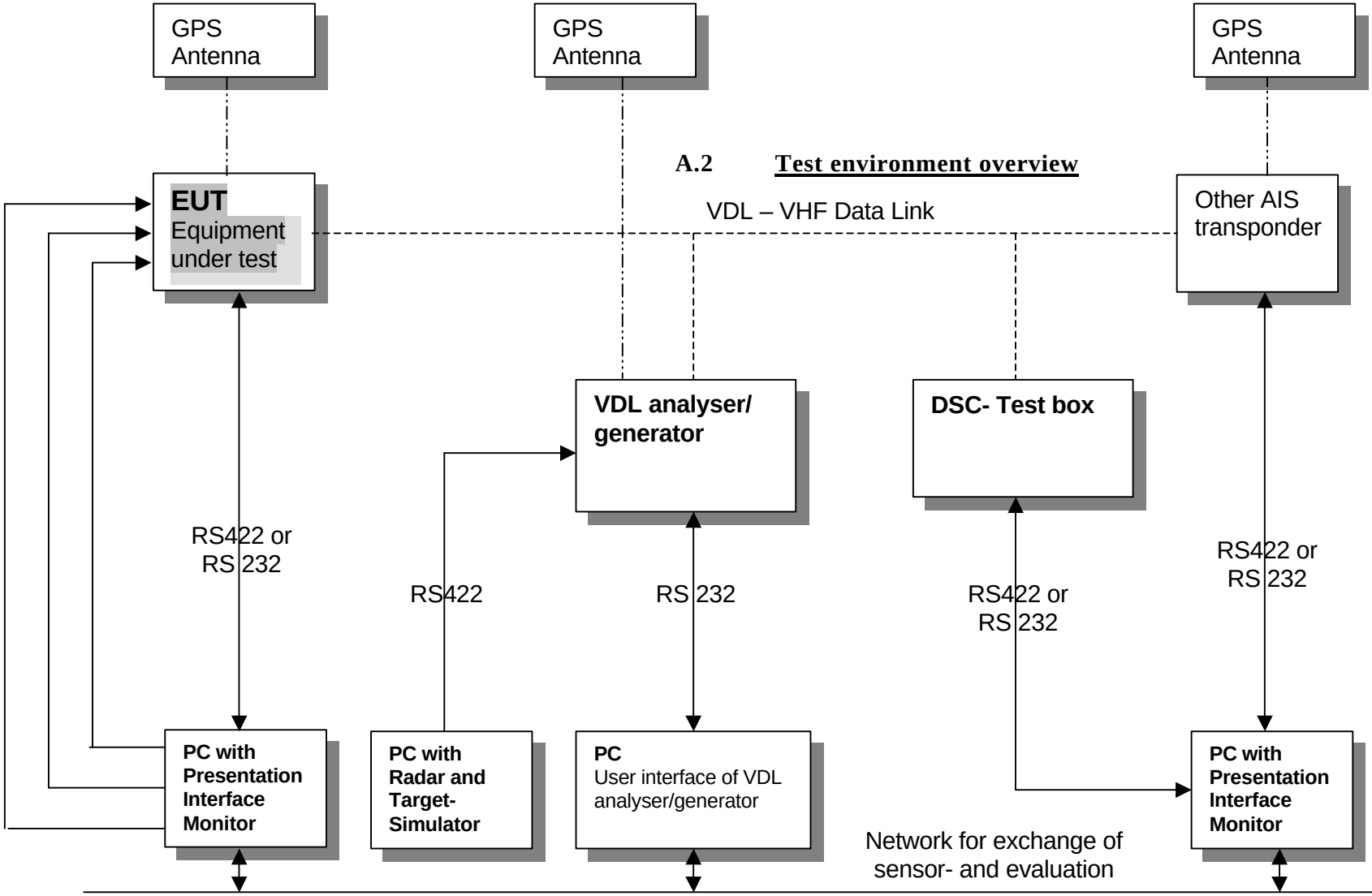
- A standard VHF DSC controller DEBEG 3817 with open interface
- A standard VHF radiotelephone DEBEG 6348

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.

A.2 Test environment overview



Annex B IEC 61162 test sentences

B.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

`$GPDTM,999,,,,,,,P90`
`$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.1.1 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.1.2 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,4,1,6,2,8,06P045678901234567890123456789012345678 9,0`
`!AIBBM,4,2,6,2,8,012345678901234567890123456789012345678 9,0`
`!AIBBM,4,3,6,2,8,012345678901234567890123456789012345678 9,0`
`!AIBBM,4,4,6,2,8,012345678901234567890123456789012345678 901,4`	

