Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Conformance test report of an

AIS system

Equipment under test: **Nauticast**

Type: **X-Pack DS AIS**

Applying test standards:

IEC 61993-2	Sections 14, 16-21

Test Report No.: 734.2/0051/2002 – S3220

Applicant:

Nauticast AG
Mariahilfer Strasse 50/2/11
1070 Wien
Österreich

Hamburg, 25.March 2003
Federal Maritime and
Hydrographic Agency

by order

Bartels
Test engineer

by order

Preuss
head of
laboratory

nach DIN EN 45001
akkreditiertes Prüflaboratorium

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Translation

Deutsche Akkreditierungsstelle Technik (DATech) e.V.

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Deutschen AkkreditierungsRat

Akkreditierung

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

of the
Bundesamtes für Seeschiffahrt und Hydrographie (BSH)
Abteilung Schiffahrt
Laboratorium für Baumusterprüfungen
Bernhard-Nocht-Straße 78
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is competent under the terms of DIN EN 45 001 to carry out testing in the fields

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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:	Nauticast AG
	Mariahilfer Strasse 50/2/11, 1070 Wien, Austria
Equipment under test:	
Type:	X-Pack DS
Manufacturer:	Siemens AG Österreich
	Siemensstr. 92, 1210 Wien, Austria
Place of test:	BSH test laboratory Hamburg, Room 916
Start of test:	11. November 2002
End of test:	25. March, 2003

Test standards[1]:

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

Summary

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

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

1.2 Composition

Minimum Keyboard and display (MKD)

X Internal ☐ Remote ☐ external

internal GNSS

☐ sync only **X** backup pos. sensor

1.3 Remarks

Result marking:

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

Not yet tested items are marked with a blue background.

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

Date	Result	Status

1.3.1 Notes on 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**
16.01.03	Area settings	EUT was at the standard position. After sending an ACA sentence including the actual position the EUT stopped VDM/VDO 04.02.03 Retest: EUT changes settings to the settings defined by the new area.	ok
17.01.03	Nav status	The nav status “at anchor” is changed to “under way using engine” at restart (or increase speed to 15 kn?) 03.03.03 Retest: The nav status “at anchor” is not lost during switch off.	ok
06.02.03	Duplex channels	On duplex channels the EUT could not be received correctly. Modulation diagram indicated that the PLL synthesizer locked on the new frequency too late because of the larger frequency distance. 28.02.03 Retest: ok	ok
07.02.03	DSC –Reception	Rx of DSC calls stopped after some calls. Worked again after restart. 28.02.03 Retest: The problem has been fixed The problem was caused by a call buffer overflow.	ok
27.02.03	TX power	There was a change of output power down to 0. 07.03.03 Retest: Output power is stabil	ok
28.02.03	Reporting rate	After manual change of a channel in the area settings the reporting rate was doubled Retest 07.03.03: No doubling of reporting rate at change of channel	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.

10.03.03	**Test details – General documentation**		
Test item	**Check**	**Remark**	**Result**
Composition of customer documentation	Check the composition of customer documentation.	The documentation consists of: • Quick Installation Manual • Installation Manual • Quick User Manual • User Manual • NMEA commands to Interface the X-Pack DS	
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	No Technical Manual, Technical information is part of the Installation manual	Ok
Installation information	Check that an installation manual is included		ok
Language	Check that the documentation is written in English		Ok
Some details of installation information			
System overview	Check that an AIS system overview diagram is available		Ok

Mechanical dimensions	Check that mechanical dimension drawings of transponder are available	Including Mounting parts	Ok
	Check that mechanical dimension drawings of MKD are available	No separate MKD, MKD is included in the transponder	ok
	Check that mechanical dimension drawings of a Connectinon box available	Not part of standard delivery, but available (Nau-B400) Drawing is included, but no dimensions on the drawing Retest 25.03.03: dimensions are included	ok
	Check that mechanical dimension drawings of GPS antenna are available	No drawing but photo and dimensions	ok
	Check that mechanical dimension drawings of VHF antenna are available		ok

10.03.03	**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	Open cable	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 illlumination required	ok

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.

	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	For the Pilot plug the A and B designation is provided, All other serial interfaces are marked with + and -. There is no information of the relation between A, B and +,-. Retest 25.03.03: Information of relation between A,B and +,- is provided, but reverted Retest 06.05.03: Relation between A,B and +,- is now correct	ok
b) Output driver	Check that the output drive capability is included	Retest 06.05.03: Output drive capability is included now (50 mA)	ok
c) Talker sentences of PI ports	Check that list of sentences is included		Ok
	Check that unused fields are noted	Not found A declaration like “all fields are provided” would be ok Retest 25.03.03: Remark in documentation: “All fields are provided”	ok
	Check if proprietary sentences are included if available		Ok
c) Talker sentences of long range port	Check that list of sentences is included		ok

	Check that unused fields are noted	Not found A declaration like “all fields are provided” would be ok Retest 25.03.03: Remark in documentation: “All fields are provided”	ok
	Check if proprietary sentences are included if available	No proprietary sentences are used	ok
d) Input load	Check that the input load is included	Not found Retest 06.05.03: Input load of 30 kOhm is included now	ok
e) Input sentences of PI ports	Check that list of sentences is included		Ok
	Check that required and unused fields are noted	Not found A declaration like “all fields are provided” would be ok Retest 25.03.03: Remark in documentation: “All fields are provided”	ok
	Check if proprietary sentences are included if available	Proprietary sentences are included	ok
e) Input sentences of long range port	Check that list of sentences is included		ok
	Check that required and unused fields are noted	Not found A declaration like “all fields are provided” would be ok Retest 25.03.03: Remark in documentation: “All fields are provided”	ok
	Check if proprietary sentences are included if available	No proprietary sentences are used	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	Not required, all 3 sensor inputs have the same function	ok
	Check that required and unused fields are noted		Ok
	Check if proprietary sentences are included if available	No proprietary sentences are used	ok
f) Software version	Check that the relevant software version is included	Not found	acc
f) Hardware version	Check that the relevant hardware version is included	Not found	acc
g) Hardware input/output circuit	Check that information about hardware interface components is included		ok
h) Standards	Check that the version number and date of update of the relevant standard is included	Only the standards are mentioned, not the version of the standards (in table 2.2 Technical	

		Information) Retest 25.03.03: The version of the standards is indicated by the year of issue	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.

13.11.02	**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		Ok
Speed	Check the values of SOG and COG		Ok
Heading/ROT	Check that the values of heading and ROT are default		Ok

2.1.1.2 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.

13.11.02	**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 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

13.11.02	**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 compared with the transmitted values			
MMSI	Check MMSI		Ok
Transmission rate	Check that the message 1 is received continuously		Ok
Position	Check the values of lat and lon		Ok
Speed	Check the values of SOG and COG		Ok
Heading/ROT	Check the values of heading and ROT		Ok

2.1.2 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 .

This test is completely covered by test in 4.6.4 (16.6.4 Assigned operation).

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.

13.11.02	**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,000005002,3,,,,,, Change type from 5 to 3 A response is automatically transmitted by the addressed transponder			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgement	$AIABK,000006003,,15,,3 AIS channel missing Retest 19.12.02 $AIABK,000006003,A,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

13.11.02	**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_5.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,000006003,,15,,3 AIS channel missing Retest 19.12.02 $AIABK,000006003,A,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

13.11.02	**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_5.sst: $AIAIR,000005002,4/20/22,,,,,, Change type to 4, 20, 22 The response from the base station is not checked			
Request msg 4	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	$AIABK,00001005,A,15,,3	ok
Request msg 20	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	$AIABK,00001005,A,15,,3	Ok
Request msg 22	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement		Ok

13.11.02	**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_35_5.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,000006003,,15,,3 AIS channel missing Retest 19.12.02 $AIABK,000005001,A,15,,3*2E	 Ok
RX of request	Check that message is received by one of the addressed transponders (VDM)		Ok
Received by VDL Analyser	Check request on VDL analyser		Ok
TX of response (VDO)	Check that response is transmitted by addressed transponder (VDO)		Ok
RX of response (VDM)	Check that the response message 5 is received by EUT (VDM)		OK

2.1.3.2 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.

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

24.02.03	**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 = 25	ok
Response channel	Check that the response is transmitted on the request channel		ok

24.02.03	**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	Slot offset = 101 28.02.03 Retest: Slot offset = 100	ok

More detailed interrogation tests are made in 6.2 “18.2 (M.1371 A1/5.3) Interrogation responses”

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 (Addressed messages).

The field contents of this test should be checked in 4.7.2 (16.7.2 transmitted messages)

13.11.02	**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		Ok
RX of request	Check that message is received by addressed transponder (VDM)		Ok
TX of ackn. msg 7 (VDO)	Check that ackn msg 7 is transmitted by addressed transponder (VDO)		Ok
Use of Appl. ID	Check for proper use of DAC and FI for text messages when using MKD	No functionality found for sending msg6 via MKD	ok
RX of msg 7 (VDM)	Check that the ackn. msg 7 is received by EUT (VDM)		Ok
AIABK acknowledgement			Ok
Add invalid character to encapsulated data, e.g. x,y,z			
Transmission	Check that message is not transmitted	Transmitted with '?' for invalid data There is no requirement of handling of incorrect sentences. Therefore this handling is accepted	acc
ABK sentence	Check that ABK message with ackn. type 2 (could not be broadcast) is output on PI	Ackn. Type 0 is used for this data	ok

13.11.02	**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		Ok
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.		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 .

13.11.02	**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

13.11.02	**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

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 6.3 18.3 Broadcast messages

13.11.02	**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 AIS channel missing Retest 19.12.02 $AIABK,,B,8,6,3*13	 Ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
Message on VDL	Check the broadcast message on VDL analyser		ok
Rx on other transponder (VDM)	Check the VDM output of an other transponder		Ok

13.11.02	**Test details - Safety related broadcast message 14**		
Test item	**Check**	**Remark**	**Result**
Transmit a safety related broadcast messages 14 with 120 data bytes of binary data by sending 4 BBM sentences to the PI. PI sentence: File AIBBM_multi_safety.sst: AIS channel for broadcast is 2: (ch B) The file contains 4 BBM sentences with in total 120 data bytes or 160 characters			
VDO output of EUT	Check the VDO output on PI		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,14,6,3 AIS channel missing Retest 19.12.02 $AIABK,,B,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

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.

13.11.02	**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_1.sst: AIS channel for broadcast is 1: (ch A) The file contains 4 BBM sentences with in total 121 data bytes or 162 characters			
VDO output of EUT	Check that no VDO is output on PI		OK
Message on VDL	Check that no message is received by VDL analyser		Ok
AIABK acknowledgement	Record the AIABK output, check that type = 2 (could not be broadcast)	No ABK found Retest 19.12.02 $AIABK,,A,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.

13.11.02	**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_long.sst: AIS channel for broadcast is 1: (ch A) The file contains 4 BBM sentences with in total 123 data bytes or 164 characters			
VDO output of EUT	Check the VDO output on PI	No output	Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements, type should be 3	Not found <u>Retest 19.12.02: Output of ABK:</u> $AIABK,,B,8,6,2 (2 = not transmitted)	 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		

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.

13.11.02	**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		OK
Position	Check the values of lat and lon and compare with MKD display		Ok
Speed	Check the values of SOG and COG and compare with MKD display		Ok
Heading/ROT	Check that the values of heading and ROT are default		Ok
Position accuracy flag	Check flag with and without differential corrections by msg 17		Ok
Time stamp	Check time stamp		Ok
Comm state	Check for availability, detailed test in 5		Ok
Default values	Check that default values for LAT, LON, SOG, COG are transmitted if internal GNSS is unavailable		Ok

14.11.02	**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

2.3.2 Information content of msg 5

	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	New msg5 missing for changing position source Retest 19.12.02	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		OK
DTE off	Check that DTE flag = 1	Not applicable. MKD cannot be disconnected because it is internal	----
Type of EPFS			
Apply simulated GLL,VTG, GDT and ROT sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst. Change talker according to test item			
Talker = GP	Check type of EPFS = 1		Ok
Talker = GL	Check type of EPFS = 2		OK
Talker = GN	Check type of EPFS = 3		Ok
Talker = LC	Check type of EPFS = 4		Ok
Talker = IN	Check type of EPFS = 6		OK
Talker = other	Check type of EPFS = 0		OK

2.4 14.4 Reporting rates

(6.5.2)

2.4.1 14.4.1 Speed and course change

(6.5.2)

Method of measurement

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

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

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

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

d) Make speed and/or heading sensor unavailable.

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

Required results

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

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

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

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

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

19.11.02	Test details – Change of reporting rate by speed		
Test item	**Check**	**Remark**	**Result**
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data. Change speed according to the test items and record VDL data. After each change wait until new reporting rate is clearly established. Lines are related to Excel table reprate_speed.xls			
Speed = 10 kn	Check that reporting rate is 10 s		Ok
Speed = 15 kn	Check slot allocation using msg 3 for new reporting rate	See note 1)	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		Ok
Speed = 25 kn	Check slot allocation using msg 3 for new reporting rate	See note 1)	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		Ok
Reduction of speed to Speed = 15 kn	Check slot allocation by deallocation of slots, Msg 3 not required for new reporting rate	Change of reporting rate is not done by deallocation of slots but by deallocation of all slots and a complete new rescheduling 24.02.03 Retest: ok	ok
	Check that new rate starts after 3 min and is established within 4 minutes	The change of reporting rate starts immediately after reduction of speed. It should start rescheduling 3 min after change of speed and should be finisched after 4 min 24.02.03 Retest: change of reporting rate starts 3 min after reduction of speed	ok
	Check that new reporting rate is 6 s		OK
Reduction of Speed to 10 kn	Check slot allocation using msg 3 for new reporting rate	See note 1) See note 2)	Ok

	Check that new rate starts after 3 min and is established within 4 minutes	The change of reporting rate starts immediately after reduction of speed. It should start rescheduling 3 min after change of speed and should be finisched after 4 min 24.02.03 Retest: change of reporting rate starts 3 min after reduction of speed	ok
	Check that new reporting rate is 10 s		Ok
Note 1) Line 14 of table Line 46 of table Line 272 of table	For the first msg 3 an unallocated slot is used. The EUT should after increase of speed wait for the next msg 1, change it to msg 3 and start the allocation chain (see ITU-R M1371 3.3.5.5.1 24.02.03 Retest: For the first msg 3 the next msg 1 slot after speed change is used		ok
Note 2) Line 272 Line 277	The keep flag is 0 but the slot is used again in the next frame. The keep flag should be set to 1. This msg 3 should allocated the slot 282 but doesn't allocate any slot. So the slot 282 is unallocated. 24.02.03 Retest: No such case found		ok
Line 283 and 285 Line 288 and 289	These msg 3 (slots 1013 and 1433) should allocate the slots 1752 and 2131. These slots are unallocated, should be e.g. allocated in slots 1013 and 1433 (line 283 and 285) 24.02.03 Retest: Slot allocation is ok		ok
Remark	See ITU-R M1371 3.3.5.5.2: Generally, before allocating a new slot, it should be checked if in the selection interval there is already a slot allocated. If it is, it should be used, and no new slot should be allocated. The recorded table shows that generally all allocated slots are deallocated and new slots are selected 24.02.03 Retest: Slots in the selection interval which are already allocated are used		ok

19.11.02	**Test details – Change of reporting rate by course change**		
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 increase heading by 6 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	See heading change at 15 kn 17.01.03 Retest: only 2 msg type 3 were inserted, not, as required, 2 msg 3 between two msg 1. 06.03.03 Retest: 2 msg 3 are inserted between 2 basic msg. The basic msg are converted to msg 3 to allocate the next msg 3	ok
	Check that new rate is established immediately	See heading change at 15 kn 17.01.03 Retest: The first msg 3 is inserted 41 s after begin of heading change, that is not immediately 06.03.03 Retest: The reporting rate is increased immediately after heading change	ok
	Check that new reporting rate is 3 1/3 s	See heading change at 15 kn 17.01.03 Retest: The reporting rate is not really increased 06.03.03 Retest: The new rate is 3 times the basic rate	ok
Speed = 10 kn Stop increasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)	See heading change at 15 kn 17.01.03 Retest: Insertion of msg 3 is stopped after end of heading change 06.03.03 Retest: Decrease of reporting rate is done by stopping insertion of additional messages	ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change	See heading change at 15 kn 17.01.03 Retest: time cannot be really checked because of the only 2 insertions 06.03.03 Retest: Reporting rate is reduced about 40 s after end of heading change	ok
Speed = 15 kn decrease heading by 6 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	Increasing of reporting rate is not done by insertion of msg 3 but by a complete new rescheduling 06.03.03 Retest: 2 msg 3 are inserted between 2 basic msg. The basic msg are converted to msg 3 to allocate the next msg 3	ok
	Check that new rate is established immediately	It starts change of reporting rate immediately after change of heading.	ok

	Check that new reporting rate is 2 s	Seems to be ok. Has to be checked again when the reporting rate is increased by insertion of additional msg 3 06.03.03 Retest: ok	ok
Speed = 15 kn Stop decreasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)	A complete new rescheduling is done 06.03.03 Retest: Decrease of reporting rate is done by stopping insertion of additional messages	ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change	Because a complete rescheduling is performed the new reporting rate cannot be established as fast as required 06.03.03 Retest: Reporting rate is reduced about 40 s after end of heading change	ok
	Check that new reporting rate is 6 s again		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

14.11.02	**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	Stopping recording after 5 min EUT didn't established new rate EUT is doing something but only sending msg 3 25.02.03 Retest: EUT reverts after 3 min to 10 s reporting rate	ok
	Check that new reporting rate is 10 s	Still 6 s rate 25.02.03 Retest: The new reporting rate is 10 s	ok

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

Date	Result	Status
14.11.02 25.02.03	Problems with changing heading and speed sensor unavailble Retest: EUT reverts after 3 min to 10 s reporting rate	 Ok
17.01.03 06.03.03	Retest of change of reporting rate by heading change was very unsuccessfull. In addition to the problems described in test details all msg on channel 2 were released and the transmission on channel 2 was stopped. The normal transmission one 2 channels could only be reactivated by restart Retest: The above described problems did not occur.	 Ok
06.03.03 07.03.03	During the temporary increase of reporting rate the time-out of the basic msg is set to 1 (according to the interpretation that the keep flag = 1 reserves the slot for one frame) After end of the increase phase the basic slots are set to a randem time-out keeping the current slot. It should be set to 0 to avoid use of the same slot for a too long time. Time-out is set to 0 after increased reporting rate phase	 acc

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)

14.11.02	**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		Ok
Nav. status = 1 (at anchor) Speed = 2 kn	Check that reporting rate is 3 min		Ok
Nav. status = 1 Speed = 4 kn	Check that reporting rate is 10 s		Ok
Nav. status = 5 (moored) Speed = 2 kn	Check that reporting rate is 3 min		Ok
Nav. status = 2 or other Speed = 2 kn	Check that reporting rate is 10 s		Ok

2.4.3 14.4.3 Assigned reporting rates

(6.5.2)

Method of measurement

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

a) initial slot offset and increment;

b) designated reporting rate.

Change course, speed and NavStatus. Record transmitted messages.

Required results

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

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

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.

25.11.02	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 = 3 (increment = 225 = 6 s)			
NavStatus = 1 (at anchor)	Check that Navstatus has no effect: slot offset = 225 and reporting rate is 6 s and msg type = 2		Ok
Nav Status = 0 speed = 15 kn	Check that slot offset = 225 and reporting rate is 6 s and msg type = 2		Ok
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
Nav Status = 0 Increase speed to 15 kn	Check that reporting rate is not changed.		Ok
NavStatus = 0 Speed = 25 kn	Check that reporting rate = 2 s and Msg type = 1 (change with msg 3)		Ok
NavStatus = 0 Speed = 15 kn: When established: Course change	Check that reporting rate = 2 s and Msg type = 1/3 (msg 3 inserted between msg 1)	Reporting rate is increased by insertion of msg 3. The timeout of the assigned slots is counted down correctly during the increased reporting rate phase. Assigned mode is continued after end of increased phase	ok

25.11.02	Test details b) – Rate assignment		
Test item	**Check**	**Remark**	**Result**
Send an assignment message 16 with offset = 100 (reporting rate = 100 msg/10 min), increment=0			
NavStatus = 0 (under way using engine), Speed = 10 kn • Send assignment cmd	Check that reporting rate is 6 s And msg type = 2		Ok
In assigned mode • change NavStatus to 1 (at anchor)	Check that Navstatus has no effect: EUT maintains assigned mode		Ok
In autonomous mode: NavStatus = 1 (at anchor), speed = 2 kn • Send assignment cmd	Check that the assignment command is accepted		Ok
Nav Status = 0, speed = 10 kn • Send assignment	Check that assignement command is executed		Ok
• Increase speed to 15 kn	Check that EUT maintains assignment mode	EUT leaves assigned mode for 1 frame (msg 1) and reverts then to assigned mode (msg 3 and then msg2) 06.03.03_Retest: EUT keeps the assigned mode	 ok
• Increase speed to 25 kn	Check that EUT reverts to autonomous mode: reporting rate = 2 s and Msg type = 1 (change with msg 3)	• Reporting rate is correctly increased to 2 s • Message type remains at 2 (not ok) • After end of assigned mode time-out the reporting rate is decreased to 10 s (at 25 kn speed) 06.03.03_Retest: Message type is changed to 1 using msg 3 to establish the new reporting rate. EUT keeps this reporting rate after timeout of assigned mode	Ok Ok Ok
NavStatus = 0, Speed = 15 kn: • Send assignment cmd	Check that EUT changes to assigned mode		ok

In assigned mode: • Change heading	Check that reporting rate = 2 s and Msg type = 1/3 (msg 3 inserted between msg 1 or 2)	Reporting rate is increased by insertion of msg 3. The timeout of the assigned slots is counted down correctly during the increased reporting rate phase. Assigned mode is continued after end of increased phase	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.

14.11.02	**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 because of change of ref. point data	EUT still in 6 min cycle 25.02.03 Retest: Msg 5 is correctly transmitted between change of position source in position report	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.

14.11.02	**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		Ok
Read out recorded data	Check that all switch off times are correctly recorded	Retest 19.12.02 No log entry found for a switch off period off 16 min. There are only entrys for longer periods e.g. over night Retest 24.02.03 works if only internal GNSS is activ or from external RMC is avaiable . Retest 26.02.03	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.

14.11.02	**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	1:25 min	Ok
b) Switch off EUT for approx. 0.5 s	Check that EUT starts transmission within 2 min	1:13 min	Ok

2.7 14.7 Channel selection

(6.9)

Method of measurement

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

a) manually,

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

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

d) By transmission of DSC telecommand to EUT

Record the VDL messages.

Required results

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

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

25.02.03	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 it is in use. The VDL analyser has to be switched to the selected channels			
a) Enter manually: 2 simplex channels 25 kHz spacing 25 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok
	Check ACA output at PI	ACA is output but the "in use" flag is not set and time of last change is empty Retest 03.03.03: ok	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	Same as a) Retest 03.03.03: ok	Ok
c) Enter by ACA sentence: 1 duplex channel 25 kHz spacing 12.5 kHz bandwidth	Check that channels are used		Ok
	Check bandwidth		Ok
	Check TXT output at PI		Ok
	Check ACA output at PI	Same as a) Retest 03.03.03: ok	Ok
d) Enter by DSC 2 simplex channels 12.5 kHz spacing 12.5 kHz bandwidth	Check that channels are used		ok
	Check bandwidth	25 kHz spacing: bandwith of 12.5 kHz is not used, bandwith is set to default 06.03.03 Retest: The stored area setting is correct, but the status display shows "default" and the TX uses 25 kHz bandwith. After moving the position out of the area and into the area again the 12.5 kHz bandwidth is indicated and used. Retest 07.03.03: Bandwidth is used but the status display indicates "default" Retest 07.03.03: Status display displays "12.5 kHz"	ok
	Check TXT output at PI		Ok
	Check ACA output at PI	ACA indicates default bandwidth	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.

