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: **McMurdo/Transas AIS**

Type: **MT-1**

Applying test standards:

IEC 61993-2 (2001)	Sections 14, 16-21

Test Report No.: 734.2/0046/2003 – S3220

Applicant: **McMurdo/Pains Wessex**
Silver Point, Airport Service Road
PO3 5PB Portsmouth
United Kingdom

Hamburg, 15.10.2003
Federal Maritime and
Hydrographic Agency

on behalf

Bartels
Test engineer

on behalf

Preuss
head of
laboratory

nach DIN EN 45001
akkreditiertes Prüflaboratorium

Federal Maritime and Hydrographic Agency
Bernhard-Nocht-Str. 78

D-20359 Hamburg
Germany

Deutscher Akkreditierungs Rat
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Translation

Deutsche Akkreditierungsstelle Technik (DATech) e.V.

represented in the

Deutschen AkkreditierungsRat

Akkreditierung

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

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 ISO/IEC 17025 to carry out testing in the fields

Marine Equipment
(Navigation Equipment, Radio-Communication Equipment, Life-Saving Appliances)

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The annex is deemed part of this certificate and comprises **16** pages.

DAR-Registration No.: **DAT-P-086/98-10**

Frankfurt/Main, April 19th, 2002

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

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General

Applicant: **McMurdo/Pains Wessex**
Silver Point, Airport Service Road,
PO3 5PB Portsmouth
United Kingdom

Equipment under test:
Type: **MT-1**
Manufacturer: **McMurdo/Pains Wessex**
Silver Point, Airport Service Road,
PO3 5PB Portsmouth
Place of test: BSH test laboratory Hamburg, Room 916
Start of test: 28.11.2002
End of test: 15.10.2003

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 General

1.1 Equipment history

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

1.1.1 EUT system no 1

Transponder				
Type	MT-1	Part No.:	----	
Delivery date	28.11.02	Serial number	0000006	
HW Version:	Delivery date	28.11.02	Version no	----
	Installation date	28.11.02		
SW Version:	Delivery date	28.11.02	Version no	
	Installation date	28.11.02		
SW Version:	Delivery date		Version no	
	Installation date			

MKD				
Type	MT-1 VU	Part No.:	----	
Delivery date	28.11.02	Serial number	000006	
HW Version:	Delivery date	28.11.02	Version no	---
	Installation date	28.11.02		
SW Version:	Delivery date		Version no	
	Installation date			
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	SA-200 GPS Antenna	Part No.:		
Delivery date		Serial number	2002707	
HW Version:	Delivery date		Version no	
	Installation date			

1.1.2 EUT system no 2

Transponder				
Type	MT-1	Part No.:	----	
Delivery date	07.01.2003	Serial number	0000012	
HW Version:	Delivery date	07.01.2003	Version no	
	Installation date	07.01.2003		
SW Version:	Delivery date	07.01.2003	Version no	Jan 07 2003
	Installation date	07.01.2003		
SW Version:	Delivery date	11.02.2003	Version no	Feb 12 2003
	Installation date	11.02.2003		
SW Version:	Delivery date	12.02.2003	Version no	Feb 12 2003
	Installation date	12.02.2003		
SW Version:	Delivery date		Version no	
	Installation date			
SW Version:	Delivery date		Version no	
	Installation date			

MKD				
Type	MT-1 VU	Part No.:	----	
Delivery date	07. 01. 2003	Serial number	000004	
HW Version:	Delivery date	07. 01. 2003	Version no	----
	Installation date	07. 01. 2003		
SW Version:	Delivery date	07. 01. 2003	Version no	----
	Installation date	07. 01. 2003		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	GPS/GLONASS antenna	Part No.:	464648,994	
Delivery date	07.01.2003	Serial number	N194	
HW Version:	Delivery date		Version no	
	Installation date			

1.1.3 EUT system no 3

Transponder				
Type	MT-1	Part No.:	----	
Delivery date	16.04.2003	Serial number	0000004	
HW Version:	Delivery date	16.04.2003	Version no	
	Installation date	16.04.2003		
SW Version:	Delivery date	16.04.2003	Version no	APR 16 2003
	Installation date	16.04.2003		
SW Version:	Delivery date	12.05.2003	Version no	MAY 12 2003
	Installation date	12.05.2003		
SW Version:	Delivery date	14.05.2003	Version no	MAY 14 2003
	Installation date	14.05l2003		
SW Version:	Delivery date		Version no	
	Installation date			