AIBBM_multi_bin_long.sst	Longer than 5 slots binary broadcast message

!AIBBM,4,1,6,2,8,06P045678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,012345678901234567890123456789012345678901234567890123,0	
AIBBM_multi_bin_1.sst	Longer than 5 slots binary broadcast message, all bits 1
!AIBBM,4,1,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,2,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,3,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,4,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0	
AIBBM_ABM_17_5.sst	Set of 2 long messages 8 and 12 for message priority test
!AIBBM,4,1,6,2,8,06P045678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIABM,4,1,2,000001005,1,12,012345678901234567890123456789012345678901234567890123456789,0 !AIABM,4,2,2,000001005,1,12,012345678901234567890123456789012345678901234567890123456789,0 !AIABM,4,3,2,000001005,1,12,012345678901234567890123456789012345678901234567890123456789,0 !AIABM,4,4,2,000001005,1,12,012345678901234567890123456789012345678901234567890123456789,0	
Dsi.sst	DSI sentence to check that DSI are not transmitted
$AIDSI,1,1,2210393930,,,,03,,11,,	
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,,	

B.1.3 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.1.4 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.1.5 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

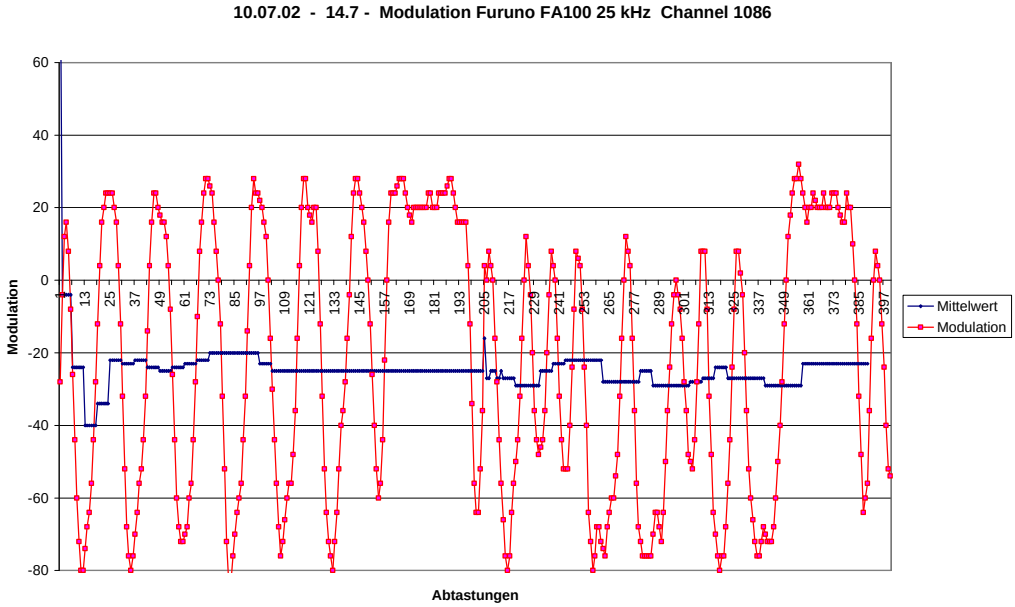
DSC Sentences	
File name	Description
Sentences	