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

2.9 14.9 Alarms and indicators, fall-back arrangements

(6.10)

14.11.02	**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	Can not test this point, because EUT is not able to decode ROT input at sensor interface Retest 19.12.02 No ALR sentence found in case off no alarm pending. At least an empty ALR sentence has to be transmitt Retest 20.01.03	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".

19.12.02	**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.

19.12.02	**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	Transmission didn't stopp	Ok
ALR output	Check that ALR sentence ID 001 is output at PI	Also ALR 002 is sent	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	Only as pop-up window once Retest 24.02.03	Ok
Send an ACK sentence	Check that alarm relay deactivated	Still active Retest 24.02.03	Ok
	Check that ALR sentence is updated	Ok	Ok
	Check that alarm display on the MKD is updated	Not found Retest 24.02.03	Ok
Reconnect VHF antenna	Check that ALR sentence is updated	ALR sentence was transmitted with the condition threshold exceeded Retest 24.02.03	Ok
	Check that alarm display on the MKD is updated	Not found Retest 24.02.03	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.

19.12.02	**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			
Continuation of Tx	Check that transmission continues		Ok
ALR output	Check that ALR sentence ID 002 is output at PI	Also ALR 001	Ok
MKD display	Check that the alarm is displayed on the MKD		Ok
Alarm relay	Check that alarm relay is activated		Ok
Send an ACK sentence	Check that alarm relay deactivated		Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated		Ok
Generate a new alarm by connection the VHF antenna and again connect the mismatched dummy load			
Acknowledge the alarm on MKD (applies to all alarms) note: NEW	Check that alarm relay deactivated		Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated (the alarm indication is cleared)		Ok
Connect VHF antenna	Check that ALR sentence is updated		Ok

2.9.2.3 14.9.2.3 Rx malfunction

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

03.03.03	**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	Only the unlock of receiver synthesizer is detected	ok
ALR output	Check that documentation describes that an ALR sentence with ID 003 (RX1), ID 004 (RX2) and ID 005 (DSC) is sent.	The documentation says that “the corresponding ALR sentences will be sent out” The exact relation between detected error and ALR ID is not mentiond	acc

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.

14.11.02	**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	Still direct Retest 19.12.02	 ok
TXT output	Check that a TXT sentence with ID 007 is output at PI	Not found Retest 19.12.02	 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	Not found Retest 19.12.02 Still not found. May be that located at AIS status screen is a good solution Retest 24.02.03	 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.

14.11.02	**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	ok
DTE flag	Check that the DTE flag in msg 5 is set to 1		
ALR output	Check that ALR sentence ID 008 is output at PI		
Alarm relay	Check that alarm relay is activated		
MKD display	Check that loss of connection to the transponder is displayed on the MKD		
Send an ACK sentence	Check that alarm relay deactivated		
	Check that ALR sentence is updated		
Reconnect MKD	Check that ALR sentence is updated		
MKD display	Check that the MKD display is updated		

2.9.3 14.9.3 Monitoring of sensor data

(6.10.3)

2.9.3.1 14.9.3.1 Priority of position sensors

(6.1.1.3, 6.10.3)

Method of measurement

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

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

a) external DGNSS in use (corrected)

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

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

d) external EPFS in use (uncorrected)

e) internal GNSS in use (uncorrected) if implemented

f) no sensor position in use

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

Required result

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

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

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

07.03.03	**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		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 0		Ok
	Check that ALR message with ID 026 (No sensor position) is output on PI every 30 s	Switching between 1min and 30 s cycle because an old alarm msg is not deleted if a new event (same alarm) is valid Retest 19.12.02	Ok
e) Change from f: • No external GNSS input • Activate internal GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that msg 5 is output with new (internal) ref. point	After 6 min Retest 19.12.02	ok
	Check that ALR message with ID 026 is updated		Ok
	Check that TXT sentence with ID 025 is output on PI	Not found Retest 19.12.02	Ok
	Check that the alarm on MKD according to ALR ID 026 is updated	Not found 26.02.03 Retest: ok, Alarm is updated	ok
	Check that status display of MKD is updated according to TXT ID 025	Not found Retest 19.12.02	Ok

d) Change from e: • Internal GNSS is available • Apply external GNSS input	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that msg 5 is output with new (external) ref. point	In 6 min cycle Retest 19.12.02	 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	Updated ALR 25 not found Retest 19.12.02	 ok
	Check that status display of MKD is updated according to TXT ID 022	Not found Retest 19.12.02	 ok
No internal Differential Mode			
a1) Change from d: • Internal GNSS • Change external mode to DGNSS	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 021 is output on PI		Ok
	Check that status display of MKD is updated according to TXT ID 021		ok
Differential Mode by Message 17			
b) Change from d: • External mode is GNSS • Apply correction data for DGNSS by msg 17	Check that internal position is used		Ok
	Check that position accuracy flag = 1	For a short time the position accuracy flag is 0, after output of TXT ID 24 it is set to 1	Ok
	Check that msg 5 is output with new (internal) ref. point	Msg 5 is output between the last msg 1 with external position and the first msg 1 with internal position	ok
	Check that TXT sentence with ID 024 is output on PI	First TXT ID 025 is output, about 7 s later TXT ID 24 and ID 28 (for speed) is output In addition TXT ID 023 is output (beacon) Retest 07.03.03: Output of TXT ID 024 (and ID 028 for speed	Ok
	Check that status display of MKD is updated according to TXT ID 024		ok
a2) Change from b: • Internal DGNSS (msg 17) • Change external mode to DGNSS	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (external) ref. point	Msg 5 is output between the last msg 1 with internal position and the first msg 1 with external position	Ok

	Check that TXT sentence with ID 021 is output on PI	TXT ID 021 and ID 027 (for speed) is output.	Ok
	Check that status display of MKD is updated according to TXT ID 021		Ok
Differential Mode by beacon input			
c) Change from d: • External mode is GNSS • Apply correction data for DGNSS by beacon	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (internal) ref. point		Ok
	Check that TXT sentence with ID 023 is output on PI	First TXT ID 025 (internal GNSS) is output, after about 5 s TXT ID 023 is output (and ID 028 for speed) Retest 07.03.03: Output of TXT ID 023 (and ID 028 for speed	ok
	Check that status display of MKD is updated according to TXT ID 023		ok
a3) Change from C: • Change external mode to DGNSS • Internal DGNSS (beacon)	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that msg 5 is output with new (external) ref. point		Ok
	Check that TXT sentence with ID 021 is output on PI	And ID 27 for speed	Ok
	Check that status display of MKD is updated according to TXT ID 021		Ok
Status change time	Check that status is changed after 30 s		ok

07.03.03	**Test details - Position priority – changing downwards**		
Test item	**Check**	**Remark**	**Result**
Connect sensor inputs and correction data according to the test items			
No Differential Mode			
a1) • Internal GNSS • External DGNSS	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to sensor input data		Ok
d) Change from a1: • Internal GNSS available • Change external sensor mode to GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that TXT sentence with ID 022 is output on PI	25.02.03 Retest: TXT ID 022 is output	ok
	Check that status display of MKD is updated according to TXT sentence		Ok

Differential Mode by Message 17			
a2) • External DGNSS • Internal DGNSS by msg 17	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to sensor input data		ok
b) Change from a2: • Internal DGNSS by msg 17 • Change external sensor mode from DGNSS to GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 1	Is set for a short time to 0	ok
	Check that msg 5 is output with new ref. point		Ok
	Check that TXT sentence with ID 024 is output on PI	First ID 022 (external GNSS) is output, then ID 025 (internal GNSS), then ID 024 (internal DGNSS). The use of PA flag is according to this Retest 07.03.03: First ID 022 (external GNSS) is output, then ID 024 (internal DGNSS). It is recommended to remove the TXT ID 022 msg Retest 25.03.03: no change	rec
	Check that status display of MKD is updated according to TXT sentence		ok
d) Change from c: • External GNSS input • Remove msg 17 correction data for Internal GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that msg 5 is output with new ref. point		Ok

	Check that TXT sentence with ID 022 is output on PI	First ID 023 (internal beacon) is output Then after about 30s TXT ID 022 (and 027 for speed) is output. At that time PA is set to 0 Retest 07.03.03: First TXT ID 023 (internal DGNSS beacon) is output, then after about 30 s ID 025 (internal GNSS), then ID 022 (external GNSS) and ID 027 for speed. It is recommended to remove the TXT ID 023 and ID 025 msg Retest 25.03.03: no change	rec
	Check that status display of MKD is updated according to TXT sentence		ok
Differential Mode by Beacon input (if applicable)			
a3) • External DGNSS • Internal DGNSS by beacon input	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to sensor input data		Ok
c) Change from a3: • Internal DGNSS by beacon • Change external sensor mode to GNSS	Check that internal position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 023 is output on PI	First ID 022 (external GNSS) is output, then ID 025 (internal GNSS), then ID 023 (internal DGNSS – Beacon). The use of PA flag is according to this Retest 07.03.03: First ID 022 (external GNSS) is output, then ID 023(internal GNSS) and ID 028 for speed. It is recommended to remove the TXT ID 022 msg Retest 25.03.03: no change	rec
	Check that status display of MKD is updated according to TXT sentence		Ok
d) Change from c: • External GNSS input • Remove correction data for Internal GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 0		Ok

	Check that RAIM flag is set according to sensor input data		Ok
	Check that msg 5 is output with new ref. point		Ok
	Check that TXT sentence with ID 022 is output on PI	And ID 27 for speed Retest 07.03.03: First TXT ID 025 (internal GNSS) is output, then ID 022 (external GNSS) and ID 027 for speed. It is recommended to remove the TXT ID 025 msg Retest 25.03.03: no change	rec
	Check that status display of MKD is updated according to TXT sentence		Ok
Common branch			
e) Change from d: • Internal GNSS available • Remove external GNSS input	Check that internal position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is set according to documentation of internal GPS		Ok
	Check that msg 5 is output with new ref. point	Transmitted at the end of msg5 cycle Retest 19.12.02	Ok
	Check that ALR message with ID 025 (external EPFS lost) is output on PI	Send with msg5 after 6 min Retest 19.12.02	ok
	Check that TXT sentence with ID 025 is output on PI	Txt 7 found (UTC CLOCK LOST) EUT is using the external GNSS for UTC Retest 19.12.02	ok
	Check that an alarm according to ALR message is displayed on MKD	Nauticast indicates that handling of alarm output is not implemented Retest 19.12.02	Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
f) Change from e: • No external GNSS input • Disable internal GNSS	Check that default position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag is set according to documentation of internal GPS		Ok
	Check that ALR message with ID 026 (No sensor position) is output on PI		Ok

	Check that an alarm according to ALR message is displayed on MKD	Nauticast indicates that handling of alarm output is not implemented Retest 19.12.02	Ok
Status change time	Check that status is changed after 5 s		

Date	Result	Status
07.03.03	When the Positioning mode status (differential beacon, differential msg 17, autonomous) changes a msg 5 is output. This is not necessary and increases the channel load. Only if the position source is changed from extern to intern and revers a msg 5 should be transmitted to broadcast the new reference parameters.	rec

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.

15.11.02	**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	ROT input is not used. Default value is used in VDL Retest 19.12.02	Ok
	Check that alarm relay is inactive		Ok
	Check that no ALR output is active	$AIALR,141800,035,A,A,AIS: NO VALID ROT INFORMATION*72 is active Retest 19.12.02	ok
a) Disconnect heading and ROT • No heading • No ROT	Check that heading in VDL = default		Ok
	Check that ROT in VDL = default		Ok
	Check that ALR message with ID 032 (heading invalid) is output on PI		Ok

	Check that ALR message with ID 035 (ROT invalid) is output on PI		Ok
	Check that alarm relay is active		Ok
	Check that an alarm according to ID 032 is displayed on MKD		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		Ok
	Check that the alarm display on MKD is updated	Displayed as a new pop-up window with alarm revoked	Ok
	Check that the status display on MKD is updated (heading and ROT valid)	Displayed as a new pop-up window with alarm revoked	Ok
c) Change ROT talker • Valid heading • ROT, talker not TI	Check that ROT in VDL is + 127 for ROT > 10 °/min, turning right	Still the in ROT transmitted value Retest 24.02.03	Ok
	Check that ROT in VDL is + 127 for ROT < -10 °/min, turning left	See above Retest 24.02.03	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)	See above Retest 24.02.03	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)	Not found Retest 24.02.03	Ok
a) Disconnect ROT • Valid heading • No ROT Change heading > 5 °/30s	Check that ROT in VDL is + 127 for increasing heading	Still default value Retest 24.02.03	Ok
	Check that ROT in VDL is - 127 for decreasing heading	See above Retest 24.02.03	Ok

	Check that TXT message with ID 034 (other ROT in use) is output on PI	Not found Retest 24.02.03	 Ok
b) Reconnect ROT	Check that ROT in VDL ok		Ok
• Valid heading • Valid ROT from TI	Check that TXT message with ID 033 (ROT in use) is output on PI		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.

15.11.02	**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	Check that external SOG is used in VDL message 1,2,3		OK
• External Position • External speed	Check that external COG is used in VDL message 1,2,3		Ok
	Check that TXT message with ID 027 (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 027 is displayed on MKD	Not found Retest 19.12.02	 ok
b) Disconnect external position	Check that SOG from internal GPS is used in VDL message 1,2,3	SOG from external	
• No external Position • External speed		Retest 24.02.03	Ok

	Check that COG from internal GPS is used in VDL message 1,2,3	COG from external Retest 24.02.03	 Ok
	Check that TXT message with ID 028 (internal speed in use) is output on PI	Not found Retest 24.02.03	 Ok
	Check that alarm relay is inactive	Not implemented Retest 28.02.03	 Ok
	Check that the status according to TXT msg ID 028 is displayed on MKD	Not found Retest 28.02.03	 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		Ok
	Check that COG from internal GPS is used in VDL message 1,2,3		Ok
	Check that TXT message with ID 028 (internal speed in use) is output on PI		Ok
	Check that alarm relay is inactive		Ok
	Check that the status according to TXT msg ID 028 is displayed on MKD		OK

2.10 14.10 Display and control

(6.11)

2.10.1 14.10.1 Data input/output facilities

Method of measurement

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

a) Check size of minimum display

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

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

Required results

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

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

c) Confirm that all necessary data can be input.

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

15.11.02	**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	RANGE is displayed as DIST, BEARING is not found on main screen Retest 19.12.02	 Ok

15.11.02	**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 - required -	Check that received target is displayed		Ok
	MMSI	Recommended	Ok
	Position (RNG, BRG); Check values	Required Not found Retest 19.12.02 Problems with calculation of bearing for other values than 0,90,180 and 360° Retest 25.02.03	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	--
	PA (Position accuracy) flag	Not required	Ok
	SOG and COG	Recommended At main screen	Ok
	True heading	Recommended	Ok
	Navigational status	Recommended	Ok
	RAIM flag	Not required	--
MSG 5 Display of static and voyage related ship data - required -	MMSI	recommended	Ok
	IMO number	Not required	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	Ok
	Estimated time of arrival	Not required	Ok
	Maximum present static draught	Not required	Ok
	Destination	Not required	Ok
	DTE flag	Not required	Ok
MSG 4 Base station report - Recommended -	MMSI	Recommended	Ok
	Position (Lat,Lon)	recommended	Ok
	Position (RNG, BRG); Check values	recommended	Ok
	Time	Not required Time since last msg is displayed	ok
	PA flag	Not required	Ok
	RAIM flag	Not required	---

	Remark:	The standard target screen is used. Some unavailable information is not cleared (e.g. nav status)	Rec
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 Time since last msg is displayed	Ok
	PA flag	Not required	Ok
	SOG and COG	Recommended Information is provided Speed is indicated in 1/10 kn. Should be indicated in kn 23.05.03: Manufacturer confirmation: Speed is displayed in units of kn	ok
	RAIM flag	Not required	---
	DTE flag	Not required	ok
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 Time since last msg is displayed	Ok
	PA flag	Not required	Ok
	SOG and COG	Recommended	Ok
	True heading	Recommended	Ok
	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	Ok
	DTE flag	Not required	Ok
MSG 21 Aids to navigation report - recommended -	MMSI	Recommended Msg 17 is not displayed	rec
	Type of Aids to navigation	Recommended	
	Name of Aids to navigation	Recommended	
	Position (RNG, BRG); Check values	Recommended	
	Position (Lat,Lon)	Recommended	
	PA flag	Not required	

	RAIM flag	Not required	
		Recommended	
	Dimension/Reference for position	Length recommended	
	Type of EPFD	Not required	
	Off position indicator	Recommended	
	SOG, COG are not displayed or show default values		
Means to select messages	Check that means to select received messages are available		ok
Means to select data fields	Check that means to select data fields are available	Not required, on the target screen all data are displayed	ok

15.11.02	**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		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	Selection from list	Ok
Dimension/Reference for position	Check that data for internal GPS antenna position can be input		Ok
	Check that data for external EPFSD position can be input		Ok
Maximum static draught	Check that data can be input		Ok
Destination	Check that name of destination can be input		Ok
	Check that estimated time of arrival can be input		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.

15.11.02	**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		Ok
	Check if input of invalid characters (e.g. lower case letters) are inhibited		Ok
	Check display of transmission status (indication that message is transmitted)		Ok
Transmission of addressed safety related message	Check selection of TX channel		Ok
	Check data input		Ok
	Check input of MMSI		Ok
	Check if selection of MMSI from received message (e.g. position report) is possible		Ok
	Check display of transmission status (indication that message is transmitted and acknowledged)		Ok
Repetition	Check if repetition of transmission is possible without entering the data again.		Ok
Transmission of other messages	Check for a sample of msg 4, 16, 17, 18, 19, 20, 21, 22 that a transmission is not possible.		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.

03.03.03	Test details - Regional area entry		
Test item	**Check**	**Remark**	**Result**
Presentation of the existing areas	Check that the 8 existing areas can be selected and displayed		ok
	Check display of Channel A and B		Ok
	Check display of RX/TX mode		Ok
	Check display transmission power		Ok
	Check display of bandwidth		Ok
	Check display of NE point of area		Ok
	Check display of SW point of area		Ok
	Check display of transitional zone		Ok
Entry of a new area	Check selection between changing an existing area and creating a new regional area entry	A new area is entered by pressing a “new” button	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	Invalid channels are immediately changed to the defauld channels (2087,2088)	Ok
Enter too small area (<20 nm)	Check that entry is refused		Ok
Enter too large area (> 200 nm)	Check that entry is refused		ok
Enter a region according to M.1371-1 A2/4.1 figure 4.1.5A (4 adjacent areas)	Check that entry is refused	Entry is refused There is no indication that the area is not accepted	Ok rec
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	No change possible	ok
	Check change of RX/TX mode	No change possible	ok
	Check change transmission power	No change possible	ok

Date	Result	Status
03.03.03	If an entry of an area setting is invalid the complete area settings are deleted. There is no way to continue and change the invalid values. In case of invalid channels the channel is immediately (before save) changed to the default channel and can be changed again.	Rec ok

03.03.03		Test details - Alarms and status display		
ID	**Test item**	**Check**	**Remark**	**Result**
001	Tx malfunction	Check is done in 2.9.2.1		
002	Antenna VSWR exceeds limit	Check is done in 2.9.2.2		
003	Rx cannel 1 malfunction	Check documentation		Ok
004	Rx cannel 2 malfunction	Check documentation		Ok
005	Rx cannel 70 malfunction	Check documentation		Ok
006	General AIS failure	Check documentation	Not generated	Ok
008	MKD connection lost	Check is done in 2.9.2.5		
025	External EPFS lost	Check is done in 2.9.3.1		
029	No valid SOG information	Check is done in 2.9.3.3		
030	No valid COG information	Check is done in 2.9.3.3		
032	Heading lost/invalid	Check is done in 2.9.3.2		
035	No valid ROT information	Check is done in 2.9.3.2		

03.03.03	Test details - Status display			
ID	**Test item**	**Check**	**Remark**	**Result**
007	UTC clock lost			Ok
021	External DGNSS in use	Check is done in 2.9.3.1		Ok
022	External GNSS in use	Check is done in 2.9.3.1		Ok
023	Internal DGNSS in use (beacon)	Check is done in 2.9.3.1		Ok
024	Internal DGNSS in use (msg 17)	Check is done in 2.9.3.1		Ok
025	internal GNSS in use	Check is done in 2.9.3.1		Ok
027	External SOG/COG in use	Check is done in 2.9.3.3		Ok
028	Internal SOG/COG in use	Check is done in 2.9.3.3		Ok
031	Heading valid	Check is done in 2.9.3.2		Ok
033	Rate of Turn indicator in use	Check is done in 2.9.3.2		Ok
034	Other ROT source in use	Check is done in 2.9.3.2		Ok
036	Channel management parameters changed	Check that status change is displayed if channel management parameters are changed.	No display in the status field but is displayed in the region settings window.	acc

2.10.4 Ergonomic aspects

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

Topic	Description

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

19.11.02	**Test details - TDMA Syncronisation**		
Test item	**Check**	**Remark**	**Result**
Operate the EUT in an environment according to the test items and check the synchronisation state. Speed = 10 kn			
• Operate with GPS	Check that sync state is 0 (UTD direct)		Ok
	Check that report rate is 10 s		Ok

• Disconnect GPS • No other AIS available	Check that sync state is 3 (UTD direct)	Sync state remains at 0 (> 5 min). When externel position was removed it changed to 1, should be 3. MKD shows GPS N/A Note) The slot timing against UTC remains constant, no timing shift. How is this possible without GPS and without another GPS (No VDM on PI port)? 04.02.03 Retest: sync state is 3, when external position is disconnected 03.03.03 Retest: If an external position is available the EUT does not switch to sync state 3 Without external position it changes to sync state 3 after about 1 min 06.03.03 Retest: Changes sync state to 3 within about 30 s.	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 is 1	Ok
	Check that report rate is 10 s		ok
• GPS disabled • Remove other AIS	Check that sync state is 3 (no UTC source)	Sync state is 1, should be 3 04.02.03 Retest: ok, sync state is 3 after 4 min,	ok
• GPS disabled, • One base station with UTC direct within range	Check that sync state is 1 (UTC indirect)	Sync state is 1	Ok
	Check that report rate is 10 s		Ok
• GPS disabled • Remove Base station	Check that sync state is 3 (no UTC source)	Sync state is 1, should be 3 04.02.03 Retest: ok, sync state is 3	ok
• Start without GPS • No other AIS available	Check that sync state is 3 (no UTC source)	Sync state is 1, should be 3 04.02.03 Retest: ok, sync state is 3	ok
• Connect to GPS	Record on VDL analyser Check that the EUT continues transmission on the same physical slots	There is a Jump of +1, T start before sync to GPS = 13 ms, that is nearly at the middle of the slot. Therefore a jump of +1 is accepted	ok

	Check that the slot number in position report is correct		Ok

Date	Result	Status
19.11.02	Sync state without GPS is 1 instead of 3	
04.02.03	Sync state without GPS is now 3	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.

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

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

4.1.3 16.1.3 Synchronisation test without UTC

(M.1371 A1/3.1.1)

Method of measurement

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

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

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

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

Check CommState Parameter SyncState in position Report and reporting rate.