MKD				
Type	MT-1 VU	Part No.:	----	
Delivery date	07. 01. 2003	Serial number	000004	
HW Version:	Delivery date	07. 01. 2003	Version no	----
	Installation date	07. 01. 2003		
SW Version:	Delivery date	07. 01. 2003	Version no	----
	Installation date	07. 01. 2003		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna			
Type	GPS/GLONASS antenna	Part No.:	464648,994
Delivery date	07.01.2003	Serial number	N194
HW Version:	Delivery date	Version no	
	Installation date		

1.1.4 EUT system no 4

Transponder				
Type	MT-1	Part No.:	With GPS receiver	
Delivery date	16.04.2003	Serial number	P/8	
HW Version:	Delivery date	16.06.2003	Version no	0000003
	Installation date	16.06.2003		
HW Version:	Delivery date	08.09.2003	Version no	New GPS receiver module with other baudrate setting
	Installation date	08.09.2003		
SW Version:	Delivery date	16.06.2003	Version no	Jun 11 2003
	Installation date	16.06.2003		
SW Version:	Delivery date		Version no	
	Installation date			

MKD				
Type	MT-1 VU	Part No.:	----	
Delivery date	16. 06. 2003	Serial number	89072002	
HW Version:	Delivery date	16. 06. 2003	Version no	----
	Installation date	16. 06. 2003		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna			
Type	GPS antenna SA-200	Part No.:	
Delivery date	16.06.2003	Serial number	2002896
HW Version:	Delivery date	Version no	
	Installation date		

1.1.5 EUT system no 5

Transponder				
Type	MT-1	Part No.:	With GPS receiver	
Delivery date	25.09.2003	Serial number	89300048	
HW Version:	Delivery date	25.09.2003	Version no	0000003
	Installation date	29.09.2003		
HW Version:	Delivery date	30.09.2003	Version no	New GPS Module, S0300846 YK01/31
	Installation date	30.09.2003		
SW Version:	Delivery date	25.09.2003	Version no	2.01.00 Sept 10 2003
	Installation date	29.09.2003		
SW Version:	Delivery date	15.10.03	Version no	2.01.01 Oct. 15. 2003
	Installation date	15.10.03		

MKD				
Type	MT-1 VU	Part No.:	----	
Delivery date	16. 06. 2003	Serial number	89072002	
HW Version:	Delivery date	16. 06. 2003	Version no	----
	Installation date	16. 06. 2003		
SW Version:	Delivery date	25.09.2003	Version no	2.01.00
	Installation date	29.09.2003		

GPS antenna				
Type	GPS antenna SA-200	Part No.:		
Delivery date	16.06.2003	Serial number	2002896	
HW Version:	Delivery date		Version no	
	Installation date			

1.2 Test environment

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

1.2.1 Test environment no 1

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

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

Equipment no	Start of test	End of test	Test engineer
1	28.11.032	04.12.02	Bartels
2	10.01.03	28.02.03	Bartels
3	09.05.03	15.05.03	Bartels
4	16.06.03	18.06.03	Bartels
4	08.9.03	12.9.03	Bartels / Wendt
5	29.9.03	15.10.03	Bartels

1.2.2 Test environment no 2

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

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

Equipment no	Start of test	End of test	Test engineer
3	28.04.2003	06.05.2003	Warnstedt, Test on GAUSS