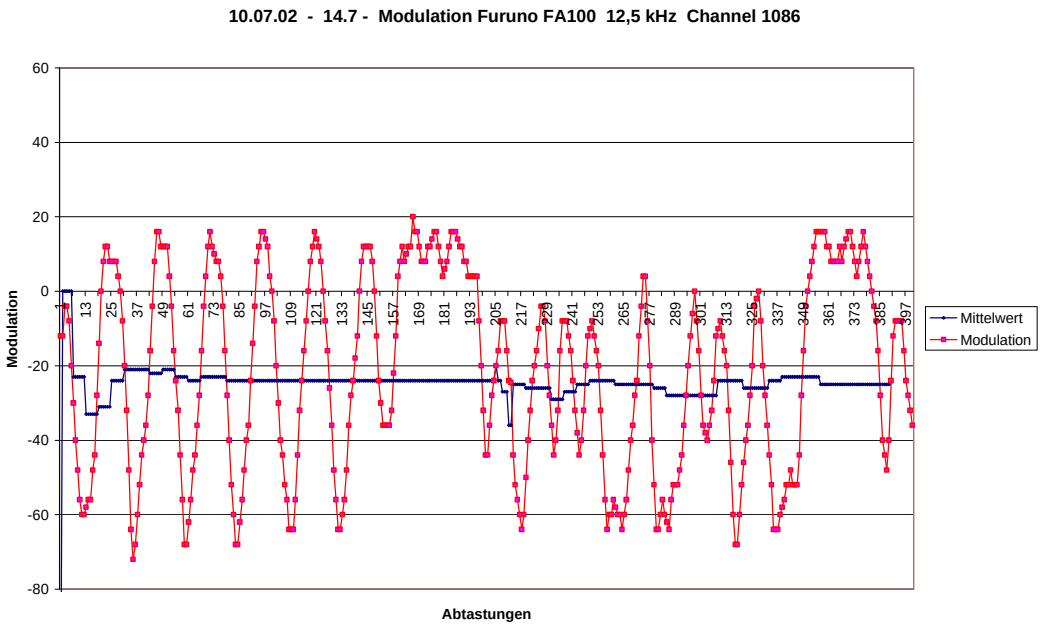
Test_Signal_1.sst	Standard test signal no 1, selective position and name request.
$PDEBT,CCDSC,T,0001460078000001005067150A27271E676F75FF	
area_pos_name_rq.sst	Position and name request addressed to an area, standard position inside
$PDEBT,CCDSC,T,0001460067052800000091E003C003C0067150A27271E676F75FF	
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,000146006700030014F1E003C003C0067150A27271E676F75FF	
sel_set_region.sst	Selective regional setting by DSC, standard pos. outside, channel 61
$PDEBT,CCDSC,T,0001460078000001005067150A27271E68090A3D00680A143D00680C053C00011400680D053200010A0075FF	
sel_set_region_in.sst	Selective regional setting, standard position inside, channel 72, 73, 12.5 kHz
$PDEBT,CCDSC,T,0001460078000001005067150A27271E680900480A680A00490A680C05280001030680D051E00005D0075FF	
sel_set_region_17_7_2.sst	Selective regional setting for test 17.7.2
$PDEBT,CCDSC,T,0001460078000001005067150A27271E6809145200680A0A5200680C051E00012800680D051400011E0075FF	
sel_set_region_17_2.sst	2 regional settings for DSC test according to 17_2
$PDEBT,CCDSC,T,0001460078000001005067150A27271E6809145200680A0A5200680C051E00012800680D051400011E0075FF $PDEBT,CCDSC,T,0001460078000001005067150A27271E6809145100680A0A5100680C05140001280068 0D050A00011E0075FF	
sel_set_ais_channel_ch65.sst	Setting AIS channel to 65
$PDEBT,CCDSC,T,0001460078000001005067150A27271E68090A4100680A14410075FF	
area_set_region.sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,0001460067052800000091E003C003C0067150A27271E68090A3C00680A143C00680C051400005A00680D050A0000500075FF	
all_ship_set_region.sst	All ship call with regional setting
$PDEBT,CCDSC,T,000146007467150A27271E68090A3E00680A143E00680C052800011400680D051E00010A007FFF	
all_ship_set_channel.sst	All ship call setting DSC channel
$PDEBT,CCDSC,T,000146007467150A27271E65467FFF	