Required results

a) Transmitted Communication state shall fit the Synchronisation mod

b) Transmitted Communication state shall fit the Synchronisation mod

d) Synchronisation mode shall revert to UTC direct

20.11.02	**Test details - TDMA Syncronisation**		
Test item	**Check**	**Remark**	**Result**
Operate the EUT in an environment according to the test items and check the synchronisation state. Speed = 10 kn			
• Disable GPS, • One base station without GPS within range	Check that sync state is 2 (Base station indirect)		Ok
	Check that report rate is 10 s		Ok
• GPS disabled • Remove Base station	Check that sync state is 3 (no UTC source)	Sync state is switched back about 6min30s after end of msg 4. We recommend to have a shorter time-out of about 3 min. 04.02.03 Retest: time-out is now 4 min. Sync state is 1, should be 3 04.02.03 Retest: ok, sync state is 3	Ok 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	Reporting rate is 10 s Number of received stations of EUT and other transponder is 1 MMSI of EUT is > MMSI of other AIS	ok
• Enable GPS • Other Transponders all without GPS,	Check that sync state is 0		Ok
	Check that report rate is 10 s		Ok

4.2 16.2 Time division (Frame format)

(M.1371 A1/3.1.2)

Method of measurement

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

Required results

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

20.11.02	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	End mark is at 24 ms (after slot start)	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 .

20.11.02	**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	Values are 327 - 338	ok
UTC indirect	Check that T2 is in the range of 302 to 364	T2 is about 1600, drifting. It seems that EUT does not synchronize to the other transponder. After 15 min test still not synchronized 04.02.03 Retest: EUT synchronises to other AIS with UTC, sync state is 1 Sync jitter is in a range of 330 to 364	ok

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

20.11.02	**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 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

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.

20.11.02	**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

4.6 16.6 Slot allocation (Channel access protocols)

(M.1371 A1/3.3.1)

4.6.1 16.6.1 Network entry

Method of measurement

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

Required results

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

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

18.11.02	**Test details – Channel access protocol**		
Test item	**Check**	**Remark**	**Result**
Switch on EUT and record data with VDL analyser. Note the switch on time in UTC			
Transmission time	Check that first transmission of position report is within 2 min after switch on	About 1 min 10 s	Ok
Initial message type	Check that the network entry is done with msg 3		ok
Keep flag	Check that the keep flag is set in msg 3		ok
Slot offsets	Check that the slot offsets of msg 3 are in the range 375 +/- 75= 300 ... 450		Ok
Slot use	Check that the allocated slots are used in the next frame		Ok
Message type	Check that the message type is changed to 1 after initial frame		Ok
Timeout	Check that the time-out in the 2nd frame is between 2 and 6 (decremented from initial 3..7)	Time-out is between 3 and 7. See note) st frame a timeout of 3...7 is assigned to the slots and immediately decremente 04.02.03 Retest: Time-out between 4...6	ok

Note) In the first frame a time-out of 3...7 is assigned to the slots. In the next frame it is decremented before transmission so that a time-out value of 2...6 is indicated in the transmitted messages (see ITU-R M1371 3.3.5.2.2).

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.

18.11.02	Test details – Autonomous scheduled transmissions (SOTDMA)		
Test item	**Check**	**Remark**	**Result**
Record the VDL data of 8 frames operating with autonomously scheduled transmissions. Generate a table and diagram from that data and check the following test items using the recorded data. Set the condition so that the reporting rate is 10 s.			
Reporting rate	Check that the reporting rate is 10 s, 6 msg per frame		Ok
Nominal increment and selection interval	Check that the allocated slots match the nominal and selection interval of 10 s reporting rate		Ok
Slot interval	Check that the slot intervals are in the range 375 +/- 75 = 300 ... 450		Ok
Timeout	Check that the time-out is counting from 3...7 to 0		Ok
Slots used	Check that the slots indicated in CommState match the slots used		Ok
Slots allocated at time-out 0	Check that the slots are used in the next frame		Ok
	Check the slot offset is 2250 +/- Selection Interval (2175...2325)		Ok
CommState sub message	Check that for time-out 3,5,7 the number of received stations is indicated		Ok
	Check that for time-out 2,4,6 the slot number is indicated		Ok
	Check that for time-out 1 the correct value of UTC is indicated		Ok
	Check that for time-out 0 the slot increment is indicated		Ok
Alternating channels	Check that the position reports are transmitted on alternating channels		Ok
Msg 5	Check that the channel alternating of position report is not impaired by msg 5		Ok
Others	Check the recorded data for other possibly incorrect items	See line 30 of Excel table: After first time-out 0 of a slot the transmission of the next slot, slot 1960, is finished. Did not happen in a repetition of the test. 04.02.03 Retest: 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.

20.11.02	**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	Check that msg 8 is transmitted within 4 s	04.02.03	ok

20.11.02	**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: AIBBM_25.sst. Delay = 2 s			
Maximum transmissions per frame	Check that only 20 msg are transmitted in one frame. Msg 21 ... have to be rejected	All 30 msg per frame are transmitted 04.02.03 Retest: 20 msg per frame	ok
ABK output	Check that ABK sentence is output with acknowledgement type = 2 for the rejected sentences.		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.

16.01.03	**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

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).

19.11.02	**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 time-out time repeat the message 16 Record VDL messages and evaluate record			
VDM output	Check VDM output of msg 16		ok
First message	Check that first message is sent after 40 slots	Message 16 with rate assignment is ignored 15.01.03 Retest: Assignment is working now, the following results are of the 15.01.03. First message 2 is transmitted 40 slots after msg 16	ok
Message type	Check that message type of position report is 2		Ok
Initialisation phase	Check that EUT starts immediately (after offset slots) with message 2		ok
Deallocation of previously used slots	Check that the slot used before assignment are deallocated using timeout value = 0 and slot offset = 0		ok
Alternating channels	Check that position report is sent alternating on channel A and B		Ok
Increment	Check that the increment is 125 slots		Ok
Timeout	Check that all slots of the first msg2 frame have the same timeout		Ok
	Check that the timeout is between 3 and 7	Timeout is 5	ok
	Check that the timeout is decremented after 1 min		Ok
Comstate	Check that the ComState is like the ComState of msg 1		Ok
Switch back to autonomous mode	Check that the deallocates all msg 2 slots with timeout 0		ok

	Check that the EUT changes slots with timeout 0 on each channel to ITDMA slot msg 3 to start autonomous mode	At switch back from assigned mode to autonomous mode the time-out of the kept slots is changed from 1 to a random number. It should be decremented to 0 with a slot offset to allocate a new slot in the associated SI. It is not required to use msg 3 for the slot allocation 05.02.03 Retest: There is now a frame with time-out 0 and allocation of new slots	ok
	Check that EUT initialises autonomous mode like network entry	Not required in this case, is done by slot allocation in msg 2 with timeout 0	ok
05.02.03 Retest: Time-out values SlotAssignment_2.xls	There are some anomalous time-out values, mainly with the value 0: Line 61, slot 2049, time-out = 0 Line 100, slot 174, time-out = 0 Line 104, slot 549, time-out = 0 Line 107, slot 924, time-out = 6 Line 119, slot 174, time-out = 6 26.02.03 Retest: all time-out values ok		ok

19.11.02	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	Message 16 with rate assignment is ignored 15.01.03 Retest: Assignment is working now, the following results are of the 15.01.03	ok
Message type	Check that message type of position report is 2 instead of msg 1		Ok
Reporting rate	Check that the reporting is 300 msg/10 min = 30msg/frame = 2 s		Ok
Alternating channels	Check that position report is sent alternating on channel A and B		Ok
Initialisation	Check that the Initialisation is according to changing reporting rate using msg 3 to allocate new slots		Ok
Timeout	Check that the assigned timeout is between 2 and 6	Timeout is 4 for all slots	Ok
Assignment repetition	Check that the timeout is extended by repetition of msg 16: Switch back is between 3 and 7 minutes after last repetition		ok
Switch back to autonomous mode	Check that the EUT reverts to normal reporting rate between 4 and 8 minutes after last msg 16		ok
Switch back	At switch back from assigned mode to autonomous mode the time-out of the kept slots is changed from 1 to a random number. It should be decremented to 0 with a slot offset to allocate a new slot in the associated SI 05.02.03 Retest: There is now a frame with time-out 0 and allocation of new slots		ok
Missing messages RateAssignment_2.xls RateAssignment_6.xls	In 4 succeeding frames the same message (in the same slot) is missing. This seems not to be a random missing of a message be signal distortion and should be checked. 05.02.03 Retest: In the first test there was the same effect, in 2 further tests not. Should be checked! 26.02.03 Retest: ok		ok

05.02.03 Retest: Stop of TX Rate_Assignment_4.xls	In 1 test (rate_assignment_4.xls) there were some strange effects: • The time-out after the first assignment frame (with msg 3) was 0. It should be in the range of 2...6 • The sync mode during the secont assigned mode frame was 1, but there was no reason for UTC not ok, also no alarm or TXT output indication UTC not ok, and there was no other station with UTC on the channel 86 used for this test which is necessary for sync state 1 (UTC indirect) • After the second assignement frame (with time-out 0) the EUT stopped TX for 7 minutes. Msg 5 was transmitted during this frame correctly at the appropriate time. • After the TX off time it started with a network entry using msg 3, but with 2 msg type 2 after the first 4 msg type 3. 26.02.03 Retest: ok		ok
05.02.03 Retest: Test in rateAssignment_3.xls	In line 226 there is a slot allocated which is never used. Instead of this slot a new slot is allocated with a msg 3 in line 247 26.02.03 Retest: No such problem		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.

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

4.6.4.4 16.6.4.4 Slot assignment to FATDMA reserved slots

(M.1371 A1/3.3.6)

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

Method of measurement

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

Required results

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

16.01.03	**Test details – Slot assignment to FATDMA reserved slots**		
Test item	**Check**	**Remark**	**Result**
Send a message 20 from VDL Generator with slot offset and increment for slot reservation: Offset = 22, slots = 7, time-out = 7, incr. = 25 Send a message 16 from VDL Generator assigning one or more of these reserved slots Offset = 25, incr. = 5 (= 75 slots)			
Rx of msg 20	Check that msg 20 has been received by EUT (VDM output)		ok
Slot use	Check that slots assigned by the msg 16 are used by the EUT		Ok

4.6.5 16.6.5 Fixed allocated transmissions (FATDMA)

(M.1371 A1/3.3.6)

Method of measurement

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

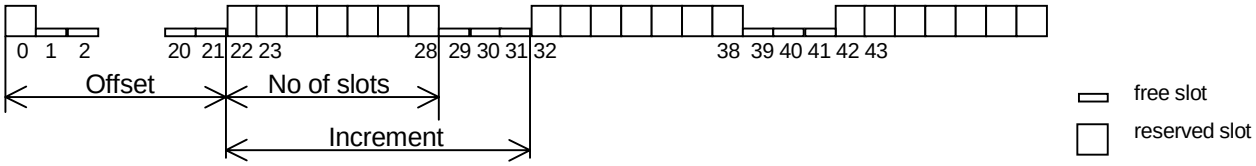
Required results

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

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: 3
- Number of slots: 7
- Increment: 10

FATDMA reservation



20.11.02	**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. To get enough new slot allocations within time-out time set reporting rate to 2 s (speed > 25 kn)			
Record VDL messages	Check that the reserved slots are not used by the EUT within a time-out of 4-8 minutes	- slots xx8, xx9 and xx0 are used, should be xx9, xx0, xx1 (see schematics below) 05.02.03 Retest: Slots xx9, xx0 and xx1 are used, ok - Slot selection handling is wrong. 05.02.03 Retest: There seems to be no change, similar incorrect slot handling. - Slots seem to be reserved on channel A and B, not only on channel A See note 2) 26.02.03 Retest: Slot handling is ok now	Ok ok
End of reservation	Check that after end of reservation all slots are used again.		ok

Note 2)
According to ITU-R M1371 §3.2.1 (candidate slots) and §4.4.1 (Slot reuse) the use of the slot on the other channel should be considered at the selection of candidate slots. Regarding this test the slots reserved by the base station on the other channel have a much lower priority than the slots free on both channels.
In this test there are at minimum 3 unreserved slots in each selection interval. Therefore I expected that at minumum 75 % of the selected slots are unreserved on the other channel. In the test in only 4 of 21 selections free slots (without reservation on the other channel) have been selected.

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.

21.11.02	**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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Navigational status	Check the field content		Ok
Rate of Turn	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True heading	Check the field content		Ok
Time stamp	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state	Check the field content		
	The communication state is checked in 4.6.2 (Autonomous scheduled transmissions (SOTDMA)		

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state	Check the field content		
	The communication state is checked in 4.6.2 (Autonomous scheduled transmissions (SOTDMA)		

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1,2		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok
Message ID	Check the field content		Ok
MMSI	Check the field content		Ok
AIS version indicator	Check the field content		Ok
IMO number	Check the field content		Ok
Call sign	Check the field content		Ok
Name of ship	Check the field content		Ok
Type of ship and cargo type	Check the field content		Ok
Reference point A,B,C,D	Check the field content		Ok
Type of EPFS	Check the field content		Ok
ETA	Check the field content		Ok
Maximum present static draught	Check the field content		Ok

Destination	Check the field content		Ok
DTE flag	Check the field content		Ok

21.11.02	**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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 112 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content	In a test with 24 bit of binary data (DAC=1, FI=0) only 20 bit are evaluated and output on PI, the last 4 bit are ignored 06.02.03 Retest: no change, data see note): 26.02.03 Retest: ok	ok

Note): Transmitted data: 07i@E=@,2
Binary: 000000 000111 110001 010000 010101 001101 0100,00
Received data: 07i@E=,0
Binary: 000000 000111 110001 010000 010101 001101
The first 16 bit are DAC=001 and FI=60
The other 24 bits are displayed in 6-bit ASCII (Table 14 of 1371): “TEST” as displayed by the AIS monitor program

21.11.02	**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.			

Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Sequence number 2	Check the field content		Ok
Destination ID 3 (MMSI)	Check the field content		Ok
Sequence number 3	Check the field content		Ok
Destination ID 4 (MMSI)	Check the field content		Ok
Sequence number 4	Check the field content		Ok

21.11.02	**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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 4 (msg length = 80 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content	In a test with 24 bit of binary data (DAC=1, FI=0) only 20 bit are evaluated and output on PI, the last 4 bit are ignored 06.02.03 Retest: no change, data see note=: 28.02.03 Retest: ok	ok

Note): Transmitted data: ...0O51Dm0,4
Binary: 00 000000 011111 000101 000001 010100 110101 00,0000
Received data: ...0O51Dm,0

Binary: 00 000000 011111 000101 000001 010100 110101
The first 16 bit are DAC=001 and FI=60
The other 24 bits are displayed in 6-bit ASCII (Table 14 of 1371): “TEST” as displayed by the AIS monitor program

21.11.02	**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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Altitude			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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Msg11 response	Check for response with msg 11 if EUT is addressed	No response 06.02.03 Retest: ok	Ok
Msg11 response	No response if addressed to other station		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Type of EPFD	Check the field content		Ok
RAIM flag	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 138 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
Safety related text	Check the field content		Ok
Transmit a message 12 from other AIS transponder or VDL generator addressed to other AIS. Message shall not be on PI.			
Msg12 to other AIS	Check PI , no VDM		ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Sequence number 2	Check the field content		Ok
Destination ID 3 (MMSI)	Check the field content		Ok
Sequence number 3	Check the field content		Ok
Destination ID 4 (MMSI)	Check the field content		Ok
Sequence number 4	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (length = 144 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check the field content		Ok

21.11.02	Test details – Content of msg 15 Interrogation		
Test item	**Check**	**Remark**	**Result**
Transmit a message 15 from other AIS transponder or VDL generator . Response on this msg is tested under 6.2 18.2 (M.1371 A1/5.3) Interrogation responses			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Message ID 1.1	Check the field content		Ok
Slot offset 1.1	Check the field content		Ok
Message ID 1.2	Check the field content		Ok
Slot offset 1.2	Check the field content		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Message ID 2.1	Check the field content		Ok
Slot offset 2.1	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 96 bit (1 dest.)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID A (MMSI)	Check the field content		Ok
Offset A	Check the field content		Ok
Increment A	Check the field content		Ok
Destination ID B (MMSI)	Check the field content		Ok
Offset B	Check the field content		Ok
Increment B	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 192 bit)		Ok
Message id	Check the field content	No VDM output 06.02.03 Retest: VDM output	Ok
Skource ID (MMSI)	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
Message type	Check the field content		Ok
StationId	Check the field content		Ok
Zcount	Check the field content		Ok
Sequence number	Check the field content		Ok
N	Check the field content		Ok
Health	Check the field content		Ok
Correction data	Clheck the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True Heading	Check the field content		Ok
Time stamp	Check the field content		Ok
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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True Heading	Check the field content		Ok
Time stamp	Check the field content		Ok
Name of ship	Check the field content		Ok
Type of ship and 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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 160 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Offset number 1	Check the field content		Ok
Number of slots 1	Check the field content		Ok
Time-out 1	Check the field content		Ok
Increment 1	Check the field content		Ok
Offset number 2	Check the field content		Ok
Number of slots 2	Check the field content		Ok
Time-out 2	Check the field content		Ok
Increment 2	Check the field content		Ok
Offset number 3	Check the field content		Ok
Number of slots 3	Check the field content		Ok
Time-out 3	Check the field content		Ok
Increment 3	Check the field content		Ok
Offset number 4	Check the field content	Messages with 4 entries are not received 06.02.03 Retest: no change 13.02.03 Retest: Test with correct message length (no spare bits at the end) is ok	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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content	The message 21 is not received correctly. The encapsulation data field in the VDM message is empty: !AIVDM,1,1,,A,,0*26 06.02.03 Retest: ok	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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Channel A	Check the field content		Ok
Channel B	Check the field content		Ok
Tx/Rx mode	Check the field content		Ok
Power flag	Check the field content		Ok
Area addressed			
Longitude of NE corner	Check the field content		Ok
Latitude of NE corner	Check the field content		Ok
Longitude of SW corner	Check the field content		Ok
Latitude of SW corner	Check the field content		Ok
Addressed or broadcast flag	Check that flag = 0		Ok
Selective addressed			
Station ID 1 (MMSI)	Check the field content	MMSI addressed msg 22 was not received 06.02.03 Retest: msg 22 is received	Ok
Station ID 2 (MMSI)	Check the field content		Ok
Addressed or broadcast flag	Check that flag = 1		Ok
Channel A bandwidth	Check the field content		Ok
Channel B bandwidth	Check the field content		Ok
Transitional zone	Check the field content		Ok

Message content result overview

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

Message type	PI out Yes/no	PI output Result	Response required (in addition to PI output)	Response result
Msg1,2,3	Yes	Ok	No	
Msg 4	Yes	Ok	No	
Msg 5	Yes	Ok	No	
Msg 6	Yes	ok	Tx of ackn. msg 7	(6.1.2)
Msg 7	Yes	Ok	ABK output, no further repetitions	(2.1.4.1)
Msg 8	Yes	ok	No	
Msg 9	Yes	Ok	No	
Msg 10	Yes	Ok	Tx of msg 11 UTC/date response	ok
Msg 11	Yes	Ok	No	
Msg 12	Yes	Ok	Tx of ackn. msg 13, Display on MKD	(6.1.4)
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	(6.2)
Msg 16	Yes	Ok	Change of TDMA mode, position report using msg 2	(4.6.4)
Msg 17	Yes	Ok	Internal GNSS receiver shall switch to differential mode	ok
Msg 18	Yes	Ok	No	
Msg 19	Yes	Ok	No	
Msg 20	Yes	Ok	Has to avoid using reserved slots	4.6.5
Msg 21	Yes	OK	no	
Msg 22	Yes	Ok	Addition of new area to the regional area table	5.2

4.7.2 16.7.2 Transmitted messages

(M.1371 A1/3.3.7)

Method of measurement

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

Record transmitted messages.

Required results

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

The message contents are checked using the VDL analyser

21.11.02	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			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
	Check that the channel field is empty (NULL) if not TX		Ok
Fill bits	Check that value = 0		Ok

21.11.02	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.			
Number of sentences	Check that value = 2		Ok
Check sentence number	Check that value = 1,2		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 112 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content	Checked on PI output of other AIS transponder	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		
	No PI output of transmitted msg 7 06.02.03 Retest: PI output ok		ok

21.11.02	Test details – Content of msg 8 Binary broadcast message		
Test item	**Check**	**Remark**	**Result**
This test can be done in combination with 6.3 18.3 Broadcast messages Apply PI sentence: File AIBBM_bin.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 4 (msg length = 80 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
DAC	Check the field content		Ok
FI	Check the field content		Ok
Binary data	Check the field content		Ok

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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content	Not transmitted if requested by msg 10 06.02.03_Retest: Tx of response	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

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 96bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Sequence number	Check the field content		Ok
Destination ID (MMSI)	Check the field content		Ok
Retransmit flag	Check the field content		Ok
Safety related text	Check the field content		Ok

21.11.02	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.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Sequence number 1	Check the field content		Ok
Destination ID 2 (MMSI)	Ommitted		
Sequence number 2	Ommitted		
Destination ID 3 (MMSI)	Ommitted		
Sequence number 3	Ommitted		
Destination ID 4 (MMSI)	Ommitted		
Sequence number 4	Ommitted		

21.11.02	Test details – Content of msg 14 Safety related broadcast message		
Test item	**Check**	**Remark**	**Result**
This test can be done in combination with 6.3 18.3 Broadcast messages Apply PI sentence: File AIBBM_safety..sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (length = 64 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Safety related text	Check the field content		Ok

21.11.02	Test details – Content of msg 15 Interrogation		
Test item	**Check**	**Remark**	**Result**
This test can be done in combination with 6.2 18.2 (M.1371 A1/5.3) Interrogation responses Apply PI sentence: File AIAIR_35_5.sst Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 160 bit)		Ok
Message ID	Check the field content		Ok
Source ID (MMSI)	Check the field content		Ok
Destination ID 1 (MMSI)	Check the field content		Ok
Message ID 1.1	Check the field content		Ok
Slot offset 1.1	Check the field content = 0		Ok
Message ID 1.2	Check the field content		Ok
Slot offset 1.2	Check the field content = 0		Ok
Destination ID 2 (MMSI)	Check the field content		Ok
Message ID 2.1	Check the field content		Ok
Slot offset 2.1	Check the field content = 0		Ok
Note:	EUT did not transmit any message initiated by AIR or BBM sentence. After restart ok 06.02.03: This problem has not been observed in the latest software versions		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.