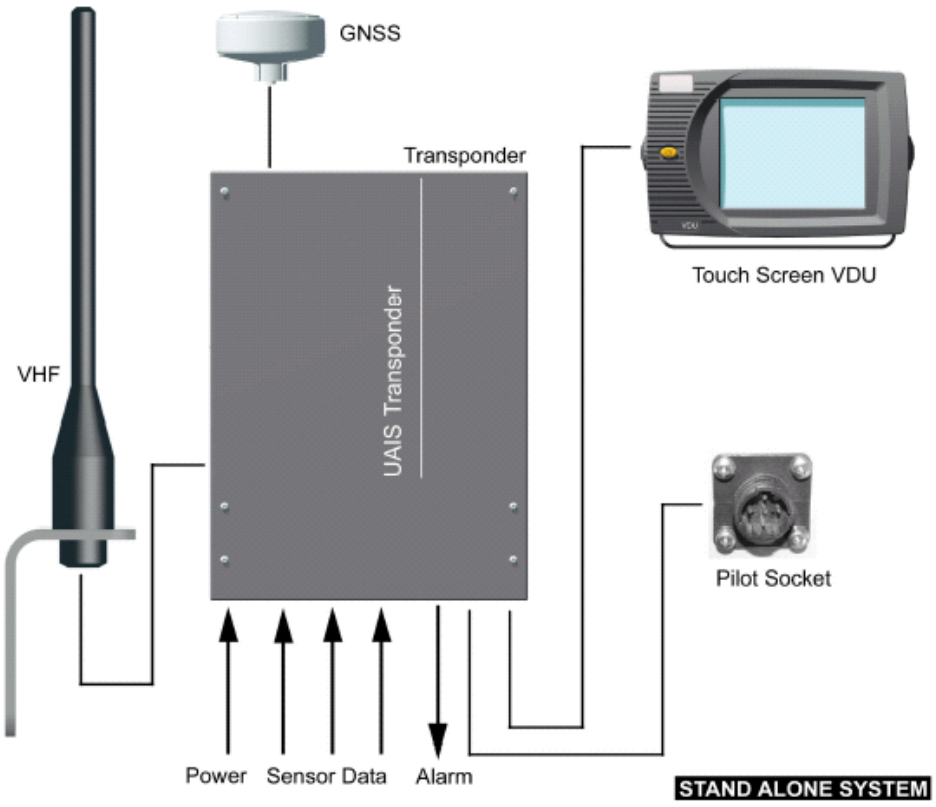
1.3 Composition

Minimum Keyboard and display (MKD)

☐ Internal ☒ Remote ☐ external

internal GNSS

☐ sync only ☒ backup pos. sensor



1.4 Remarks

Result marking:

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

Not yet tested items are marked with a blue background.

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

Date	Result	Status

1.4.1 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**
10.01.03	VSWR alarm	Very often there is an TX malfunction or VSWR limits exceeded alarm. This has been checked with different cables and dummy loads, including the original Transas dummy load at the original cable, without success. At higher reporting rate, there are much more alarms. Retest 17.06.03: No problems with TX malfunction	ok
10.01.03	Transmitter alarm handling	In case of VSWR limits exceeded the EUT should continue transmitting the sheduled position reports to be able to detect end of disconnection, may be with reduced power. The sheduling scheme should not be changed. Retest 14.05.03: EUT continues transmitting in case of VSWR limits exceeded	ok
10.01.03	GPS receiver performance	The GPS receiver often did not fix a position using a re-transmitting GPS antenna in the lab. All other AIS transponders including the GPS tester did work. With the GPS antenna outside on the roof the GPS receiver worked correctly Retest 14.05.03: It is now working correctly with the re-transmitting Antenna	ok
10.01.03	MKD switch on	If power supply has been switched off and on again the MKD should be automatically switched on like the transponder itself.	Rec
14.02.03	Semaphore mode	In a test with the EUT in sync mode 0 and receiving a class B AIS in sync state 3 the EUT switched to semaphore mode. According to clarification 2.11 in "Technical Clarifications of Rec. ITU-R M.1371-1 (ed 1.3), second table, a mobile transponder should never become semaphore if its own sync state is 0 Retest 14.05.03: Does not become semaphore under this condition (own sync state=0). When own sync state is changed to 3 (no GPS) it becomes semaphore as required.	ok
14.02.03	VDO output	The VDO outputs with a channel have the correct length with 28 characters of encapsulated data (168 bit) The VDO outputs without a channel (no tx) include additional 4 characters (3 Byte) resulting in a length of 32 characters of encapsulated data (192 Bit). This may not be compatible with connected equipment 14.05.03 Retest: VDO outputs without a channel have the correct length now.	ok
17.06.03	Marking of connection	At all connection terminals the marking is reversed:	