Annex C test diagrams

C.1 GMSK modulation 12.5 and 25 kHz bandwidth

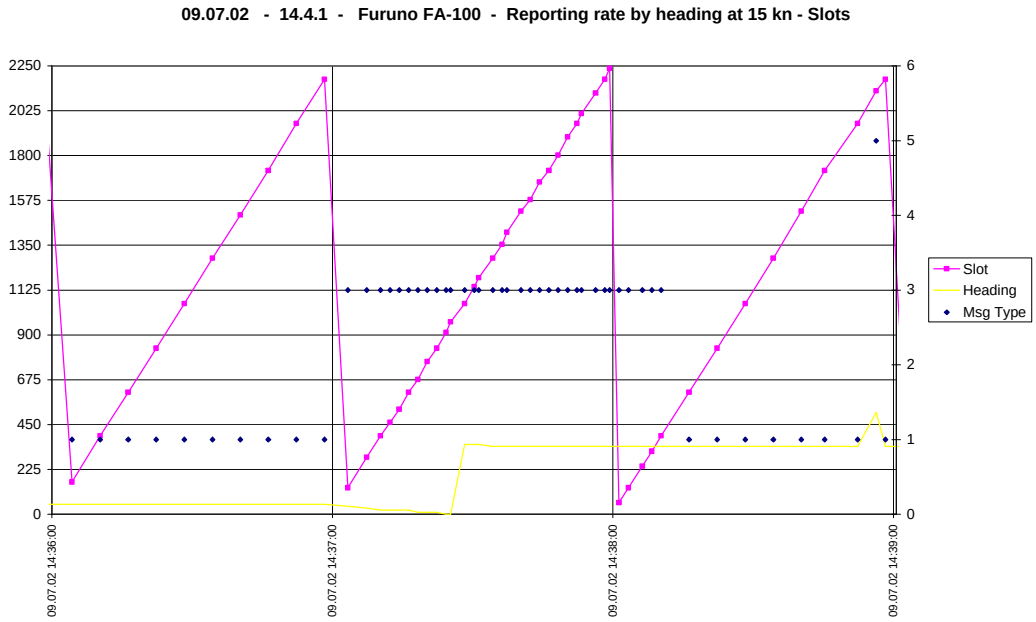
see test clause 2.7



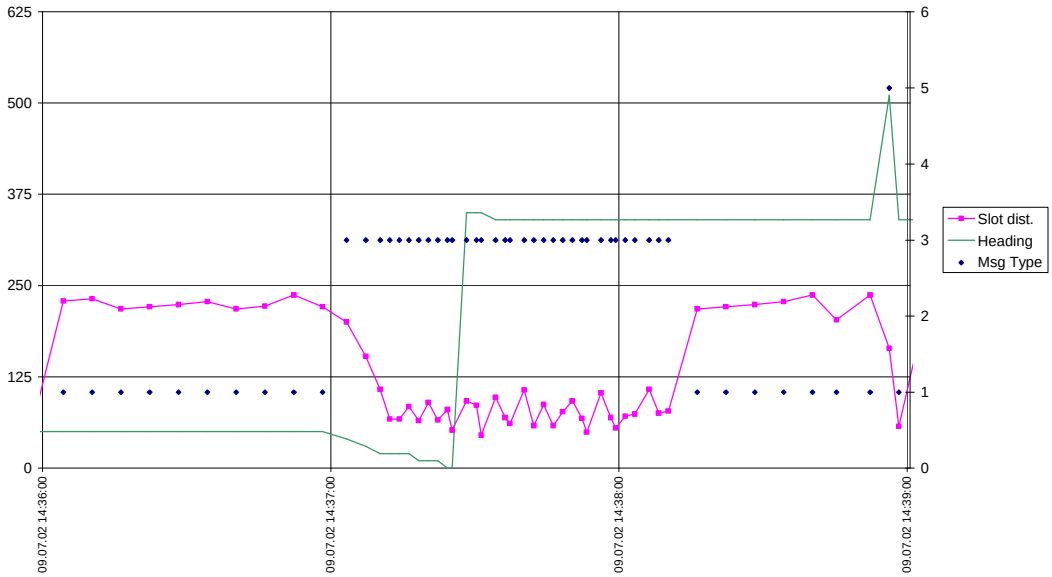


C.2 Reporting rate by course change

see test clause 2.4.1, 4.6.4



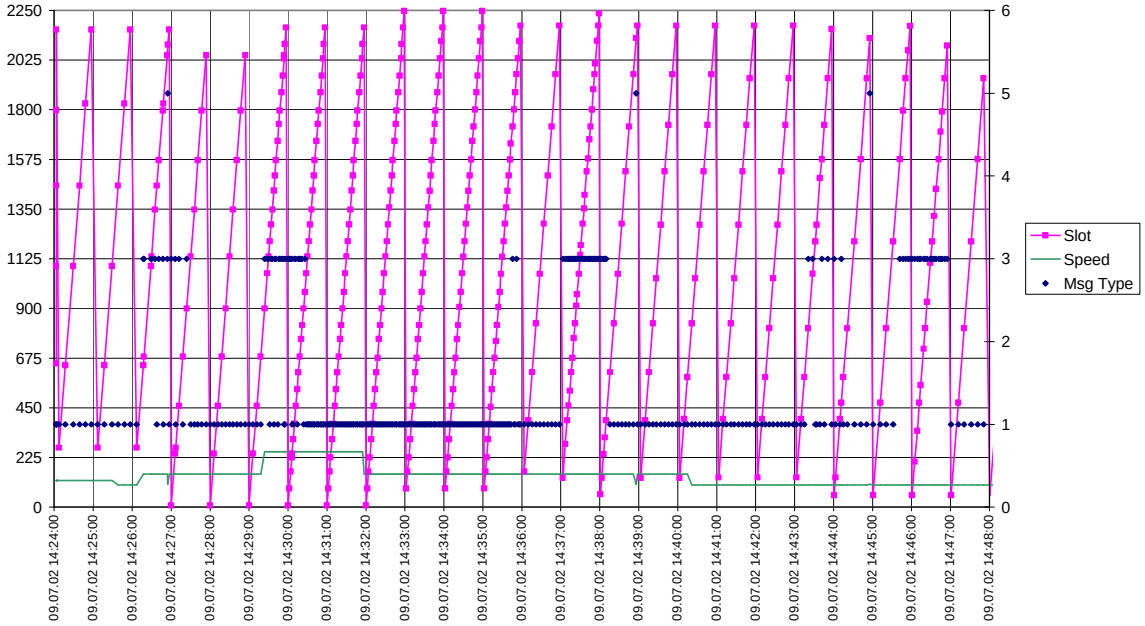
09.07.02 - 14.4.1 - Furuno FA-100 - Reporting rate by heading at 15 kn - Slot offset