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

5.2 17.2 Regional area designation by VDL message

(M.1371 A1/4.1))

Method of measurement

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

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

Required results

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

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

21.11.02	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	There is also an ACA output. Remark: There is 1 ACA output for each received message (without time and in use flag), and 1 ACA output with time and flag. 06.02.03 Retest: The time of "In use" change is not included in the sentence We recommend to output 1 sentence only (including in use flag and time of "in use" flag change) 03.03.03 Retest: no change 06.03.03 Retest: ACA output provides the "in use" flag It does not provide a time of last change of "in use" flag We recommend to include in all cases the time of last change, in the case the time when the area is stored The ACA sentences are without checksum 14.01.02 retest: no change 06.02.03 Retest: ACA sentences are output with checksum	Rec Ok Rec ok
MKD display defined area	Check that the defined area is correctly displayed 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 ACA output	No ACA output This is acceptable because an ACA is output at the border of the area, not the transitional zone.	acc

Check that EUT keeps old channels for 1 min. timing out the transmissions of AIS2	The messages on the old channel are not released by time-out 0 reports. The transmission stops immediately. So the unused slots can not be used by other station. 14.01.03 Retest: The slots are timed out now, but on the wrong channel. The transmitter is immediately switched to the new channel. The old slots are released on the new channel, but they have to be released on the old channel where they were allocated 06.02.03 Retest: Slots are now released on the old channels	ok
Check that channel AIS 1 and A2 are used for Tx	Only channel AIS1 is used for TX 14.01.03 Retest: It is different from test to test which channel is used for the B channel. In 2 tests it was AIS1, the same as for the A channel, in a 3rd test it was the correct channel A2 06.02.03 Retest: no change 27.02.03 Retest: Channels AIS1 and A2 are in use Remark: in outer TZ:: A=AIS1, B=A2, in inner TZ: A=A2, B=AIS1	Ok Ok
Check that channel AIS 1 and A2 are used for Rx	Only channel AIS1 is used for RX Same usage as for TX 06.02.03 Retest: no change 27.02.03 Retest: Channels AIS1 and A2 are in use	ok
Check that reporting rate is doubled	Reporting rate is doubled, but all transmissions on channel A. It seems that both channels are set to the same frequency	Ok

	Check the limits of the TZ	It seems that the limits of the TZ are used assuming 1min=1nm. This is not correct for the longitude. 06.02.03 Retest: ok Remark: The outer TZ size is the default TZ size of 5 nm.	ok ok
Item 3: Move position into region 2	Check ACA output	ACA is output at the border of the area itself	Ok
	Check that EUT keeps transtional channels for 1 min. timing out the transmissions of AIS 1	Following tests are from 16.01.03	ok
	Check that channel A2 and B2 are used for Tx	The msg transmitted on the A channel are output on PI as received on channel B, Tx on channel B are output with A. 06.02.03 Retest: The channels in PI output are ok now 06.02.03 Retest: The channels AIS1 and B2 are used (on VDL and displayed on MKD (VHF status)) In a second test ok! 27.02.03 Retest: Channels A2 and B2 are in use	Ok ok
	Check that channel A2 and B2 are used for Rx	The msg received on the A channel are output on PI as received on channel B, Tx on channel B are output with A. 06.02.03 Retest: The channels in PI output are ok now 06.02.03 Retest: The channels AIS1 and B2 are used (on VDL and displayed on MKD (VHF status)) In a second test ok! 27.02.03 Retest: Channels A2 and B2 are in use	Ok 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	Remark:	At a lon of 11°05 no change, at al lon of 11°04 the EUT outputs ACA output indicating that Area 2 and high sea area are in use at the same time. Then EUT stopped operation and seemed to restart in a loop. EUT outputs only ALR sentences at PI. A switch off and on at the same position does not solve the problem. Log of PI is provided (log time 10:50) In a repetition of the test changing the position directly from 11°10 to 11°02 this problem did not happen 06.02.03 Retest: The limits are corrected from 11°05 to 11°07 Therefore the nearly the same problem happens now at 11°07. The EUT does not restart now but uses the channels A2 and AIS 1 (like in a TZ between area 2 and High sea. 27.02.03 Retest: no change 07.03.03 Retest: ok, at 11°07 the EUT is in transitional zone between the 2 areas and used the channels A1 and A2	ok
	Check that channels A2 and A1 are used	If lat is changed directly from 11° 08 to 11°06 it is ok	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	AIS1 and AIS2 are in use. VDO output is reverse (A for channel B and B for channel A frequency 06.02.03 Retest: channels in VDO output are correct	Ok ok

	Check that reporting rate is changed back to normal reporting rate		ok
ACA sentence	Time of “in use” change	At a request by Q,ACA the time in the ACA sentence is the actual time, not the time of the last change of the “in use” flag 06.02.03 Retest: time is correct now	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.

16.01.03	**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		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	Channels A2 and B2 are used. Remark: VDM/VDO output uses reverse channels 06.02.03 Retest: channels in VDO output are correct	Ok 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	Remark: in this area the channel in the VDO output is not reverse	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

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.

27.02.03	Test details – Power setting by ACA		
Test item	**Check**	**Remark**	**Result**
Apply the following message at PI: File name = AIACA_region_in_86.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	Remains on high power (measured at antenna output and displayed in VHF status) 28.02.03 Retest: Power level is set to low power	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	28.02.03 Retest: Power level is set to hig power	ok

27.02.03	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	Remains on high power (measured at antenna output and displayed in VHF status) 28.02.03 Retest: Power level is set to low power	ok
Set power level back to high power.			
Power high	Check that EUT reverts to high power	28.02.03 Retest: Power level is set to high power	ok

16.01.03	Test details – Power setting by msg 22		
Test item	**Check**	**Remark**	**Result**
The EUT has to be in an area with regional operating settings and the channels as used in the following msg 22. Transmit a msg 22 from VDL generator like the following: 22,0,2345,0,2086,1086,0,**1**,[MMSI(MSB)],[MMSI(LSB)],1,0,0,,0			
Channel switch	Check that the EUT doesn't switch channels	It seems that the EUT performs a complete new network entry. It seems that there is also a complete restart of the EUT but this is not sure. The transmission on channel B is completely stopped. The EUT is transmitting only on channel A. VDO outputs without transmission are all of msg type 3. When the power level is changed in a msg 22, nothing should be changed except the power level of the transmitter 06.02.03 Retest: no change 27.02.03 Retest: There is no change in transmission schedule but power level is also not changed. Has to be rechecked when power level is correct. 28.02.03 Retest: ok in test with correct change of power level	Ok
Power low	Check that the transmitting power is changed from high to low	27.02.03 Retest: Power level is also not changed. 28.02.03 Retest: Power level is set to low power	ok
MKD	Check the low power settings are displayed on MKD		Ok
Transmitt the same message 22, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power	Same problem as above, MKD is set to high power but output power remains at low level. 28.02.03 Retest: Power level is set to high power	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).

16.01.03	**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	Without channel load msg 12 is transmitted first. With 90 % channel load the EUT breaks operation for some time. But msg 12 is also in this case 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.

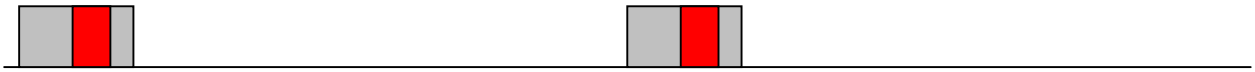
Required results

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



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

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

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

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

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

05.02.03	**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		Ok
	Check that a the slot of a target is not used twice in a frame	In one case 27.02.03 Retest: In no case the slots of the same target are reused	ok
Reserved Slot	Check that slots reserved by msg 20 are not used	The test of use of reserved slots is done in 16.6.5 Fixed allocated transmissions (FATDMA)	

Date	Result	Status
16.01.03	During this test in some cases (5 of 14 timeout0) in 2 consecutive frames a time-out of 0 was used. In a frame after a frame with time-out 0 a new time-out in the range of 3..7 has to be selected, but not 0	
05.02.03	Retest: no change (7 of 29 timeout 0)	
27.02.03	Retest: no repetition of time-out 0 found	ok

5.7 17.7 Management of received regional operating settings

(7.4.1)

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

(7.4.1)

Method of measurement

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

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

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

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

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

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

Required results

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

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

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

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

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

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

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

06.02.03	**Test details – Test of replacement or erasure of dated or remote regional operating settings**		
Test item	**Check**	**Remark**	**Result**
The following check of area entries can be done by MKD or by request of ACA			
Send by ACA • 1 area including own position • 7 areas not overlapping, not including own position File name: AIACA_8_regions_17_7_1.sst	Check that area 1...7 are displayed on MKD		Ok
	Check that all 8 areas are output on PI after request by sentence xxAIQ,ACA		Ok
a) Send a 9. msg 22 to the EUT	Check that the first area is deleted		Ok
	Check that the EUT returns to the default operating settings		Ok
b) step 1: Set own position to one of the 7 areas	Check that the EUT changes its operating settings according to that region		ok
b) step 2: Send an area overlapping the area of step 1 not including own position	Check the overlapped area is deleted and replaced by the new one		Ok
	Check that the EUT reverts to the default operating settings		Ok
d) Erasure by distance: Move own position of EUT to a distance of more than 500 miles from all regions defined by previous commands	Check that all areas are deleted		Ok

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.

06.02.03	**Test details – Correct input via Presentation Interface or MKD**		
Test item	**Check**	**Remark**	**Result**
Send msg 22 with same settings as in 17.2 Channel management, set position of own ship into this area			
a) Use of settings	Confirm that the EUT uses the regional operating settings commanded by msg 22		Ok
b) MKD input Entering new area by MKD	Step 1: Confirm that the regional operating settings of the previous msg 22 is displayed to the user on the MKD for editing.	Area can be selected from the list of stored areas. It is indicated which area is in use	ok
	Step 2: Check, that the EUT allows the user to edit the displayed regional operating settings.	A new area is stored and the old area is deleted, even if e.g. only the TZ size is changed	Acc
	Check, that the EUT does not accept incomplete or invalid regional operating settings.	Invalid channels are immediately changed to the defauld channels (2087, 2088)	ok

	Check, that the EUT accepts a complete and valid new 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
Move position inside the new area	Step 4: Check, that the EUT uses the regional operating settings input via the MKD.		Ok
c) New area by ACA Input a new area via PI (ACA sentence) overlapping area of b), position inside	Check, that the EUT uses the regional operating settings received via PI		Ok
d) Default settings via MKD Input the default operating settings via the MKD for the regional operating area of c)	Check, that the EUT accepts the default operating settings for the regional operating area	The area with the default operating settings is not deleted	Ok
	Check, that the EUT uses the default operating settings		Ok
e) Area setting by VDL Send message 22 with a different regional operating setting to the EUT with a regional operating area, which contains current position of own station	Check, that the EUT uses the regional operating settings commanded to it by message 22		Ok
f) Priority of VDL msg Rejection of a shipborne (ACA) regional operating setting when overlapping a setting from base station not older than 2 hours (Clarifications to 1371, 2.54 paragraph 4	Check, that the EUT does not accept the regional operating setting commanded to it via the Presentation Interface.	ACA input is not accepted Manual change is not accepted. On the display it is displayed "Data saved". It should be displayed that data are not saved! 27.02.03 Retest: It is not displayed "Data saved". There is a very short display which may be "invalid"	Ok 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.

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

5.7.4 17.7.4 Test for invalid regional operating areas (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.

06.02.03	**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

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**
	No self-Certification required	

5.8 17.8 Continuation of autonomous mode reporting rate

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

Method of test

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

Required result

Ensure that the autonomous reporting rate is maintained.

17.01.03	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		Ok
Slot assignment command in a transitional zone	Check that an slot assignment command is ignored in a transitional zone		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.

15.11.02	**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		Ok
Channel = 1 (A)	Check Tx on channel A		OK
Channel = 2 (ch. B)	Check Tx on channel B		Ok
Channel = 3 (ch. A+B)	Check Tx on channel A+B		Ok

15.11.02	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		Ok
Channel = 1 (ch. A)	Check Tx on channel A		Ok
Channel = 2 (ch. B)	Check Tx on channel B		Ok
Channel = 3 (ch. A+B)	Check Tx on channel A+B		Ok

15.11.02	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 alternating on channel A and B as indicated int the ABM sentences. PI sentence: File AIABM_4_bin.sst: A response is automatically transmitted by the addressed transponder ID 5002			
VDO output of EUT	Check that the 4 messages are transmitted directly without waiting for ackn.		Ok
Channel	Check Tx on channel A and B as indicated in the ABM sentence		Ok
Message sequence number	Check that sequence number in VDL msg = Sequential message identifier of ABM sentences		Ok
RX of request	Check that message is received by addressed transponder (VDM)		Ok
Received by VDL Analyser	Check msg on VDL analyser		Ok
TX of ackn. msg 7 (VDO)	Check that ackn msg 7 is transmitted by addressed transponder (VDO)		Ok
RX of msg 7 (VDM)	Check that the ackn. msg 7 is received by EUT (VDM)		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements		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).

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15.11.02	**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	Not found at PI Retest 19.12.02	 Ok
Sequence numbers	Check that sequence number in ackn = sequence number of Rx message		Ok
Ackn. channel	Check that ackn Tx channel = Rx channel		Ok
RX of ackn. msg 7	Check that the ackn. msg are received by Transmitter (VDM/ABK)		Ok

6.1.3 18.1.3 Transmission Retry

(M.1371 A1/5.3.1)

Method of measurement

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

Required results

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

Basic test of addressed message is made in **2.1.4.1** **"**14.1.4.1 Transmit an addressed message**"**

15.11.02	**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	3 repetitions	Ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s		Ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	$AIABK,000001005,,6,2,1 AIS channel missing Retest 19.12.02 $AIABK,000006001,A,6,2,1	 ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

15.11.02	**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	3 repetitions	Ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s		Ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	$AIABK,000001005,,12,2,1 AIS channel missing Retest 19.12.02 $AIABK,000001005,A,12,2,1	 ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

6.1.4 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).

15.11.02	**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

6.2 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.

03.03.03	**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

03.03.03	**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

03.03.03	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	Slot offset = 100	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	Slot offset = 199, should be 200 06.03.03 Retest: Slot offset = 200	ok

03.03.03	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	Slot offset = 199, should be 200 06.03.03 Retest: Slot offset = 200	ok

03.03.03	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	Slot offset = 299, should be 300 06.03.03 Retest: Slot offset = 300	ok

Date	Result	Status
03.03.03 06.03.03	The first slot offset is ok, but the 2. and 3. offset is offset of msg 15 – 1 Retest: Slot offset is ok	 ok

6.3 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).

15.11.02	**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_5_bin.sst: !AIBBM,1,1,[7;8;9;0;1],0,8,06P0test1,0 AIS channel for broadcast is 0: autoselect The file contains 5 BBM sentences with consecutive sequential message identifiers.			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx alternating channels A and B		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,8,8,3*5F $AIABK,,,8,7,3*50 $AIABK,,,8,9,3*5E $AIABK,,,8,1,3*56 $AIABK,,,8,0,3*57 AIS channel missing <u>Retest 19.12.02</u> $AIABK,,A,8,8,3*1E $AIABK,,B,8,7,3*12 $AIABK,,B,8,1,3*14 $AIABK,,A,8,9,3*1F $AIABK,,A,8,0,3*16	Ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
MMSI	Check Transmitter MMSI		Ok

15.11.02	**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_5_safety.sst: !AIBBM,1,1,[6;7;8;9;0],0,8,D5CDi,0 AIS channel for broadcast is 0: autoselect The file contains 5 BBM sentences with consecutive sequential message identifiers.			
VDO output of EUT	Check the VDO output on PI		Ok
Channel	Check Tx alternating channels A and B		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,,,14,7,3*6D $AIABK,,,14,6,3*6C $AIABK,,,14,9,3*63 $AIABK,,,14,8,3*62 $AIABK,,,14,0,3*6A AIS channel missing Retest 19.12.02 $AIABK,,A,14,6,3*2D $AIABK,,B,14,7,3*2F $AIABK,,B,14,9,3*21 $AIABK,,A,14,8,3*23 $AIABK,,A,14,0,3*2B	Ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
MMSI	Check Transmitter MMSI		Ok

7 19 Specific Presentation Interface Tests

(7.6)

7.1 19.1 General

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

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

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

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

15.11.02	**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

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*

10.03.03	Test details - Check of manufacturers documentation		
Test item	**Check**	**Remark**	**Result**
Approved sentences	Check approved sentences against IEC 61162		Ok
Proprietary sentences	Check proprietary sentences against IEC 61162		ok
Usage of Fields	Check usage of fields		Ok
Transmission intervals	Check transmission intervals	Checked in functional test	
Hardware configuration	Check hardware configuration	Not relevant	
Output drive capability	Check output drive capability	No information provided in customer documentation Retest 06.05.03: output drive capabilty is ok (max current is 50 mA)	ok
Input load	Check input load	No information provided in customer documentation Retest 06.05.03: input load is ok (30 kOhm)	ok
Electrical Isolation	Check electrical isolation		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.

07.03.03	Test details - Electrical test of inputs		
Test item	**Check**	**Remark**	**Result**
Minimum voltage	Check that input works with minimum input voltage	All input checked with 0.3 V input signal	ok
Maximum voltage	Check that input is not damaged by maximum input voltage	0.45 mA at 15 V, no damage	Ok
Input current	Check the input current against the IEC 61162-1 or IEC 61162-2 Without termination: < 3.25 mA at 10 V With optional termination: > 100 Ohm	0.15 mA at 5 V = 33 kOhm	ok

7.4 19.4 Test of input sensor interface performance

(7.6.2)

Method of measurement

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

Required results

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

28.11.02	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 1 Sensor input at 4800 with position data 1 Sensor input at 4800 with log data 1 Sensor input at 38400 with heading and ROT data			
VDL contents	Check that the VDL contents agree with in input data	EUT is not able to decode the external GPS sentence continously. It goes back to internal GPS It look like that the transponder make a restart during this test Retest 18.12.02	Ok
VDO output	Check that VDO outputs on both high speed ports agree with the sensor input data	Retest	Ok

Loss of data	Check that VDL messages are transmitted without loss of sensor data	Retest	Ok
	Check that output data at VDO output are sent without loss of sensor data	Retest	Ok
Delay of data	Check that there is no delay from sensor input change to VDL messages	Retest	Ok
	Check that there is no delay from sensor input change to VDO output	Retest	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

15.11.02	**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	Indecate as 3D	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	3D instead of DGPS Retes 19.12.02	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 = "-----"	N/A is displayed	Ok
	Check longitude = "-----"	N/A is displayed	Ok
	Check PA-Flag = 0	N/A is displayed	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
Change the latitude to only degrees and minutes, without decimal point	Chack that the latitudo on VDL is correct		Ok
No GBS sentence applied	Check that RAIM-Flag = 0		Ok

7.5.2 GGA sentence

15.11.02	**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 is 1 Retest 20.12.02	Ok
Set mode =4 (RTK fixed) Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set mode =5 (RTK float Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL		Ok
Set mode = 6 (dead reck.) Check on VDL	Short check default data		Ok
Set mode = 7 (manual) Check on VDL	Short check default data		Ok
Set mode = 8 (simulated) Check on VDL	Short check default data		Ok
Set mode = 0 (**no fix**) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok

7.5.3 GNS sentence

15.11.02	**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	EUT didn't used position shows default values Retest 20.12.02	Ok
	Check PA-Flag = 0 on VDL		Ok
Set Mode = NA (no GPS/ autonomous GLONASS)	Short check data ok		Ok
	Check PA-Flag = 0 on VDL		Ok
Set Mode = **DA** (differential GPS/ autonomous GLONASS)	Short check data ok		Ok
	Check **PA-Flag = 1** on VDL	Still PA = 0 Retest 20.12.02	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	Default value Retest 20.12.02	Ok
	Check PA-Flag = 1 on VDL	PA = 0 Retest 20.12.02	Ok
Set Mode = AD (autonomous GPS/ differential GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL	PA = 0 Retest 20.12.02	Ok
Set Mode = ND (no GPS/ differential GLONASS)	Short check data ok		Ok
	Check PA-Flag = 1 on VDL	PA = 0 Retest 20.12.02	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

15.11.02	**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	PA = 0 Retest 20.12.02	 Ok
Set status/mode to **V,N** (invalid data) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **V,A** (invalid data) Check on VDL (Test if also status is evaluated)	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
	Check SOG = 102.3		Ok
	Check COG = 360°		Ok

7.5.5 DTM sentence

15.11.02	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	EUT used the reference datum instead of local datum Retest 20.12.02	Ok
Set Datum = not WGS 84	Check that data are changed to default		Ok
Apply **GGA** sentence with DTM File name: ais2d_gga_dtm_vtg_hdt_rot.sst Datum = not WGS 84	Check on VDL that data are default data		Ok
Set Datum = WGS 84	Check that data are valid	EUT used the reference datum instead of local datum Retest 20.12.02	Ok
Set Datum = not WGS 84	Check that data are changed to default		Ok
Set Datum = WGS 84	To get valid data for further tests		Ok

7.5.6 GBS sentence

15.11.02	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

7.5.7 VTG sentence

15.11.02	**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		Ok
Set mode to **N (**invalid) Check on VDL	Check SOG = 102.3 (default)	EUT try to used the SOG and COG from internal EPFS but this data are not valid Retest 20.12.02	Ok
	Check COG = 360 (default)		Ok
Check VDO output on PI	Check SOG = 102.3 (default)		Ok
	Check COG = 360 (default)		Ok
Check Display on MKD	Check SOG = "-----"		Ok
	Check COG = "-----"		Ok
Set mode to E (estimated)	Short check SOG/COG default		Ok
Set mode to M (manual)	Short check SOG/COG default		Ok
Set mode to S (simulated)	Short check SOG/COG default		Ok
Delete SOG-N field and add SOG K-Field (speed in km/h)	Check SOG value in VDL It has to be converted into knots or set to default		Ok

7.5.8 VBW sentence

15.11.02	**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	Calculation failed Retest 20.12.02 Still wrong Retest 24.02.03	 Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	See above Retest 24.02.03	 Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value	See above Retest 24.02.03	 Ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG from VTG		Ok
	COG from VTG		Ok
Check on VDO output of PI	SOG from VTG		Ok
	COG from VTG		Ok
Check on MKD	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VTG		Ok
	COG from VTG		Ok

15.11.02	**Test details – VBW log input, no VTG**		
Test item	**Check**	**Remark**	**Result**
Apply simulated VBW sentence to the sensor input, GPS disconnected, No VTG speed available File name is ais08_gll_vbw_hdt_rot.sst			
Status of bottom track: **A** (valid) Ahead and across speed available. Check on VDL	Check that SOG = resultant of ahead and across speed		Ok
	COG = calculated from SOG vector and heading	Calculation failed Retest 20.12.02 Still wrong Retest 24.02.03	 Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = calculated from SOG vector and heading	See above Retest 24.02.03	 Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = calculated from SOG vector and heading	See above Retest 24.02.03	 Ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG = default		Ok
	COG = default		Ok
Check on VDO output of PI	SOG = default		Ok
	COG = default		Ok
Check on MKD	SOG = default	Displayed as N/A	Ok
	COG = default	Displayed as N/A	Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG = default		Ok
	COG = default		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VBW or default	Default	Ok
	COG = default	Default	Ok

7.5.9 OSD sentence

15.11.02	**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		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Check VDO output on PI	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Check Display on MKD	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading from OSD		Ok
Set speed reference to P (Positioning system)	Check SOG and COG from OSD		Ok
Set speed reference to R Radar tracking	Check SOG and COG from OSD		Ok
Set speed reference to W (Water speed)	Check SOG = default		Ok
	Check COG = default	Still COG from OSD	Ok
	Check heading from OSD		ok
Set speed reference to M (Manual)	Check SOG = default		Ok
	Check COG = default	Still COG from OSD Retest 20.12.02	Ok
	Check heading from OSD		ok
Set speed reference to P (Positioning system) Set **heading status = V** (invalid)	Check SOG from OSD		Ok
	Check COG from OSD		Ok
	Check heading = default		Ok
Change speed reference from N (kn) to K (km/h)	Check SOG value in VDL It has to be converted into knots		Ok

7.5.10 HDT sentence

15.11.02	**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**	0	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	Display: “N/A”	Ok

7.5.11 ROT sentence

20.12.02	**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)	177.2	Ok
	360 converted to 361.6 (90)		Ok
	720 converted to 708.7 (126)		Ok
	-20 converted to 19.7 (-21)		Ok
	-720 converted to –708.7 (-126)		Ok
Set ROT status = **V** (invalid)	Check that ROT = default on VDL (default = -731.4 = -128)		Ok
	Check that ROT = default on VDO		Ok
	Check that ROT = default on MKD	Display: “N/A”	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	EUT must convert values < 10° to 0.0 and not only 9° Retest 24.02.03	Ok
	11 converted to 720	EUT must convert values > 10° to 720 and not only 11° Retest 24.02.03	Ok
	- 9 converted to 0	See above Retest 24.02.03	Ok
	-11 converted to -720	See above Retest 24.02.03	Ok

7.5.12 Additional Tests

15.11.02	**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		Acc
	Check SOG/COG		Acc
	Check heading		acc
	Check ROT	EUT is not able to decode ROT information Retest 20.12.02	acc
Send sentences with false checksum, check on VDL	Check position = default		Ok
	Check SOG/COG = default	EUT try to used the SOG and COG from internal EPFS but this data are not valid Retest 20.12.02	Ok
	Check heading = default		Ok
	Check ROT = default	EUT is not able to decode ROT information Retest 20.12.02	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	EUT try to used the SOG and COG from internal EPFS but this data are not valid Retest 20.12.02	ok
	Check SOG/COG = default	See above	Ok
	Check heading = default		Ok
	Check ROT = default	EUT is not able to decode ROT information Retest 20.12.02	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	EUT is not able to decode ROT information Retest 20.12.02	Ok

7.5.13 Check of different inputs

15.11.02	**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	EUT is not able to decode ROT information Retest 20.12.02	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	EUT is not able to decode ROT information Retest 20.12.02	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	COG calculation from VBW fail Retest 24.02.03	Ok
	Check heading		Ok
	Check ROT	EUT is not able to decode ROT information Retest 20.12.02	Ok

7.5.14 Sensor sentences overview

20.12.02	Supported sentences overview			
Sentence	**Description**	**Required**	**Supported**	**Result**
This list is derived from the results of the above tests of the single sentences for overview, not an additional test				
GLL	Geographical Latitude Longitude	required	Yes	Ok
GGA		optional	Yes	Ok
GNS		required	Yes	Ok
RMC		required (COG)	Yes	Ok
DTM		required	Yes	Ok
GBS		required	Yes	Ok
VTG	Velocity True Ground	optional	Yes	Ok
VBW	Velocity Bottom Water	required	Yes	Ok
OSD	Own Ship Data	optional	Yes	Ok
HDT	Heading	required	Yes	Ok
ROT	Rate of Turn	required	Yes	Ok

7.6 19.6 Test of high speed output

(7.6.3)

Method of measurement

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

Required results

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

This contents of VDM and VDO including header are checked in

- 16.7.1 Received messages and
- 16.7.2 Transmitted Messages

In this test the header fields of some multislot messages which require more than 1 VDM or VDO sentence are tested.