	terminals	The RxA and TxA terminals are marked as RxB and TxB, and the RxB and TxB terminals are marked as RxA and TxA, Retest 11.08.03: check of new PCB drawing	ok
17.06.03	Default settings	The default settings of the serial lines should be according to the requirements of IEC 61193 and ITU-R M1371. All serial lines were switched off, all baud rates were set to 9600 bd. They should be 38400 baud for the 61162-2 ports (high speed ports) and 4800 baud or 38400 baud for the 61162-1/2 ports (sensor inputs). Retest 30.09.03 Ba: The new unit started with a correct default setting of serial data ports. The manufacturer confirmed that the default setting of the new units is according to the standard.	ok
17.06.03	Length of output sentences	The following sentences exceed the limit of 82 characters (including <cr><lf>: VDO and VDM output of msg 5: 84 characters ACA output: 94 characters VDM of msg 17 is also to long. Length depends on correction data length (number of satellites) The lat and log of the area corners are output with a resolution of 1/1000 min, it should be output with a resolution of 1/10 min Retest 30.09.03 Ba: ACA output and other sentence are of the correct length now	Ok
17.06.03	Input into main port	I had no success to input data into the MAIN port. Output was working correctly, and the input current was the same as the current of the aux port. The AUX port is working correctly. I reconnected the connection cable from the AUX port (working) to the MAIN port (no input). I checked the setup: exactly the same as AUX port. Retest 30.09.03 Ba: Test with a new unit: Main input is ok, no problems. So it seems to be a hardware problem of this specific unit.	ok
17.06.03	RTCM input	The GPS receiver did not switch to differential mode. The status screen on MKD indicated that RTCM messages were received and sent to GPS receiver. A test with msg 17 has the same result: the EUT receives the msg 17 (VDM output) and forwards the correction data to the internal GPS receiver (Status/Diff. data monitor of MKD), but the internal GPS receiver does not switch to differential mode. The correction data received by msg 17 are output by the EUT on the RTCM port. I checked this RTCM data with an RTCM analyser program and it seems to be correct.	

		The EUT also indicates the correct RTCM source (diff. Data selector: Port/Msg 17 on MKD). Retest 09.09.03 Ba: After exchange of the GPS receiver module the internal GPS receiver switched to differential mode when receiving msg 17. The problem was caused by wrong baudrate setting of GPS receiver module	ok

1.5 4.3 Manuals

1.5.1 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.

30.09.03 Ba	Test details – General documentation		
Test item	**Check**	**Remark**	**Result**
Description of AIS	Check that an general function description of AIS as a new system is included. This is not required but recommended in the introduction phase of a new system.	In the installation manual there is a very short explanation of the AIS system. Operational manual is not yet available	
Operating information	Check that an operating manual is included	OP manual 89-042N Iss4 dated 7.10.03	ok
Technical information	Check that an technical manual is included	Included in the installation manual	ok
Installation information	Check that an installation manual is included	INST manual 89-041N Iss5 dated 6.10.03	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		Ok
	Check that mechanical dimension drawings of MKD are available	Including the dimensions of the holder	ok

30.09.03 Ba	Test details – Requirements of IEC 61993-2		
Test item	**Check**	**Remark**	**Result**
Connector of external display	Check that type of connector of external Display is included	External display is connected by connection to a terminal board, noch connector is used	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 illumination required. Display is illuminated and is used as keyboard too.	Ok

1.5.2 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.

30.09.03 Ba	Test details – Requirements of Interface documentation		
Test item	**Check**	**Remark**	**Result**
a) A and B signal lines	Check that identification of A and B signal lines is included	In the manual genarally the names A and B are used for the data lines	Ok
b) Output driver	Check that the output drive capability is included	Can drive up to 12 listeners on a terminated cable	ok
c) Talker sentences of PI ports	Check that list of sentences is included		Ok
	Check that unused fields are noted	No information about unsupported fields Acceptable because all fields have to be supported	acc
c) Talker sentences of long range port	Check that list of sentences is included		Ok
	Check that unused fields are noted	No information about unsupported fields Acceptable because all fields have to be supported	acc
c) Proprietary output sentences	Check if proprietary sentences are included if available	No proprietary output sentences provided	ok
d) Input load	Check that the input load is included	Input load without termination 12 kOhm, with termination 120 Ohm	ok
e) Input sentences of PI ports	Check that list of sentences is included		Ok
	Check that required and unused fields are noted	No information about unused fields Acceptable because all fields have to be used	acc
e) Input sentences of long range port	Check that list of sentences is included		ok
	Check that required and unused fields are noted	No information about unused fields Acceptable because all fields have to be used	acc
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	Same for all sensor input ports	ok
	Check that required and unused fields are noted	included in INST manual 89-041N Iss5 dated 6.10.03	ok
e) Proprietary input sentences	Check if proprietary sentences are included if available	No proprietary input sentences used (“none” in the manual)	ok
f) Software version	Check that the relevant software version is included	“This manual is valid for all hardware and software	ok