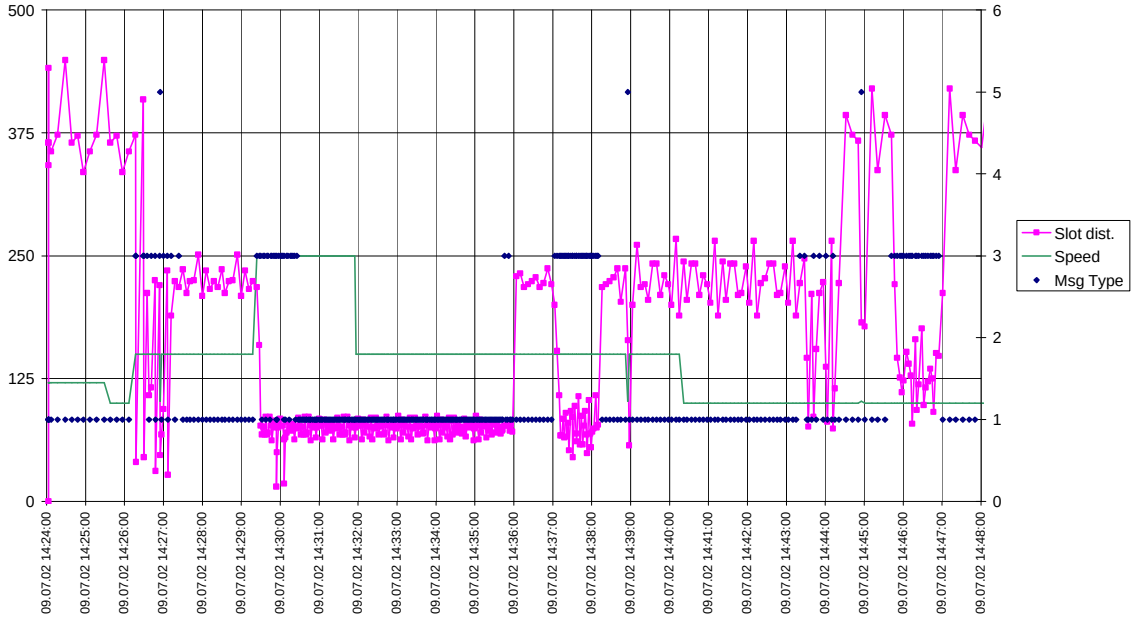
C.3 Reporting rate by speed

see test clause 2.4.1

09.07.02 - 14.4.1 - Furuno FA-100 - Reporting rate by speed - Slots



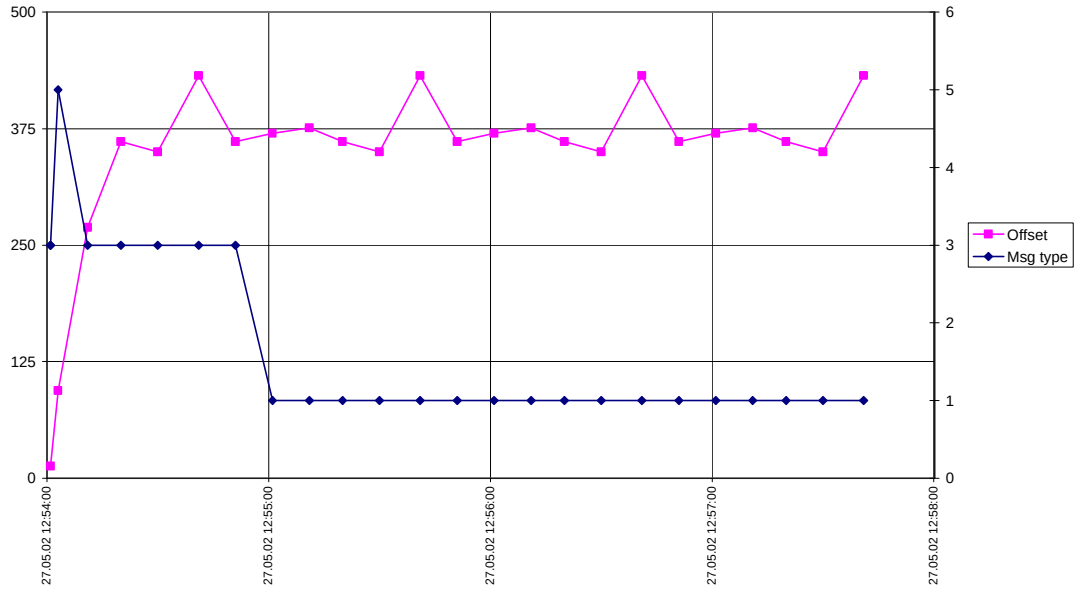
09.07.02 - 14.4.1 - Furuno FA-100 - Reporting rate by speed - Slot offset