7.6.1 VDM – Received message

22.05.03	**Test details – Content of received messages**		
Test item	**Check**	**Remark**	**Result**
Transmit all types of messages from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Message id	8 binary broadcast message, multiy slot		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3 according to length of message		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 1008 bit)		Ok
Message id	14 Safety related broadcast message, multi slot		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 1000)		Ok
	Additional checks		
Length of sentence	Confirm that no sentence exceedet the length of 82 character (no warning from monitor program)		Ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

7.6.2 VDO Transmitted messages

22.05.03	**Test details – Content of transmitted messages**		
Test item	**Check**	**Remark**	**Result**
Transmit all applicable types of messages Check the field content of the fields listed under Test item.			
Message id	8 binary broadcast message, multiy slot		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3 according to length of message		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0 (msg length = 1008 bit)		Ok
Message id	14 Safety related broadcast message, multi slot		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2 (msg length = 1000 bit)		Ok
	Additional checks		
Length of sentence	Confirm that no sentence exceeded the length of 82 character (no warning from monitor program)		Ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

7.7 19.7 High speed output Interface performance

(7.6.3)

Method of measurement

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

Required results

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

Date	Result	Status
18.12.02	In average 15 msg / s of 67.5 msg/s are received. See diagram which has been provided	
14.01.02	Retest: 41 msg/s of 67.5 msg/s are received	
15.01.02	Retest: 43 msg/s of 67.5 msg/s are received	
04.02.03	Retest: 66 msg/s of 67.5 msg/s received, 97.6 %	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
21.11.02	**VSD**	See test details below	Ok
21.11.02	**SSD**	See test details below	ok

All other sentences are tested in special test items

21.11.02	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	DTE flag of SSD sentence is transmitted in msg 5,	ok

21.11.02	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 type of ship is displayed on MKD		Ok
Maximum actual static draught	Check that the new draught is transmitted in msg 5		Ok
	Check that the new draught is displayed on MKD		Ok
Destination	Check that the new destination is transmitted in msg 5		Ok
	Check that the new destination is displayed on MKD		Ok
Estimated Time of Arrival (ETA)	Check that the new ETA is transmitted in msg 5		Ok
	Check that the new ETA is displayed on MKD		Ok
Regional application flag	Check if the regional application flag is entered in VDL message 1		Ok
Persons on board	Check if the persons on board are displayed on MKD Not required		Ok

8 20 DSC functionality tests

(M.1371 A3)

8.1 20.1 General

(M.1371 A3/1)

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

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

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

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

18.11.02	**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	Very low probability of a response, about 10 % 13.01.03 Retest: ok, 100% response	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	Very low probability of a response, about 10 % 13.01.03 Retest: ok, 100% response	ok

07.02.03	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		ok
• Increase the channel load so that there are no 20 free succeeding slots (1 position report every 5 s) • Wait 1 frame until the slot allocation table is filled • Transmit test signal 1	Check that no responses are transmitted by the EUT	EUT transmits response All targets are displayed on MKD 27.02.03_Retest: No Response	ok

13.01.03	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	07.02.03 Retest: no response with matching course 27.02.03 Retest: Response received	ok
Change course to a value differing > 2 degrees	Check that call is not answered	Call is responded at +3, +4 degrees 07.02.03 Retest: could not be tested because there is also no response with matching course 27.02.03 Retest: No response	ok
Delete course, add matching type of ship	check that call is answered		Ok
Change type of ship to All ships of this type	check that call is answered		Ok
Change type of ship	Check that call is not answered		Ok
Position inside area , area now in a critical region (lon about 180 degr.) File name =area_pos_name_rq_180.sst	Check that the call is answered within 20 s	Call is responded at a lon of 179°50E, Call is not responded at a lon of 179°50W, 07.02.03 Retest: Call is also responded at a lon of 179°50W,	ok
Change position to outside the area,	check that call is not answered	07.02.03 Retest: ok	ok
Start DSC transmission of Selective call with command "Activate alternate system" File name is "eut\sel_act_alt_system.sst"			
Sel. Call with symbols: 104+03+01+120 (68+03+01+78)hex	Check that EUT does not transmit a response		Ok

8.2 20.2 Regional area designation

(M.1371 A3/5)

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

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

13.01.03	Test details – Regional area designation		
Test item	**Check**	**Remark**	**Result**
Send a selective region setting call File name “eut\sel_set_region.sst”	Check that an acknowledgement is received	Acknowledgement is received, but the SW corner of the area is transmitted in a separate message. This additional message is addressed to “All ships” with category 103. 07.02.03 Retest: ok	Ok ok
	Check that an ACA sentence is output at PI port	ACA output, but ACA sentence is without checksum 07.02.03 Retest: ACA is with checksum	Ok 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 acknowledgment received, call seems to be too long. A shorter call (without SW corner) is received. 07.02.03 Retest: no change 27.02.03 Retest: no change 06.03.03 Retest: Ackn received.	 ok
	Check that an ACA sentence is output at PI port	Note) no time of change of “in use” flag in ACA output	Ok
	Check that new region is stored in the region list of the EUT		ok
Send a selective call with channel setting in the area in use. File name”eut\sel_set_ais_channel_65.sst”	Check that an acknowledgement is received		Ok
	Check that AIS channels are set according to the call content		Ok

	Check that new AIS channels are used for transmission and reception		Ok
Send a selective call with channel setting if the EUT is not in an area. File name"eut\sel_set_ais_channel_65.sst"	Check if an acknowledgement is received	An acknowledgement is transmitted by EUT	Ok
	Check that AIS channels are not changed	No ACA output, channels are not changed	Ok

	Test details – Channel management test of 17.2		
Test item	**Check**	**Remark**	**Result**
Set-up EUT in autonomous mode transmitting on channel AIS1/AIS2, send 2 DSC messages, defining 2 adjacent areas with channels A1, B1 and A2, B2. Use external sensor input to simulate a voyage through both areas. Set the position outside the areas. Set the positions near the limits of the transitional zones to check the dimensions. The transitional zone is 5 nm by default			
MKD display defined area	Check that the defined areas are correctly displayed on MKD or output as ACA on request	07.02.03 Retest: Could not be tested because area setting was not received. 06.03.03 Retest: The quadrant of the received area is always set to 0 (NE) 07.03.03 Retest: The quadrant is ok now (Quadrant 1 tested)	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	At a lat of 53°05 (on the border of TZ) the channels A2 and AIS1 are used The same is at the other side of the TZ, at a lat of 52°55 Retest 25.03.03: ok	ok
	Check that reporting rate is doubled		Ok
Item 5: Move position into region 1	Check that channels A1 and B1 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Move position into transitional area of region 1	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the transitional zone of region 1	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

8.3 20.3 Scheduling

(M.1371 A3/2)

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

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

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

17.01.03	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	After 2 responses EUT stopped TX of DSC responses and AIS messages. VDO output (with channel) was still active indicating transmissions. No TX alarm active. 07.02.03 Retest: After a short time EUT stops receiving the DSC calls 27.02.03 Retest: ok	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	EUT did not transmit any response. It indicated Rx of response with: $PNAUDSX,mmsi $CDDSI, ... and the response from another AIS in that region: $PNAUDSX,mmsi $CDDSR,adr,.... but did not transmit any response 07.02.03 Retest: ok see note)	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	Could not perform the test because EUT did not respond under normal conditions 07.02.03 Retest: ok, no response	ok
Note)	This test has been done in 2 parts of about 30 min. In both test after about 20..30 min the receiving probability became worse and then stopped completely (see log file) 27.02.03 Retest: Receiving and responding without problems for about 30 min		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.

13.01.03	**Test details (a),(b),(c) – Information polling**		
Test item	**Check**	**Remark**	**Result**
Start DSC transmission of Test signal 1. File name is “eut\Test_Signal_1.sst”. Modify sentence according test item			
Set channel (101+xx) (101+ch 76) (65h+4Ch)	Check that direct answer on channel xx		ok
	Check if following answers on channel xx	It seems that the DSC Receiver is also switched to channel 72. EUT does not receive DSC calls on channel 70 after channel switch command. 07.02.03 Retest: ok The following calls on channel 70 are answered on channel 72	ok
Request automatic position report (102+xx)	Check that immediate response with EOS=BQ is received		Ok
	Check automatic reporting rate		ok
	Check that further TX are transmitted with EOS = RQ (117)		Ok

	Check that automatic reporting is finished after 5 transmissions (without ackn. by base station)	Is finished after 6 transmission, direct response and 5 repetitions	ok
	Check that the automatic reporting is not finished with ackn. by base station.	Automatic report is finished after 5 repetitions. 3 messages were acknowledged, content = original message of position report 07.02.03 Retest: no change 28.02.03 Retest: EUT continues automatic position report if ack by base station is received	ok
Send message with 102+00 (66h+01h	Check that the automatic position report is finished	Is acknowledged by a position report, EOS = BQ	Ok
Request position (103) (67h)	Check position in response		Ok
	Check time		Ok
	Check type of ship	Optional type of ship is not included	ok
Request length of ship (108=6Ch)	Check length of ship (124=7Ch)		ok
Request course (109=6Dh)	Check course (119=77h)	Response: 119 35 00, should be: 119 03 50 (leading zero) 07.02.03 Retest: ok	ok
Request ships name (111=6Fh)	Check name (115=73h)		ok
Request ackn. (112=70h)	Check ackn. (110=6Eh)	Response: 110 126 Only symbol 110 (message acknowledged) should be responded 07.02.03 Retest: ok	ok
Request speed (116=74h)	Check speed (120=78h)	Response: 120 01 00	ok
(C) Request test signal 1 (pos, name request) + 109 + 116 (6F 67 6D 74))	Check automatic response submitting name, position, course and speed	Response is splitted in 2 calls: 1 call with name, pos and course, 1 call with speed. The second call is an all ship call with category 103 and additional symbols 08,127, 127 at the end It is recommended to put the 2 long items (name, position) in different calls 07.02.03 Retest: ok All 4 items in 1 call	Ok ok
Send test signal 1 (101+72)=(65h+48h) (set DSC channel to a simplex channel) + Geographically addressed call.	Check that the communication on selected simplex channel is working	Response is transmitted on channel 72 It seems that the DSC Receiver is also switched to	

File: sel_check_channel.sst		channel 72. EUT does not receive DSC calls on channel 70 after channel switch command. 07.02.03 Retest Test could not be finished because of the unpredictable and intransparent behaviour. Often it does not receive and has to be restarted, then it receives but does not respond. So I wait for a more stable version. 28.02.03 Retest: ok, EUT responses area addressed call on channel 72	ok
Send test signal 1 (101+60) =(65h+3Ch) (set DSC channel to a duplex channel) + Geographically addressed call.	Check that the communication on selected duplex channel is working	See previous test 28.02.03 Retest: ok, EUT responses area addressed call on channel 1060 (ship frequency of channel 60)	ok

13.01.03	**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	1 symbol 126	ok
Request length of ship (108)	Check length of ship (124)	Length can not be deleted	----
Request course (109)	Check course (119)	1 symbol 126	ok
Request ships name (111)	Check name (115)	Name can not be deleted	----
Request speed (116)	Check speed (120)	1 symbol 126	ok

28.02.03	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		Ok
Set channel (104+00+2088) (68 00 14 58)	Check that response is transmitted on channel 70		Ok

28.02.03	Test details (f) – DSI sentence check		
Test item	**Check**	**Remark**	**Result**
Apply DSI sentence to the PI interface. File name is ais_dsi.sst			
ON CH4 = PI interface	Check that the EUT does not transmit a DSC message.		Ok
ON CH5 = Pilot port	Check that the EUT does not transmit a DSC message.		Ok

28.02.03	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	Power level not reduced 06.03.03 Retest: DSC response is transmitted with low power TDMA power setting in the area is set to low power too	ok
Ad symbols to set power = 12.5 watt (high power) (Symbols 104+ 01+ 12)	Check that response is transmitted with high power	06.03.03 Retest: DSC response is transmitted with lhigh power TDMA power setting in the area is set to low power too	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*

18.11.02	**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		Ok
	Check that replay status is displayed on MKD		Ok
PI output	Check that LR interrogation and response is output on PI		Ok
Contents of LRF response	Check output of LRF sentence		Ok
	Check that sequence number = request		Ok
	Check MMSI = requestor		Ok
	Check name of requestor		Ok
	Check function request = request		Ok
	Check that function reply is according to the availability of data (2=avail, 3= not av.)		Ok
Contents of LR1 response	Check output of LR1 sentence		Ok

	Check that sequence number = request = LRF		Ok
	Check own MMSI		Ok
	Check MMSI of responder = responder of request		Ok
	Check ship's name		Ok
	Check Call sign		Ok
	Check IMO number		Ok
Contents of LR2 response	Check output of LR2 sentence		Ok
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder = responder of request		Ok
	Check date, UTC		Ok
	Check Lat, Lon		Ok
	Check COG		Ok
	Check SOG		Ok
Contents of LR3 response	Check output of LR3 sentence		
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder = responder of request		Ok
	Check destination		Ok
	Check ETA		Ok
	Check draught		Ok
	Check ship/cargo	Empfelung : es sollte Ship und Cargo auch hier eingetragen werden ähnlich dem Feld in msg 5, da die definition von ship/cargo nicht ganz eindeutig zu trennen ist (z.B. die 5x gruppe) Retest 20.12.02	ok
	Check length of ship		Ok
	Check breadth of ship		Ok
	Check ship type	See above Retest 20.12.02	ok
	Check persons		Ok

18.11.02	**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		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		Ok
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided		Ok
	Check that only requested fields are not empty		Ok
Request C,E,F Position COG SOG	Check that only LF and LR2 are transmitted		Ok
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided		Ok
	Check that only requested fields are not empty		Ok
Request P,W Ship/cargo Persons	Check that only LF and LR3 is transmitted		Ok
	Check that function request field = request		Ok
	Check that function reply status field matches request and data availability		Ok
	Check that requested fields are provided	See above Retest 20.12.02	 ok
	Check that only requested fields are not empty		Ok

18.11.02	**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		Ok
	Check that response is transmitted after manual confirmation on MKD		Ok

18.11.02	**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		Ok
	Check that response is transmitted after external confirmation via PI		Ok

9.2 21.2 LR “all ships” interrogations

(9.2)

Method of measurement

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

- *Automatic response*
- *Manual response.*

Repeat check with own ship outside specified area.

Required results

Check that EUT outputs a LR position report message

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

No response shall be output on the repeat check.

18.11.02	**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		Ok
	Check that the request and response is output on PI		Ok
Own position not in Area File name: LRI_LRF_out_area_CEF.sst	Check that the request is not responded	LR intterogation is requested by EUT Retest 20.12.02	Ok
	Check that the request is not displayed on MKD	See above Retest 20.12.02	ok
	Check that the request is not output on PI	See above Retest 20.12.02	ok

	Test details – Area addressing – Manual confirmation		
Test item	**Check**	**Remark**	**Result**
Set EUT to manual response Apply an area addressed request to the LR port of EUT requesting position and speed information			
Own position in Area File name: LRI_LRF_area_CEF.sst	Check that the request is displayed on MKD		Ok
	Check that response is transmitted on confirmation on MKD		Ok
	Check that the request and response is output on PI		Ok
Own position not in Area File name: LRI_LRF_out_area_CEF.sst	Check that the request is not displayed on MKD	Request is displayed on MKD Retest 20.12.02	Ok
	Check that the request is not output on PI	Request is output on PI after manual confirmation Retest 20.12.02	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.*

18.11.02	**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

Annex A Test equipment

A.1 Test equipment summary

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

for a description of pos. 1-4 see below

A.1.1 VDL analyser / generator

The VDL analyser/generator:

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

A.1.2 Target simulator

The target simulator consists of a standard PC with

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

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

A.1.3 Presentation Interface Monitor

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

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

For that purpose it includes the functions:

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

A.1.4 DSC Testbox

The DSC test box includes:

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

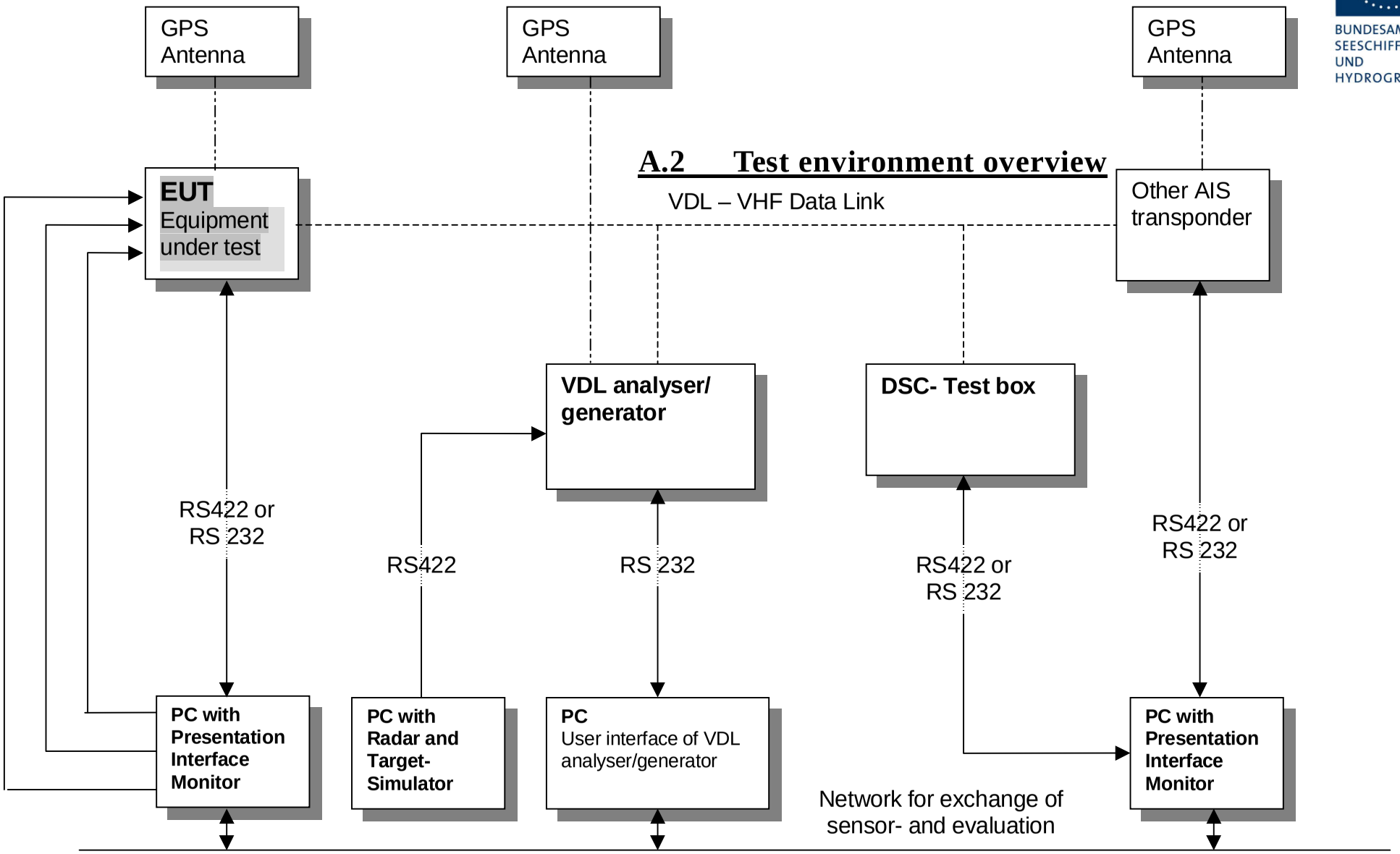
The software modification of the DSC controller comprises a remote control input/output facility

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

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

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

A.2 Test environment overview



Annex B Test sentences

B.1 IEC 61162 test sentences

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

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

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

B.1.1 Sensor input

Sensor input sentences	
File name	Description
Sentences	
AIS01_gll_vtg_hdt_rot.sst	Standard sensor input sentences

`$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A`
`$GPVTG,350.0,T,,M,10.0,N,,K,A`
`$TIHDT,359.9,T`
`$TIROT,0.0,A`	

AIS01d_dtm_gll_vtg_hdt_rot.sst	Standard sensor input with DTM
Similar files with an additional DTM sentence are also available for the other position sentence sets and not listed explicitely	

`$GPDTM,w84,,,,,,,P90`
`$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A`
`$GPVTG,350.0,T,,M,10.0,N,,K,A`
`$TIHDT,359.9,T`
`$TIROT,0.0,A`	

AIS01g_gll_vtg_gbs_hdt_rot.sst	Standard sensor input with GBS sentence

`$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A`
`$GPVTG,350.0,T,,M,10.0,N,,K,A`
`$GPGBS,141800.00,2.6,2.8,4.2,,,,`
`$TIHDT,359.9,T`
`$TIROT,0.0,A`	

AIS01x_gll_vtg_hdt_rot_180.sst	Standard sensor input at Longitude of 180°

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

B.1.2 Settings (VSD,SSD)

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

B.1.3 Messages (ABM,BBM)

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

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

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

AIABM_4_safety.sst	Set of 4 addressed safety related messages

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

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

AIBBM_5_bin.sst	Set of 5 binary broadcast messages
!AIBBM,1,1,7,0,8,06P0test1,0 !AIBBM,1,1,8,0,8,06P0test2,0 !AIBBM,1,1,9,0,8,06P0test3,0 !AIBBM,1,1,0,0,8,06P0test4,0 !AIBBM,1,1,1,0,8,06P0test5,0	
AIBBM_5_safety.sst	Set of 5 safety related broadcast messages
!AIBBM,1,1,6,0,14,D5CDi,0 !AIBBM,1,1,7,0,14,D5CDj,0 !AIBBM,1,1,8,0,14,D5CDk,0 !AIBBM,1,1,9,0,14,D5CDl,0 !AIBBM,1,1,0,0,14,D5CDm,0	
AIBBM_bin_stuffing.sst	Special message for bit stuffing test
!AIBBM,1,1,6,1,8,06Qv>khvOP,4	
AIBBM_multi_bin.sst	Long 5 slot binary broadcast message
!AIBBM,4,1,6,2,8,06P045678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,0123456789012345678901234567890123456789012345678901,4	
AIBBM_multi_safety.sst	Long 5 slot safety related broadcast message
!AIBBM,4,1,6,2,14,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,14,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,14,012345678901234567890123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,14,012345678901234567890123456789012345678901234567890123456789,0	
AIBBM_multi_bin_1.sst	Longer than 5 slots binary broadcast message, all bits 1
!AIBBM,4,1,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,2,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,3,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,4,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,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	
AIBBM_25.sst	25 broadcast message to check 20 slots per frame rule