		issues of the equipment described"	
f) Hardware version	Check that the relevant hardware version is included	"This manual is valid for all hardware and software issues of the equipment described"	ok
g) Hardware input/output circuit	Check that information about hardware interface components is included	No schematics and information aobut hardware interface components is included. This can be supplied in an extra paper for BSH only, it is not necessary to include it in the customer manual 15.10.03 check ok	ok
h) Standards	Check that the version number and date of update of the relevant standard is included	Only the expression "current standards" is included. For the main standards like ITU-R M.1371, IEC 60945, IEC 61993 and IEC 61162 the version or edition should be explicitly mentioned. In case of IEC 61162 it should be mentioned which version it complies with. This is important for the installer if the EUT is connected to older sensor units 15.10.03 included in INST manual 89-041N Iss5 dated 6.10.03	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.

3.12.02	**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	SOG and COG are default Retest 26.02.03	 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.

3.12.02	**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

3.12.02	**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

Date	**Result**	**Status**
3.12.02		Ok

2.1.2 14.1.2 Assigned mode

(4.2.1 M.1371A2/3.3.6)

Method of measurement

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

a) Slot offset and increment

b) Designated reporting rate.

Record transmitted messages..

Required results

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

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

A test if the assigned reporting rate depends on course, speed and navigation status is done in 2.4.3 14.4.3 Assigned reporting rates.

This test is completely covered by test 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.

4.12.02	**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,1007,B,15,0,3 The Message Sequence Number field has to be a NULL (empty) field Retest 26.02.03	Ok
RX of request	Check that message is received by addressed transponder (VDM)		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

4.12.02	**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,1007,B,15,0,3 The Message Sequence Number field has to be a NULL (empty) field Retest 26.02.03	Ok
RX of request	Check that message is received by addressed transponder (VDM)		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

16.06.03	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,2345,15,,3	Ok
Request msg 20	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	AIABK,2345,15,,3	Ok
Request msg 22	Check the VDO output on PI		Ok
	Record and check the AIABK acknowledgement	AIABK,2345,15,,3	Ok

4.12.02	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,5002,B,15,0,3 $AIABK,1007,B,15,0,3 The Message Sequence Number field has to be a NULL (empty) field Retest 26.02.03	Ok
RX of request	Check that message is received by one of the addressed transponders (VDM)		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.

12.05.03	**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 = 11	ok
Response channel	Check that the response is transmitted on the request channel		Ok

12.05.03	**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		Ok

More detailed interrogation tests are made in 6.3 “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 “”.

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

6.12.02	**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	Only safety related text msg can be sent using MKD not requried	
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	Character are replaced by '@' – character	Ok
ABK sentence	Check that ABK message with ackn. type 2 (could not be broadcast) is output on PI		Ok
acknowledgement	Check AIABK or MKD for corresponding pos. and neg. ack.		Ok

6.12.02	**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
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 .

6.12.02	**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

6.12.02	**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 6.4 18.3 Broadcast messages

6.12.02	**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,,A,8,6,3	Ok
Sequential message identifier in VDO	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
Message on VDL	Check the broadcast message on VDL analyser		Ok
Rx on other transponder (VDM)	Check the VDM output of an other transponder	EUT didn't send msg 8 Retest 27.02.03	 Ok

6.12.02	**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,,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.

9.12.02	**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	VDO output found	Ok
Message on VDL	Check that no message is received by VDL analyser		ok
AIABK acknowledgement	Record the AIABK output, check that type = 2 (could not be broadcast)	$AIABK,,A,8,1,2*16	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.

9.12.02	**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	Not transmitted	Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements, type should be 3	$AIABK,,A,8,1,2*16	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.