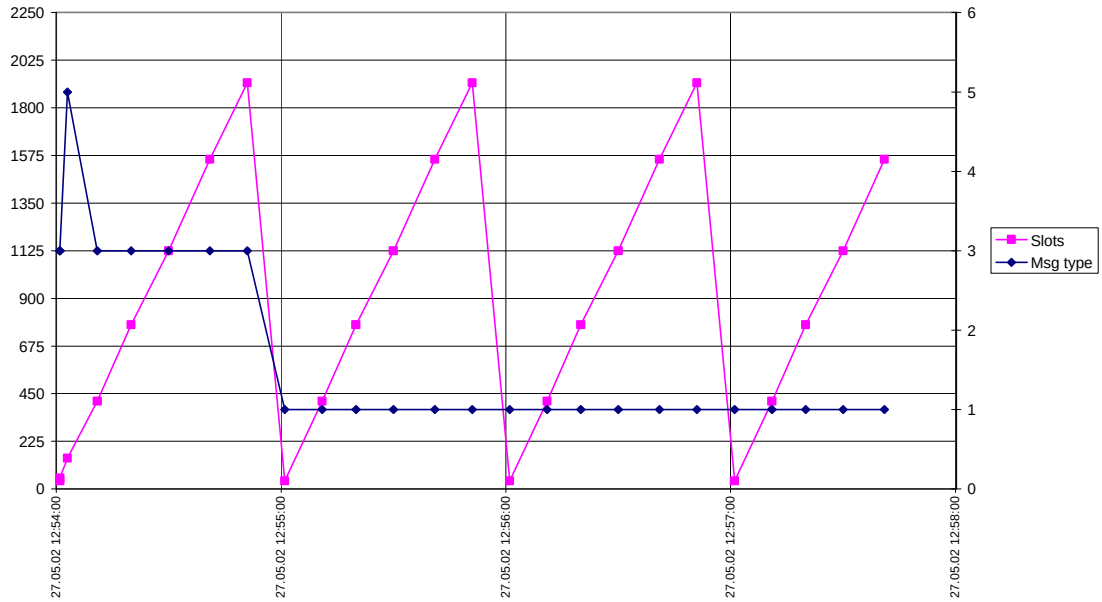
C.4 Network entry phase

see test clause 4.6.1

Furuno FA-100 - Slot offset at Network entry - 27.05.02



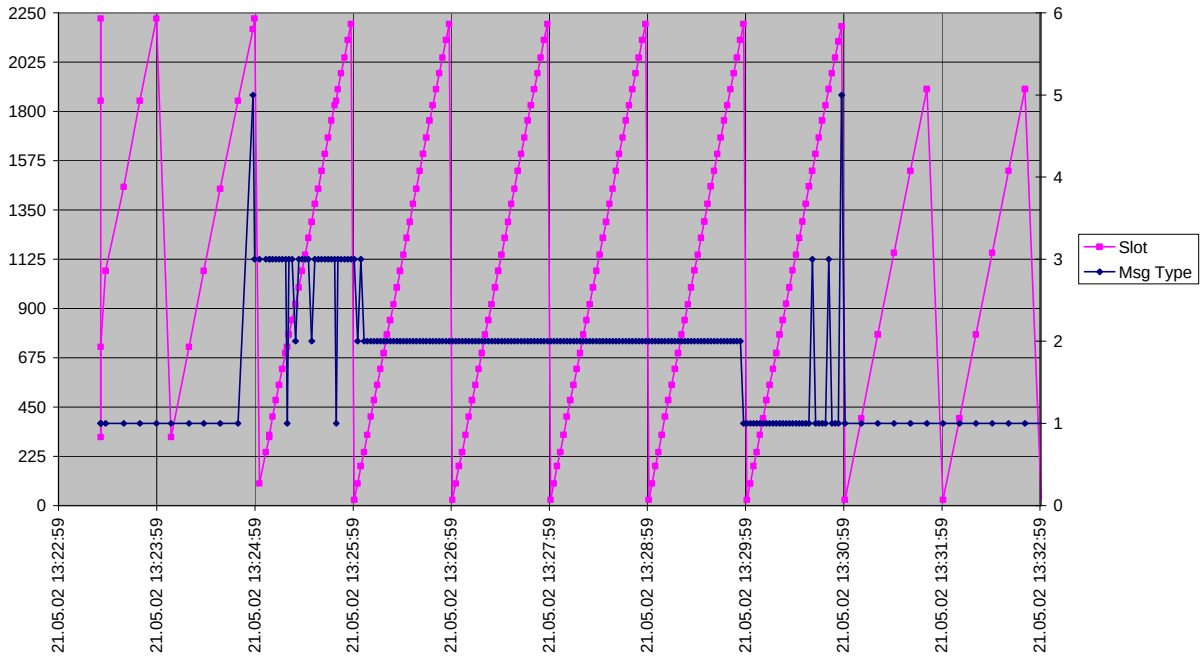
Furuno FA-100 - Slot allocation at Network entry