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

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

B.1.4 Regional operational settings (ACA)

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

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

B.1.5 Long range requests

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

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

B.2 DSC sentences

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

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

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

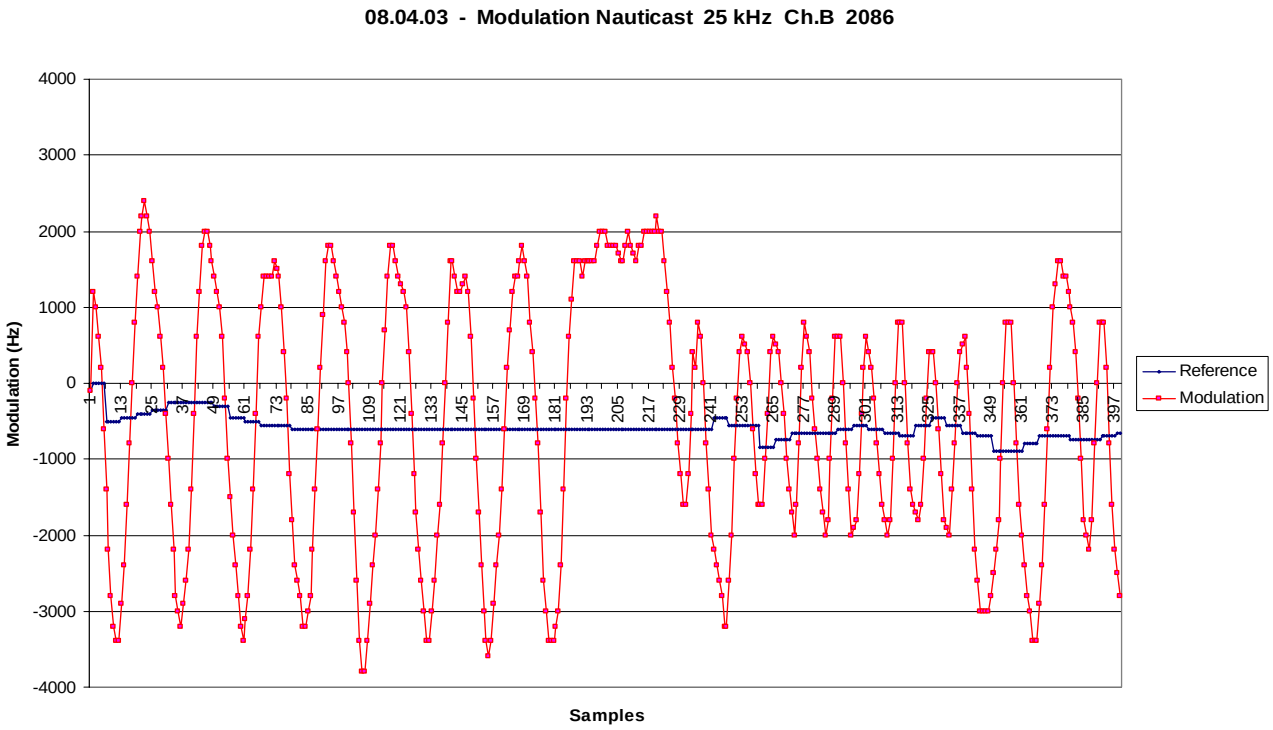
The DSC sentences include MMSI number which is changed according to the actual MMSI number the EUT

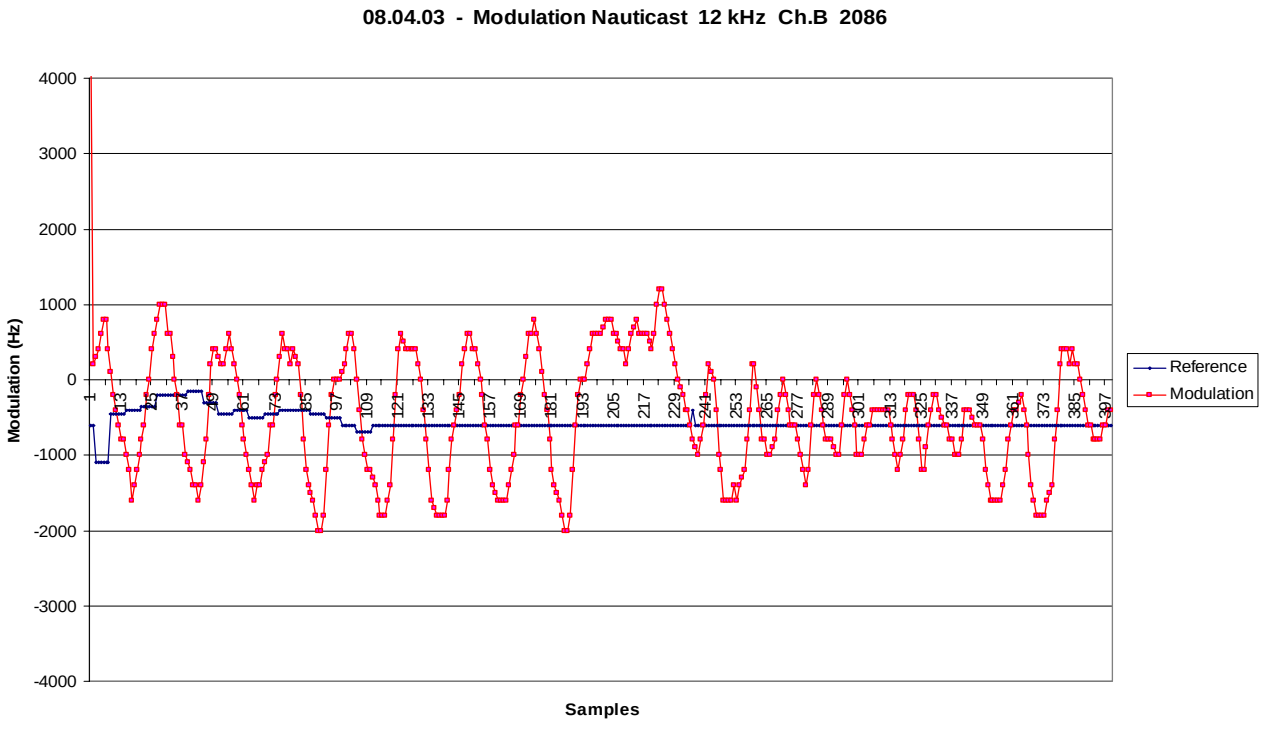
DSC Sentences	
File name	Description
Sentences	
Test_Signal_1.sst	Standard test signal no 1, selective position and name request.
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E676F75FF	
area_pos_name_rq.sst	Position and name request addressed to an area, standard position inside
$PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E676F75FF	
area_pos_name_rq_180.sst	Position and name request addressed to an area around a longitude of 180° and latitude of 0°.
$PDEBT,CCDSC,T,000146006700030014F1E003C003C0067150A27271E676F75FF	
sel_set_region.sst	Selective regional setting by DSC, standard pos. outside, channel 61
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E68090A3D00680A143D00680C053C0001140068 0D053200010A0075FF	
sel_set_region_in.sst	Selective regional setting, standard position inside, channel 72, 73, 12.5 kHz
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E680900480A680A00490A680C05280001030068 0D051E00005D0075FF	
sel_set_region_17_7_2.sst	Selective regional setting for test 17.7.2
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E6809145200680A0A5200680C051E0001280068 0D051400011E0075FF	
sel_set_region_17_2.sst	2 regional settings for DSC test according to 17_2
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E6809145200680A0A5200680C051E0001280068 0D051400011E0075FF $PDEBT,CCDSC,T,000146007800000100506715 0A27271E6809145100680A0A5100680C05140001280068 0D050A00011E0075FF	
sel_set_ais_channel_ch65.sst	Setting AIS channel to 65
$PDEBT,CCDSC,T,000146007800000100506715 0A27271E68090A4100680A14410075FF	
sel_check_channel.sst	Test of channel use in 20.4
$PDEBT,CCDSC,T,000146007800000101006715 0A27271E654875FF $PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E676F75FF	
area_set_region.sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E68090A3C00680A143C00680C05 1400005A00680D050A0000500075FF	
area_set_region_20_2.sst	Area addressed regional setting for test 20.2
$PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145200680A0A5200680C0F 1E00011E00680D0F140001280075FF $PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145100680A0A5100680C0F 1400011E00680D0F0A0001280075FF	
Sequence_20_1sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF $PDEBT,CCDSC,T,000146006606000 50A0A64150A27271E646E5A00487E7E7E7FFF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E646E5A00487E7E7E75FF $PDEBT,CCDSC,T,000146007800000101006715 0A27271E676F75FF	
Test_sequence_20_3.sst	Sequence of an area addressed call and continues transmission of other call for test of free channel check

$PDEBT,CCDSC,T,000146006705320000091E003C003C0067150A27271E676F75FF $PDEBT,CCDSC,T,000846007800000000167150A27271E676F75FF	
Sel_act_alt_system	Activate an alternative system
$PDEBT,CCDSC,T,00014600780000000A0567150A27271E6803017875FF	
all_ship_set_channel.sst	All ship call setting DSC channel
$PDEBT,CCDSC,T,000146007467150A27271E65467FFF	

Annex C test diagrams

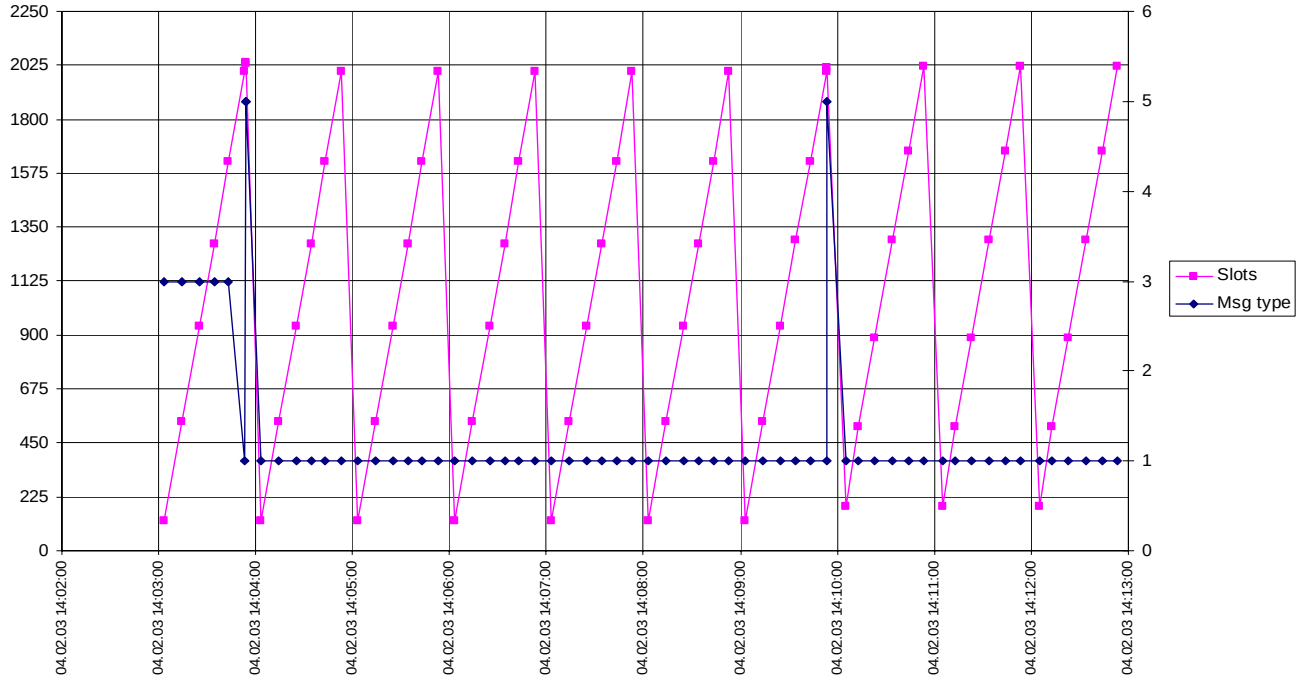
C.1 GMSK modulation 12.5 and 25 kHz bandwidth