9.12.02	**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	EUT didn't used internal SOG and COG Retest 27.02.03	 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

9.12.02	**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

9.12.02	**Test details – Content of msg 5**		
Test item	**Check**	**Remark**	**Result**
Check of the contents of msg 5 (static and voyage related data) Data can be changed using MKD or VSD/SSD input at PI			
MMSI	Check value in msg 5		Ok
AIS version indicator	Check that version is 0		Ok
IMO number	Check value in msg 5		Ok
Call sign	Check value in msg 5		Ok
Name of ship	Check value in msg 5		Ok
Type of ship and cargo type	Check value in msg 5		Ok
Reference point for internal GPS			
Reference point A	Check value in msg 5		Ok
Reference point B	Check value in msg 5		Ok
Reference point C	Check value in msg 5		Ok
Reference point D	Check value in msg 5		Ok
Reference point for EPFS			
Reference point A	Check value in msg 5		Ok
Reference point B	Check value in msg 5		Ok
Reference point C	Check value in msg 5		Ok
Reference point D	Check value in msg 5		Ok
Tx of msg 5	Check if msg 5 is transmitted at change of position source		Ok
Voyage related data			
ETA	Check value in msg 5	A check of date and time is missing it is possible to make an input for 30th of february Retest 27.02.03	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	Terminal is installed but EUT shows always DTE = 1 Retest 27.02.03	Ok
DTE off	Check that DTE flag = 1	EUT shows DTE = 0 if Terminal of Retest 05.05.03	Ok
Type of EPFS			
Apply simulated GLL,VTG, GDT and ROT sentence to the sensor input File name is ais01_gll_vtg_hdt_rot.sst. Change talker according to test item			
Talker = GP	Check type of EPFS = 1	Always EPFS type = 0 Retest 27.02.03	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.

08.01.03	Test details – Change of reporting rate by speed		
Test item	**Check**	**Remark**	**Result**
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data. Change speed according to the test items and record VDL data. After each change wait until new reporting rate is clearly established. Lines are related to Excel table reprate_speed.xls			
Speed = 10 kn	Check that reporting rate is 10 s		ok
Speed = 15 kn	Check slot allocation using msg 3 for new reporting rate		Ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions	1 frame is used to deallocate the actual slots, and in the next frame the new slots are allocated. Therefore the new reporting rate is established after about 1 frame. This does not fulfill the requirement of b). See note) Deallocation of old slots and allocation of new slots should be in the same frame. If an old slots is inside the SI it should be used (see ITU-R M1371 §3.3.5.5.2 14.02.03 Retest: Increase of reporting rate starts immediately	ok
	Check that new rate is established within 1 minute	The new rate is astablished within 1 minute after start of new slot allocation	ok
	Check that new reporting rate is 6 s		ok
Speed = 25 kn	Check slot allocation using msg 3 for new reporting rate		ok
	Check that slot allocation for the new reporting rate has started after 2 transmissions	See increase of reporting rate to 6 s 14.02.03 Retest: Increase of reporting rate starts immediately	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	There is a complete new rescheduling 14.02.03 Retest: Decreasing reporting rate is now done be deallocation of unrequired slots	ok
	Check that new rate starts after 3 min and is established within 4 minutes	Immediately after change of speed the deallocation of the old slots starts. There is no delay of 3 minutes 14.02.03 Retest: No change. Because a frequent change of reporting rate is avoided by the speed hysteresis this immediate reduction of reporting rate is accepted	acc
	Check that new reporting rate is 6 s		ok
Reduction of speed to Speed = 10 kn	Check slot allocation using msg 3 for new reporting rate		ok
	Check that new rate starts after 3 min and is established within 4 minutes	Immediately after change of speed the deallocation of the old slots starts. There is no delay of 3 minutes 14.02.03 Retest: No change. Because a frequent change of reporting rate is avoided by the speed hysteresis this immediate reduction of reporting rate is accepted	acc
	Check that new reporting rate is 10 s		ok
Speed hysteresis	There seems to be a hysteresis of 2 kn. If the speed is increased to 16 kn the reporting rate is increased to 6 s and if the speed is increased to 25 kn the reporting rate is increased to 2 s If the speed is reduced to 21 kn the reporting rates is decreased to 6 s and if the speed is reduced to 12 kn the reporting rate is decreased to 10 s 14.02.03 Retest: no change The use of a speed hysteresis to avoid frequent changes of reporting rate instead of a time delay is acceptable because it is a equivalent or even better solution. To fullfill the IMO requirements for the reporting rate the hysteresis should be below the IMO limits of 14 and 23 kn, e.g a hysteresis from 12 to 14 kn and from 21 to 23 kn. 12.05.03 Retest: Hysteresis is now from 12 to 14 kn and from 21 to 23 kn.		acc ok