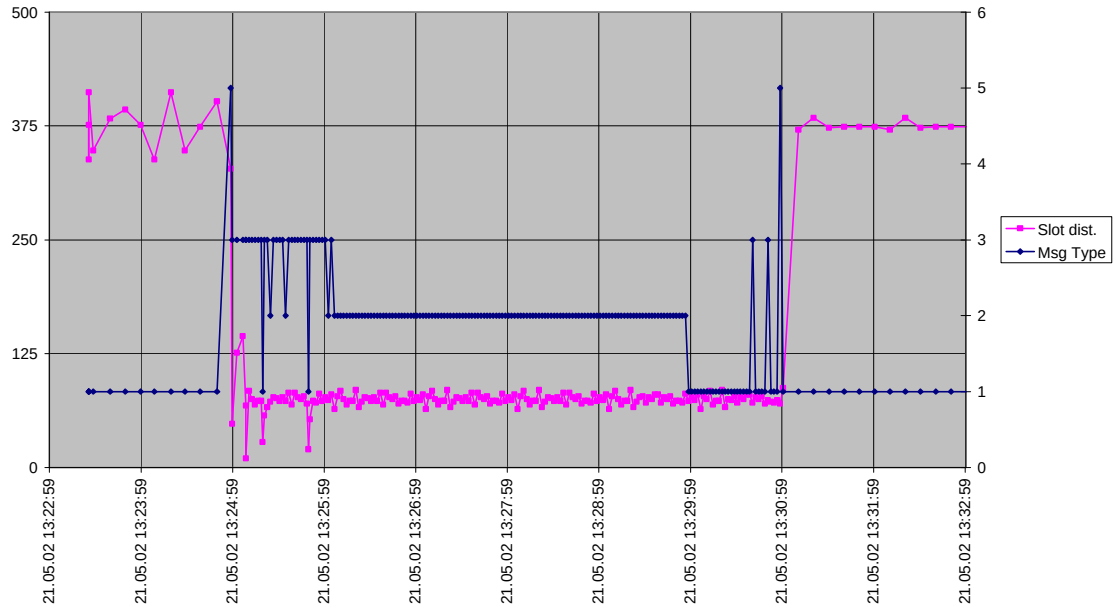
C.5 Assigned mode / report rate

see test clause 4.6.4

Furuno FA-100 Rate Assignement



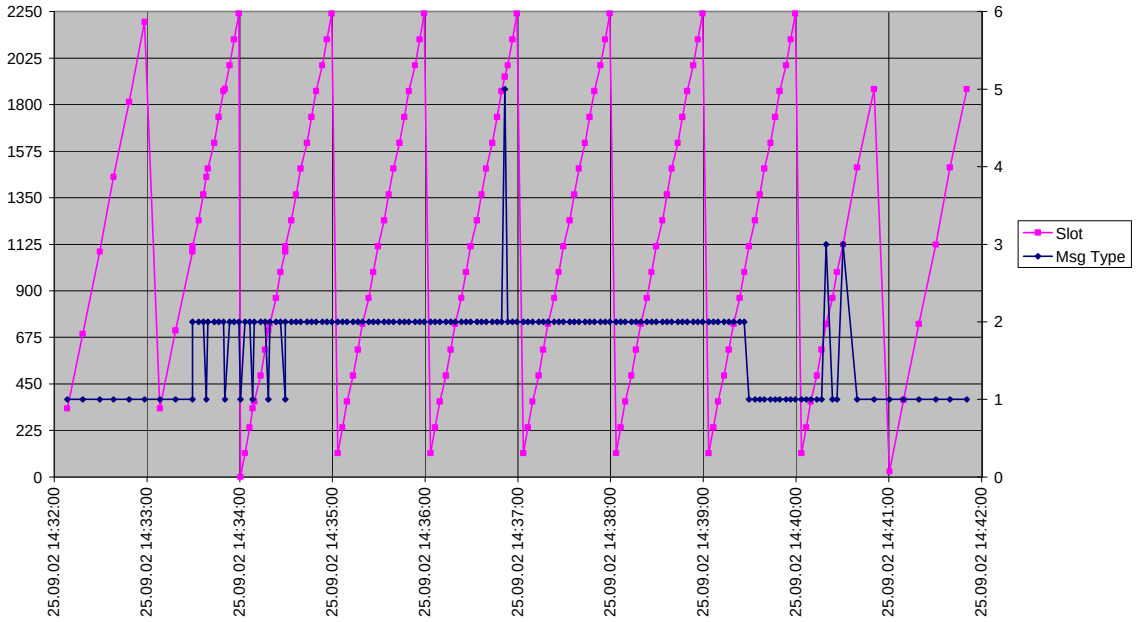
Furuno FA-100 Rate assignment - Slot offset