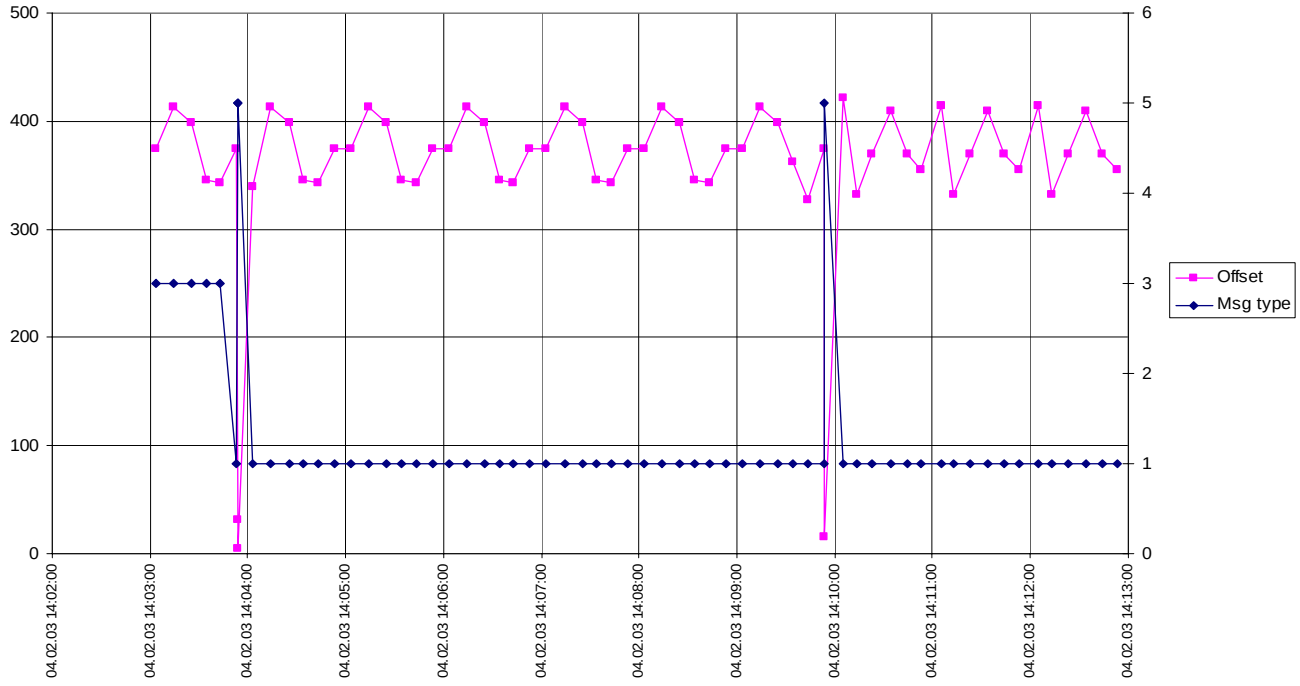


C.2 Network entry phase

04.02.03 - 16.6.1 - Nauticast X-Pack DS - Network entry

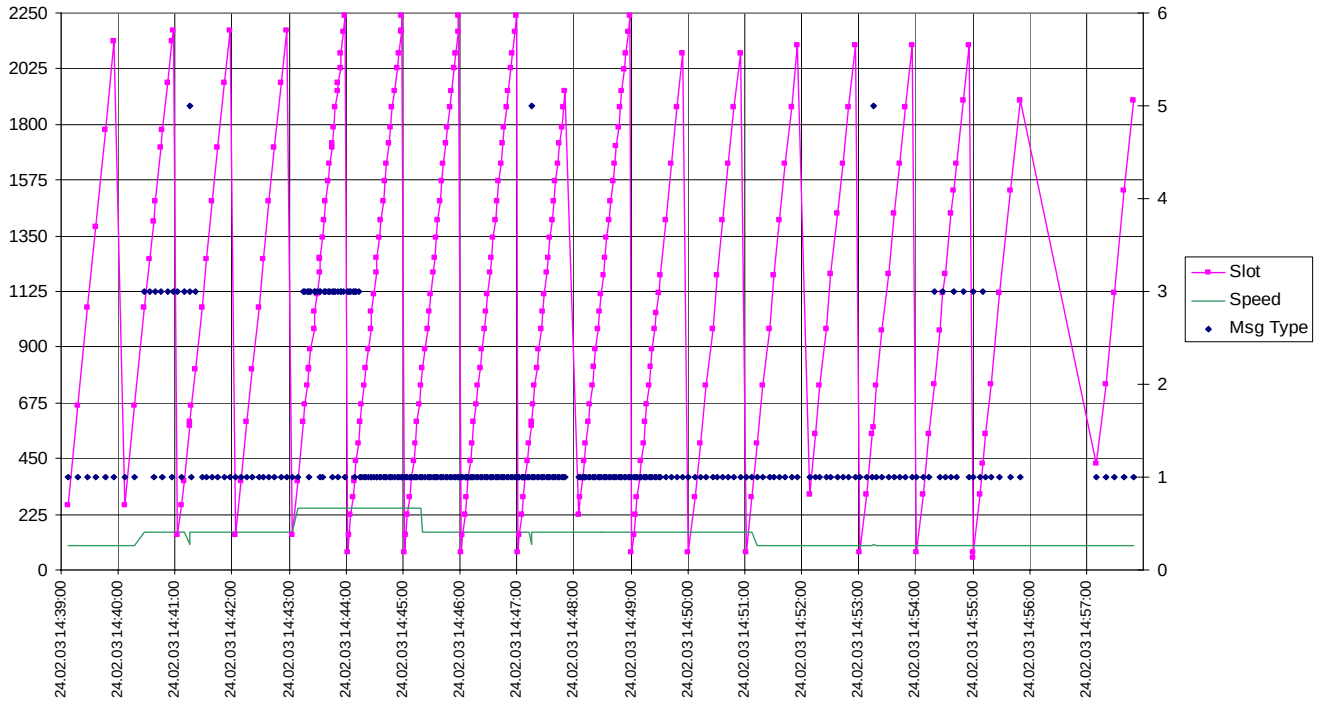


04.02.03 - 16.6.1 - Nauticast X-Pack DS - Network entry - Slot offset

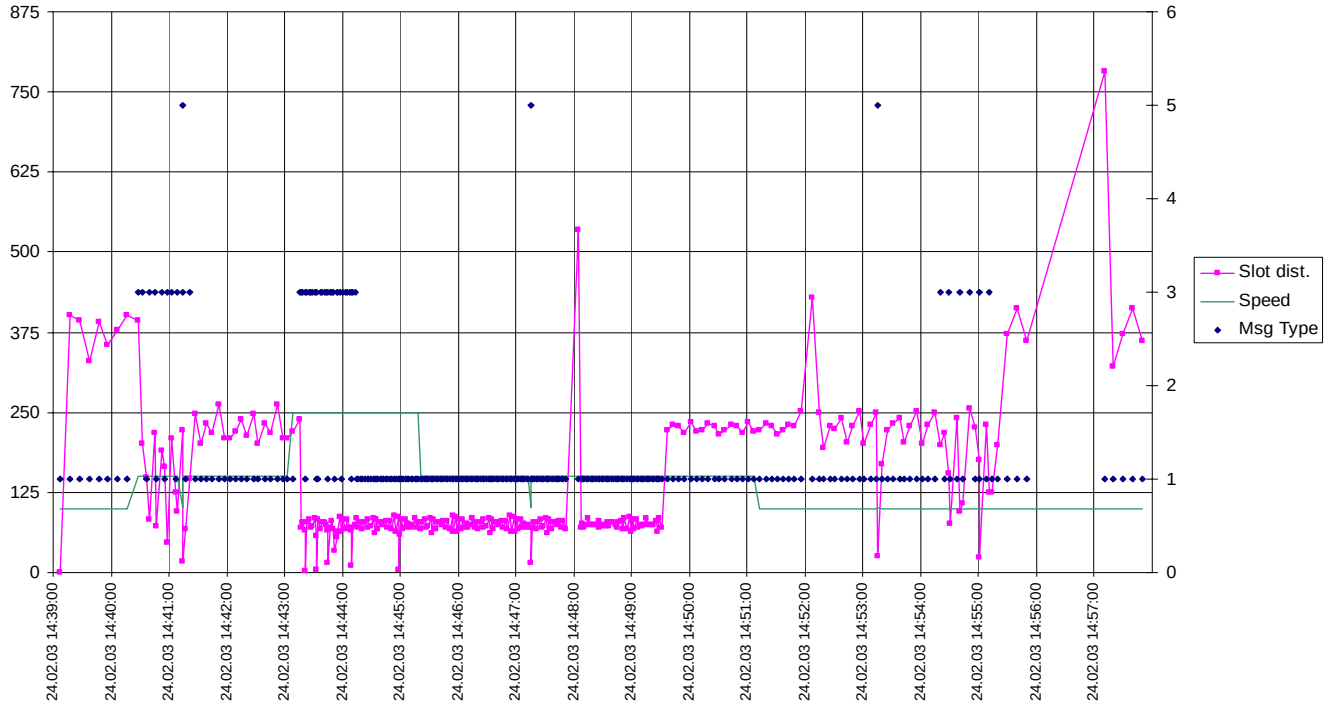


C.3 Reporting rate by speed

24.02.03 - 14.4.1 - Nauticast X-Pack DS - Reporting rate by speed - Slots

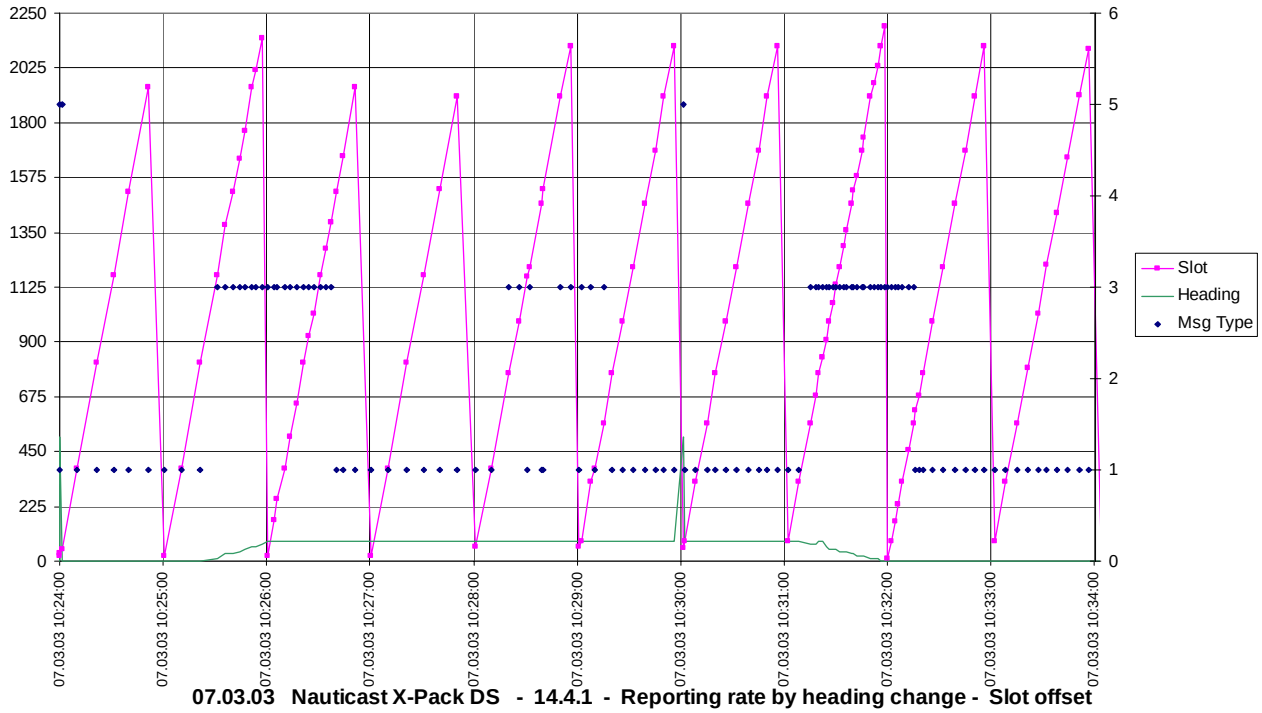


24.02.03 - 14.4.1 - Nauticast X-Pack DS - Reporting rate by speed - Slot offset

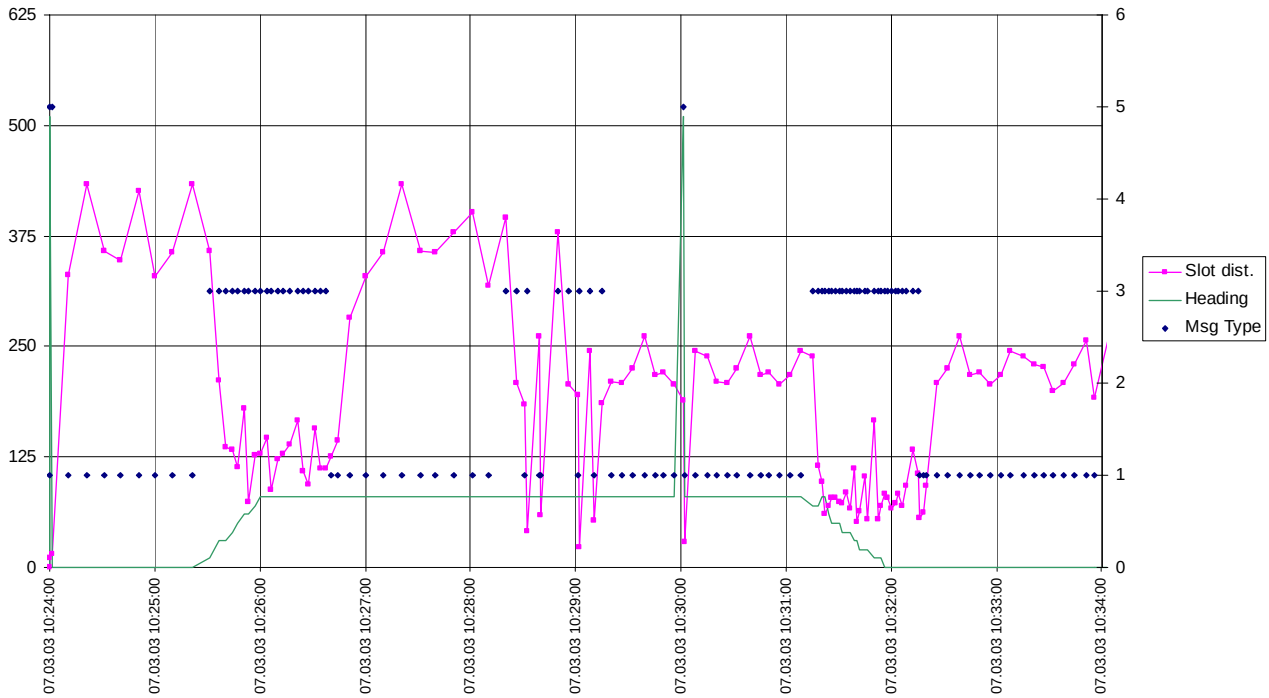


C.4 Report rate by heading

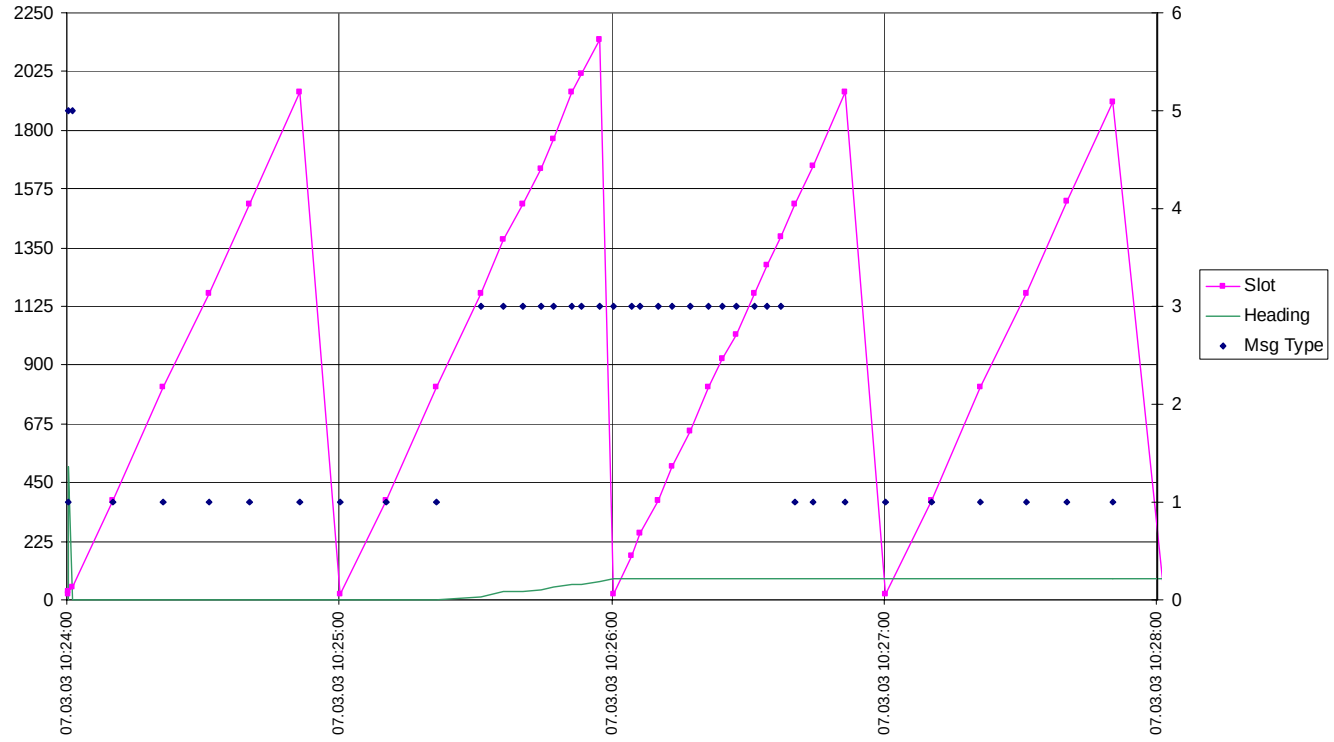
07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate by heading change - Slots



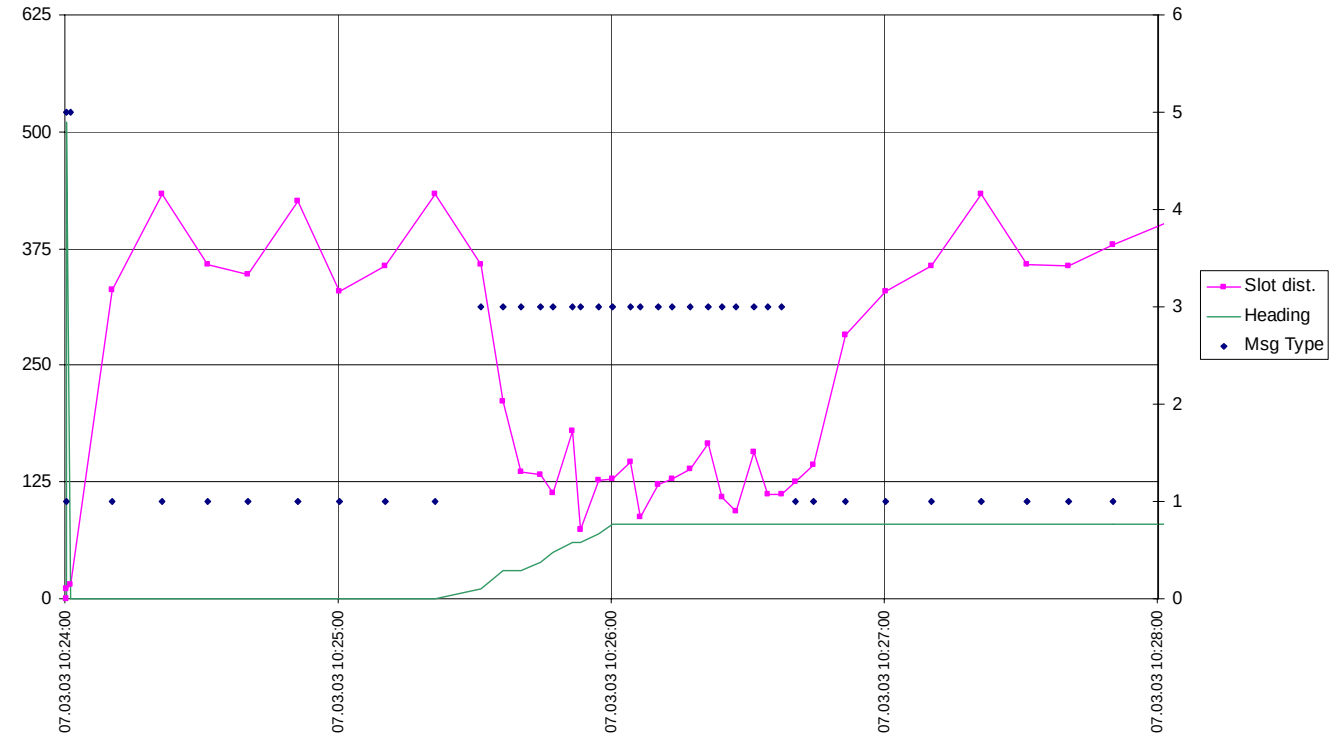
07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate by heading change - Slot offset



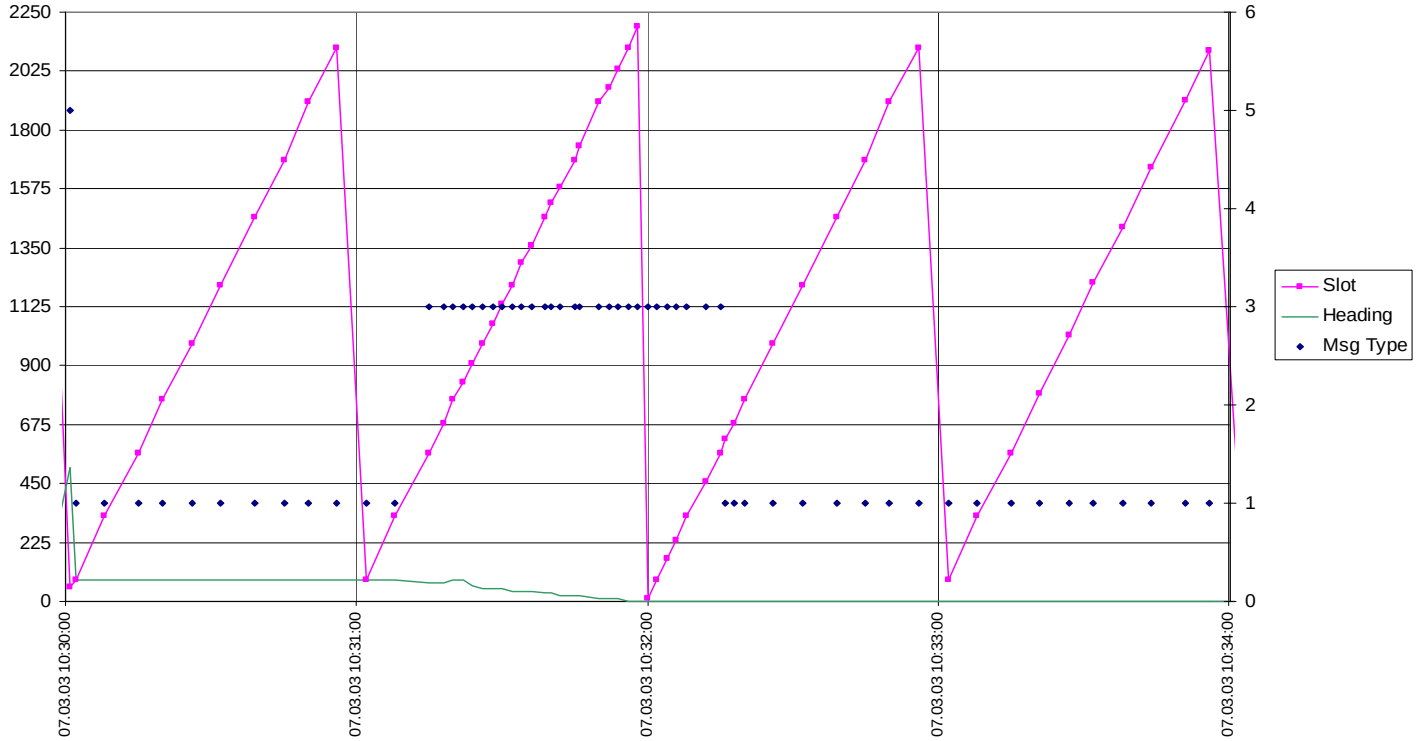
07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate change by heading at 10 kn - Slots



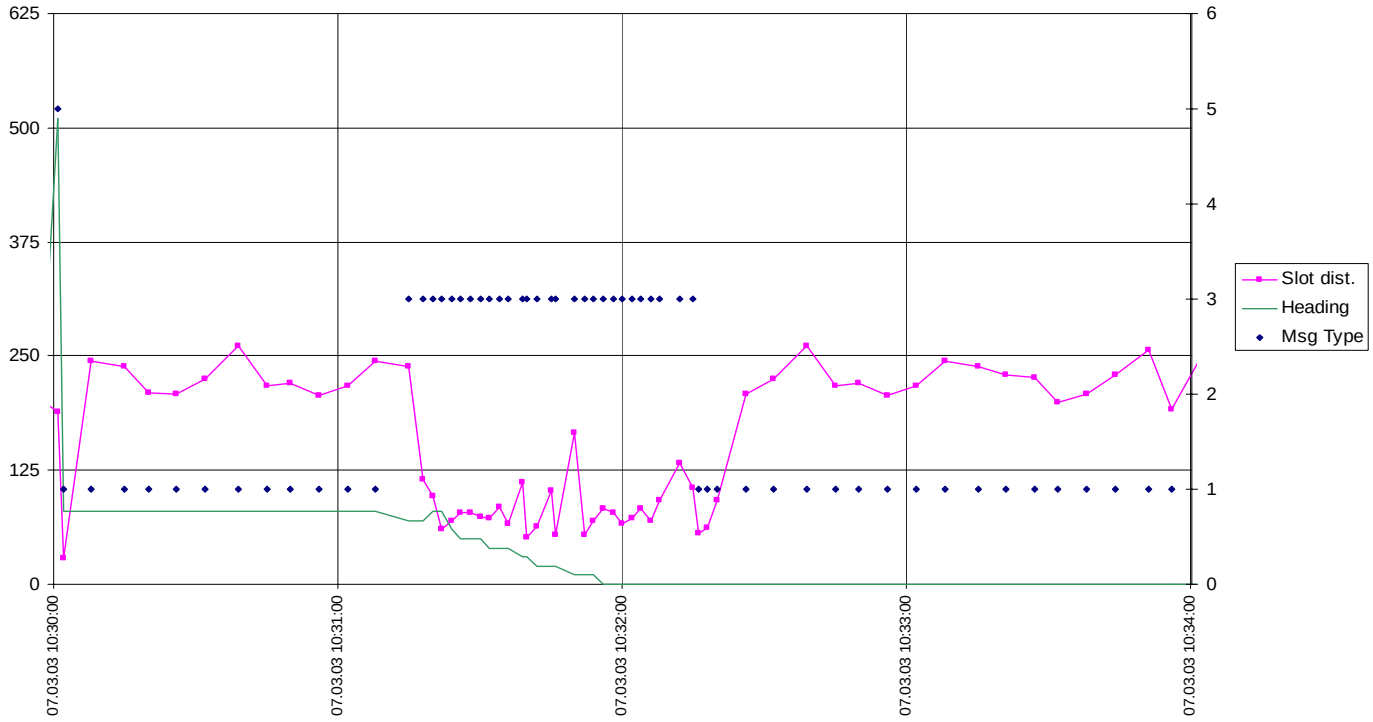
07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate change by heading at 10 kn - Slot offset



07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate change by heading at 15 kn - Slots