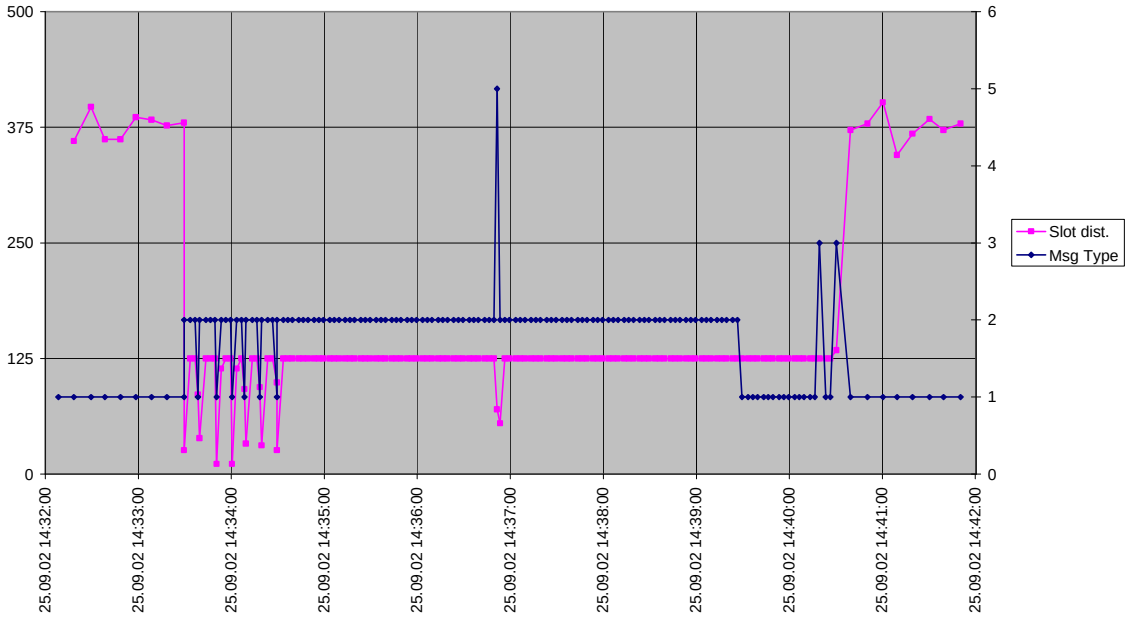
C.6 Assigned mode / slot assignment

(test clause 4.6.4 16.6.4 Assigned operation)

Furuno FA-100 Slot Assignment - Slots

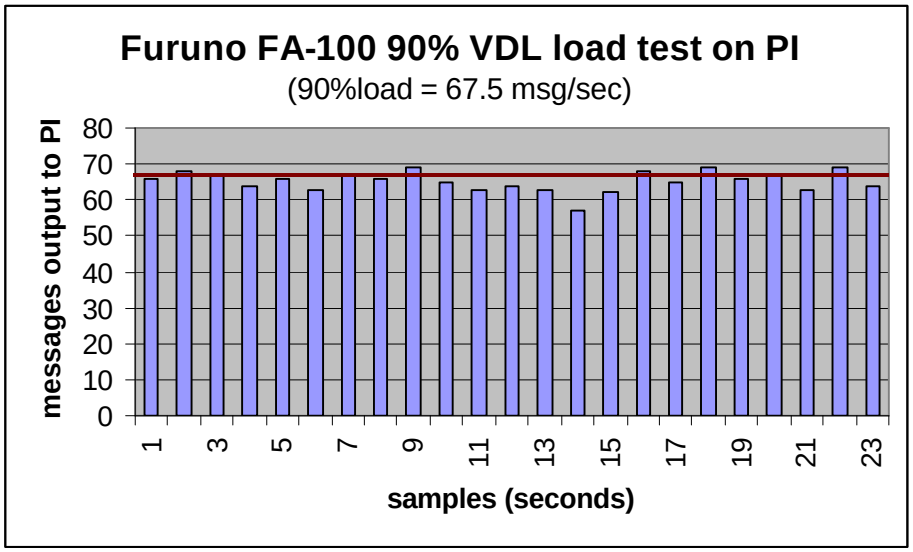


Furuno FA-100 Slot assignment - Slot offset



C.7 PI output under high channel load

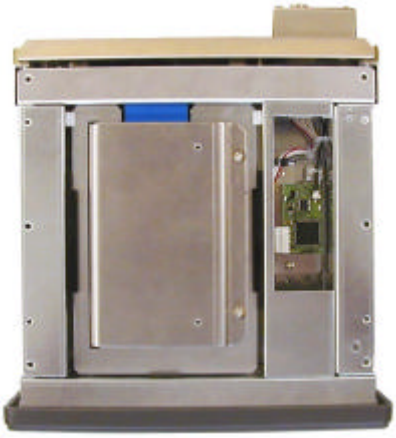
(test clause 7.7)



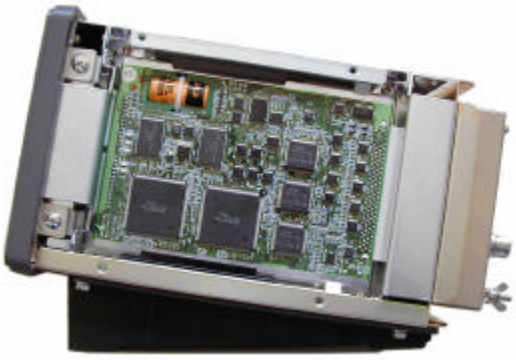
Annex D Photos of equipment under test

Picture 1: Front view

Picture 2: Rear view / label



Picture 3: Top view



Picture 5: Left view