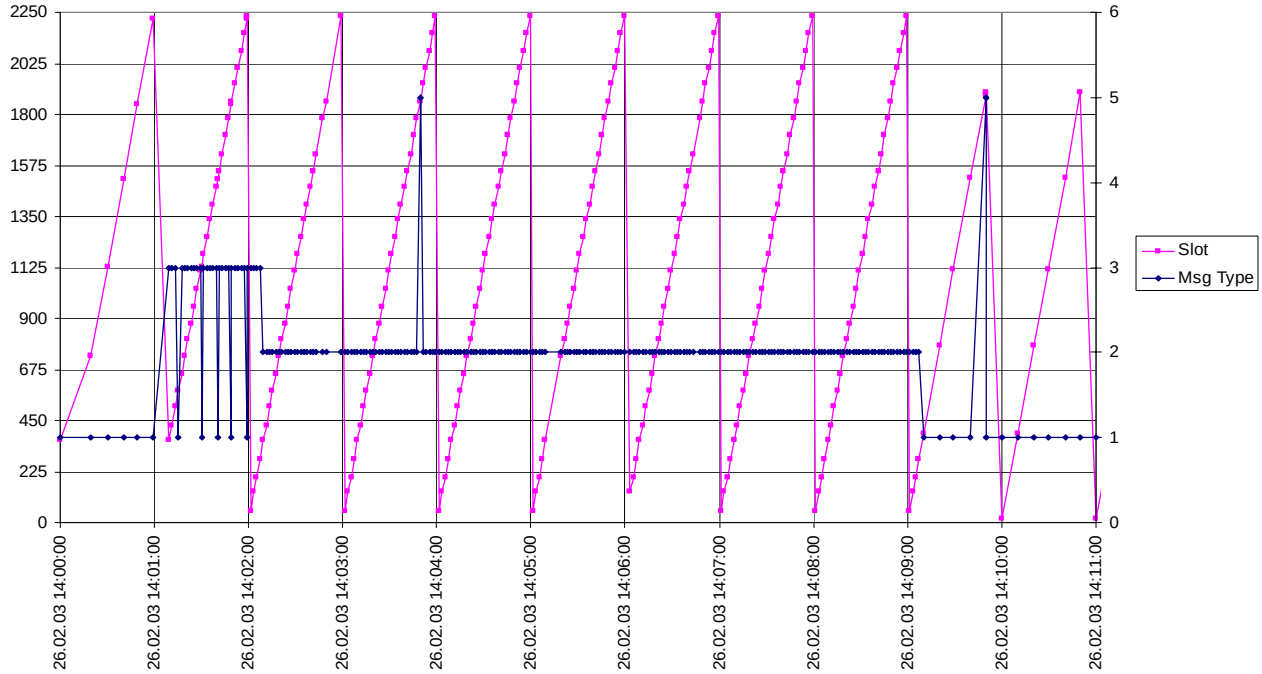


07.03.03 Nauticast X-Pack DS - 14.4.1 - Reporting rate change by heading at 15 kn - Slot offset

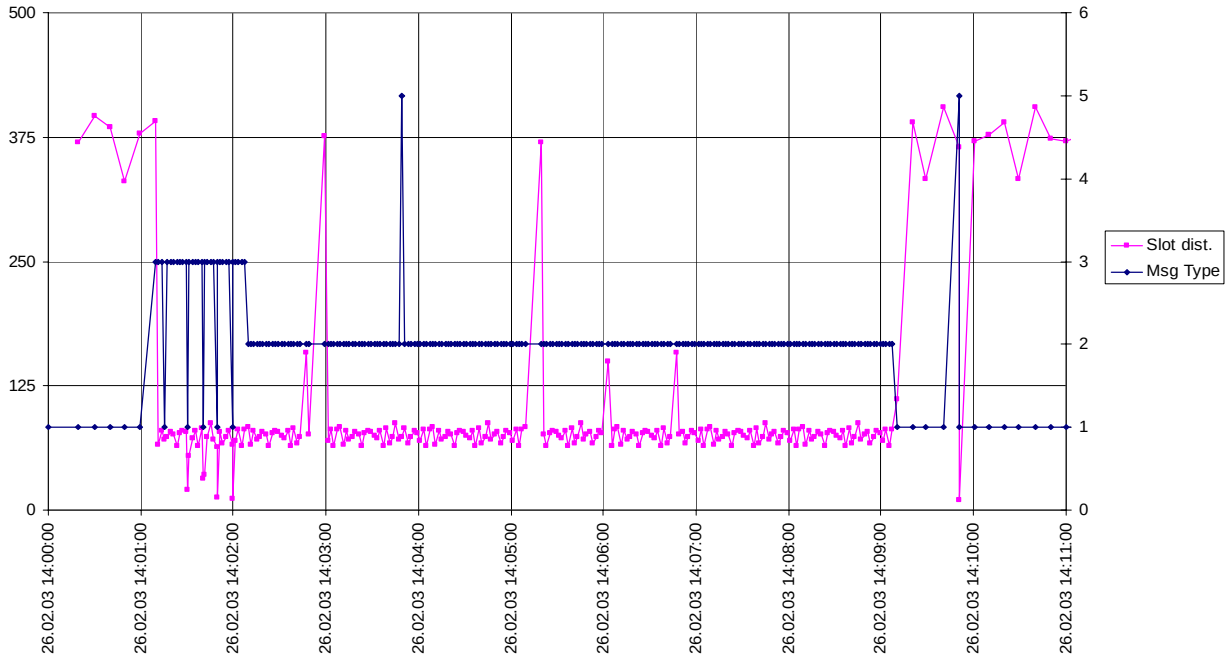


C.5 Assigned mode / rate assignment

26.02.03 - Nauticast X-Pack DS - 16.6.4.2 - Rate assignment - Slots

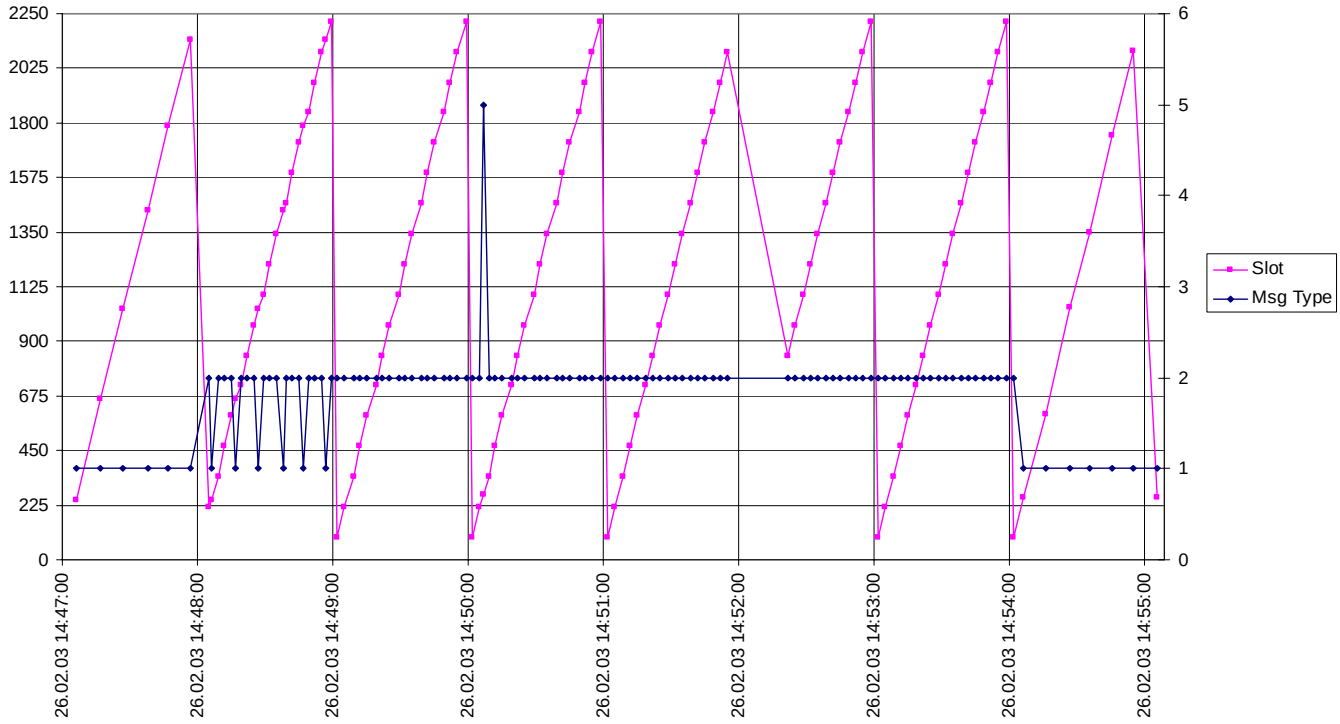


26.02.03 - Nauticast X-Pack DS - 16.6.4.2 - Rate assignment - Slot offset

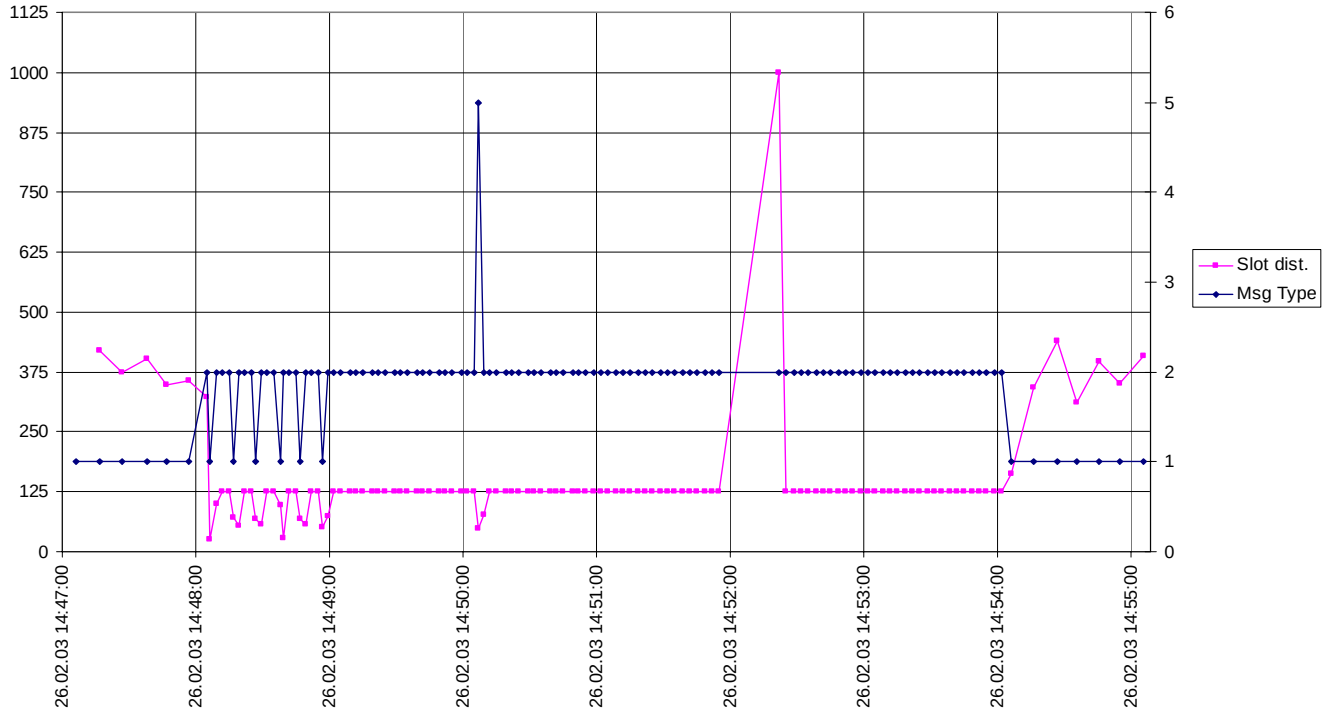


C.6 Assigned mode / slot assignment

26.02.03 - Nauticast X-Pack DS - 16.6.4.2 - Slot assignment - Slots

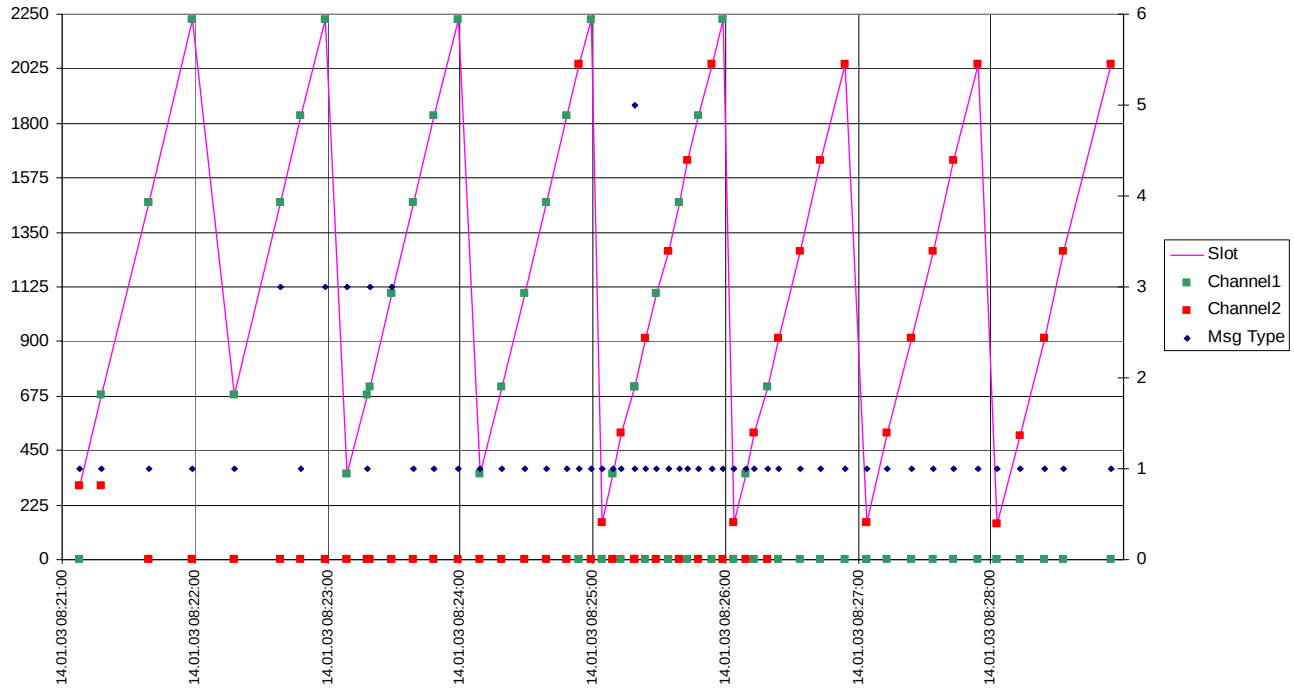


26.02.03 - Nauticast X-Pack DS - 16.6.4.2 - Slot assignment - Slot offset

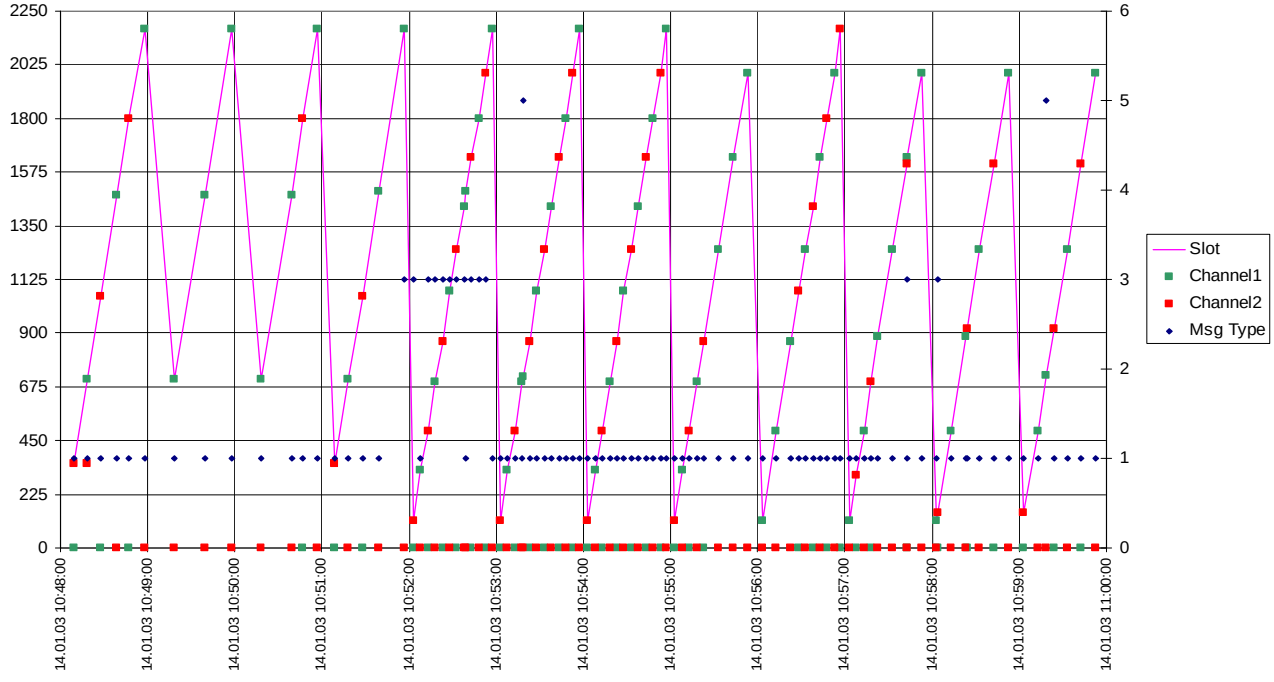


C.7 Area entry through transitional zone

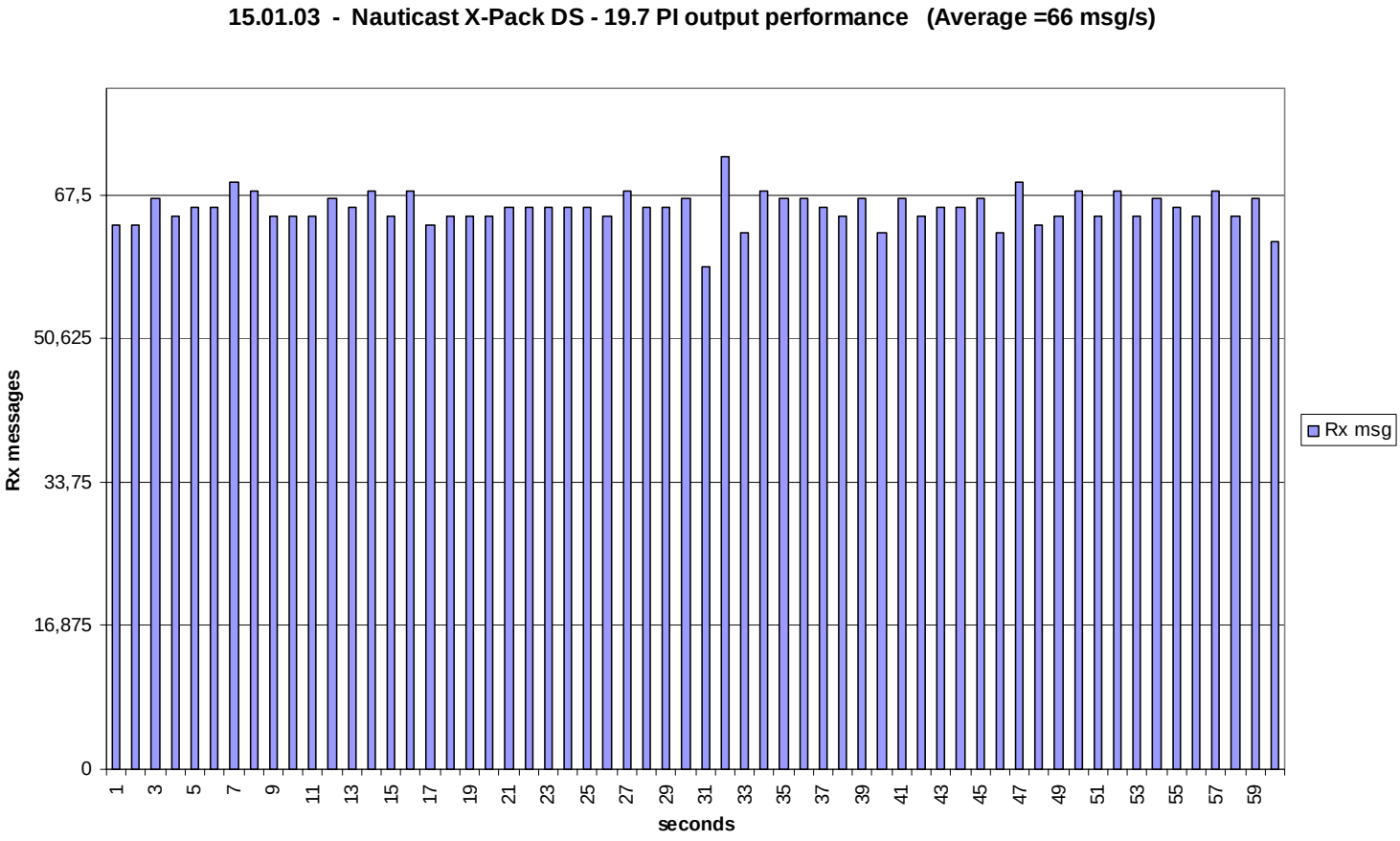
14.01.03 - 17.2 - Nauticast X-Pack DS - Area Entry, previous channels - Slots



14.01.02 - 17.2 - Nauticast X-Pack DS - Area Entry, new channels - Slots

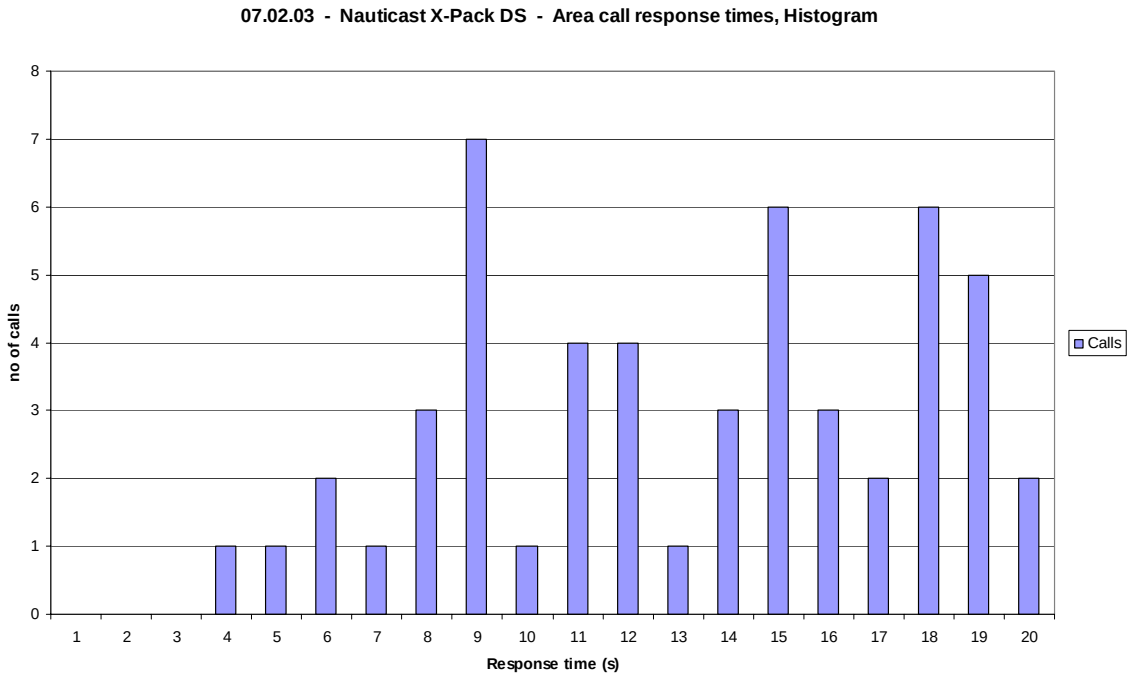


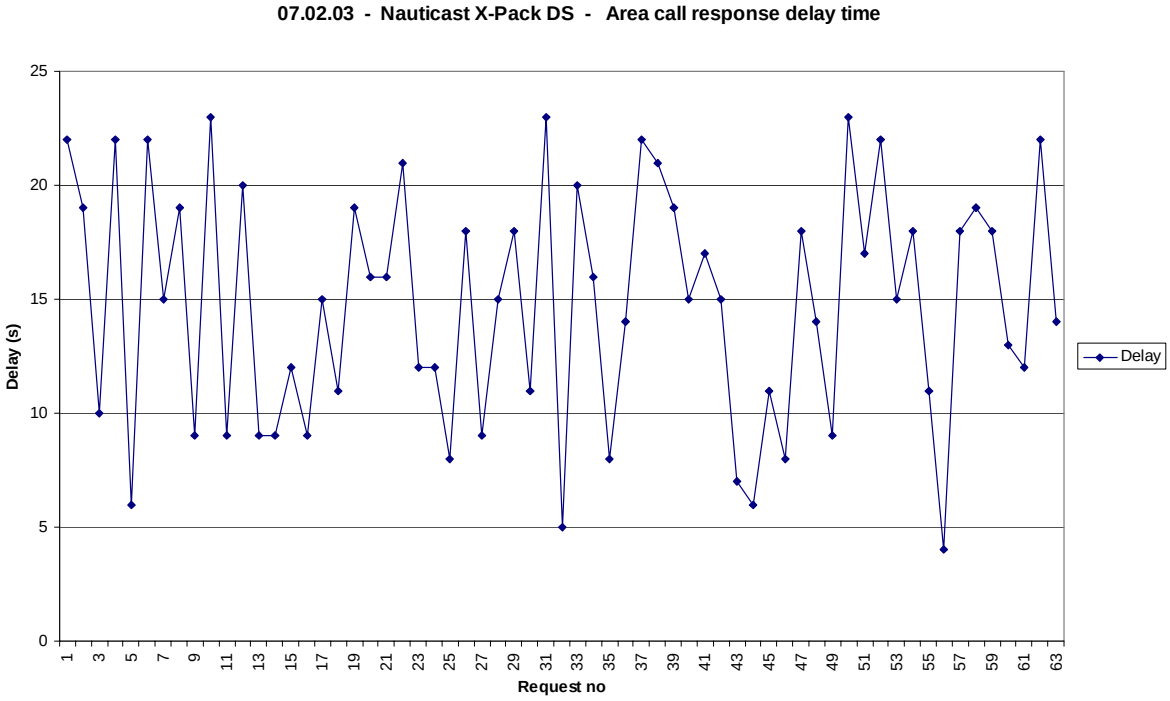
C.8 High speed output performance



C.9 DSC response time

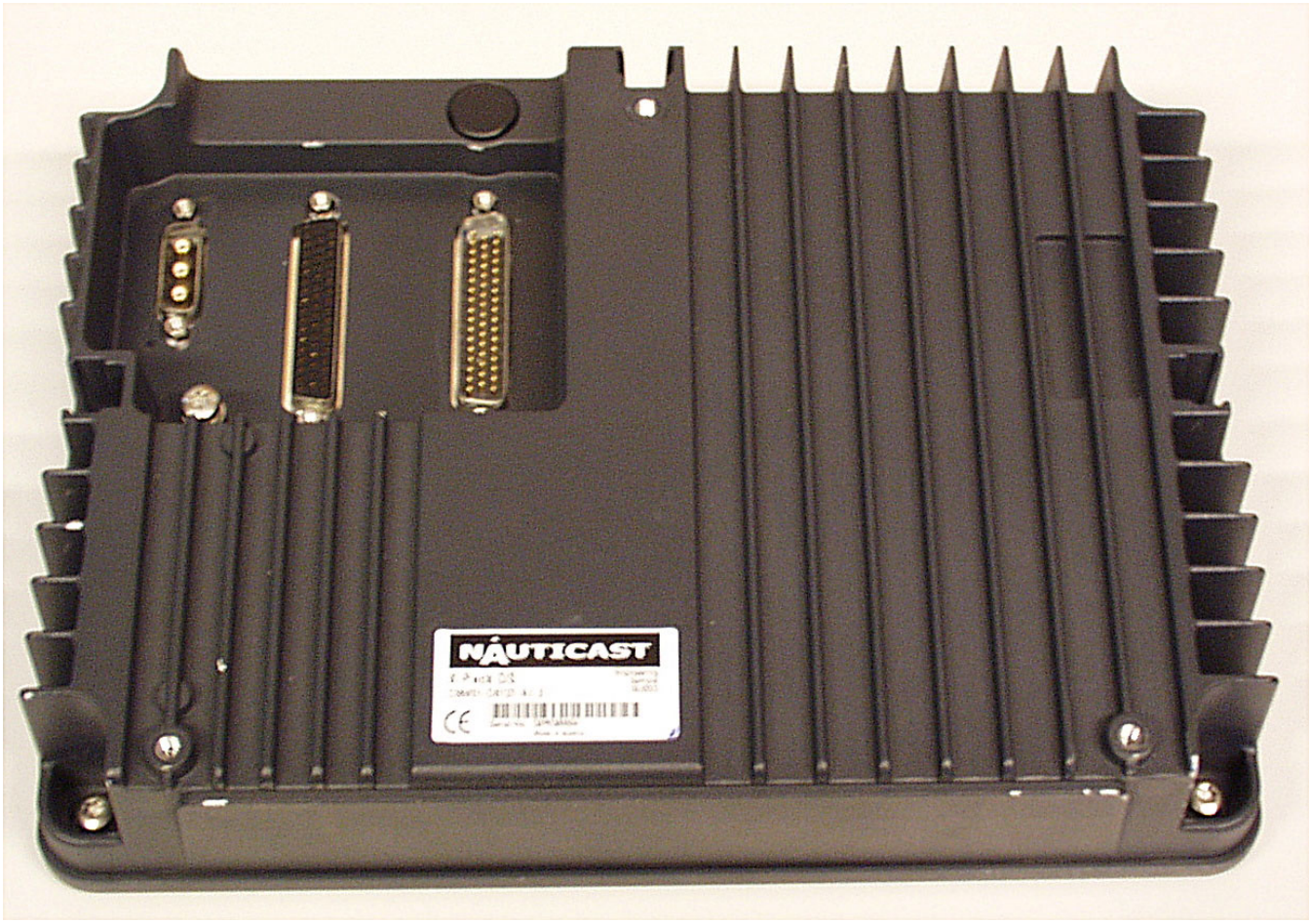
see test clause 8.4





Annex D Photos of equipment under test

D.1 Transponder Unit


NAUTICAST


NAUTICAST
X-Pack DS
C98451-D6127-A1-2
Engineering
Sample
09/2002
Serial-No. Q6P8368694
Made in Austria

D.2 GPS antenna