Note)

The AIS transponders are also used on high speed crafts with high acceleration (fast increase of speed). Mainly in this case it is very important to increase the reporting rate immediately, not with a delay of 1 minute.

08.01.03	**Test details – Change of reporting rate by heading**		
Test item	**Check**	**Remark**	**Result**
Apply simulated GLL sentence to the sensor input. Set Navigation status to 0 (under way) File name is ais01_gll_vtg_hdt_rot.sst Record the VDL data of the procedure according to the following test items, generate a table and diagram from that data and check the items using the recorded data. Change speed according to the test items and record VDL data. After each change wait until new reporting rate is clearly established. Lines are related to Excel table reprate_speed.xls			
Speed = 10 kn Heading = 0	Check that reporting rate is 10 s		Ok
Speed = 10 kn Increase heading by 10 degr. steps some times	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	A complete new rescheduling is done See note) 14.02.03_Retest: no change Retest 12.05.03: ITDMA slots are inserted to increase the reporting rate	ok
	Check that new rate is established immediately	Because in the first frame the old slots are deallocated the new reporting rate is established after 1 minute 14.02.03_Retest: The new reporting starts immediately	ok
	Check that new reporting rate is 3 1/3 s		Ok
Speed = 10 kn Stop Increasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)	A complete new rescheduling is done 14.02.03_Retest: A rescheduling is done by release of unrequired slots	ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change	Because of the complete new rescheduling establishing the new (reduced) reporting rate is established after about 2 min 14.02.03_Retest: no change Retest 12.05.03: The higher reporting rate is stopped within 50 s	ok
	Check that new reporting rate is 10 s again		ok
Speed = 15 kn	Wait until speed is 6 s with msg type 1		Ok

Speed = 15 kn Decrease heading by 10 degr. steps sometimes	Check slot allocation by inserting ITDMA slots (msg 3) for new reporting rate	See at 10 kn Retest 12.05.03: ITDMA slots are inserted to increase the reporting rate	ok
	Check that new rate is established immediately		Ok
	Check that new reporting rate is 2 s		Ok
Speed = 15 kn Stop decreasing heading	Check slot allocation by stopping insertion of ITDMA slots (msg 3)	See at 10 kn	ok
	Check that new rate is established within (30 s averaging+20 s delay =) 50 s after stop of heading change	See at 10 kn Retest 12.05.03: The higher reporting rate is stopped within 50 s	ok
	Check that new reporting rate is 6 s again		Ok
Speed = 25 kn	Wait until speed is 2 s with msg type 1		Ok
Speed = 25 kn Increase heading by 10 degr. steps sometimes	Check that no change		Ok
Speed = 25 kn Stop Increasing heading	Check that no change		Ok

Note)
In ITU-R M1371, §3.3.5.5 for temporary changes the increase of reporting rate should be done by inserting ITDMA messages between the scheduled position reports. Changing course is a typically temporary change because the course is normally changing for a short time until the new course is established.

Therefore the reporting times for changing course course are defined 3 times the basic reporting rate (defined by speed)

14.02.03	**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	EUT starts immediately change of reporting rate	ok
	Check that new reporting rate is 10 s		ok

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

2.4.2 14.4.2 Change of navigational status

(6.5.2)

Method of measurement

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

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

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

c) set NavStatus to other values

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

Required results

a) Reporting rate shall be 3 min.

b) Reporting rate shall be 10 s.

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

14.02.03	**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 = 40 (offset to first assigned slot = 40) and slot increment parameter = 3 (increment = 225 = 6 s)			
NavStatus = 0 (under way using engine), Speed = 10 kn • Send assignment cmd	Check that slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
In assigned mode • change NavStatus to 1 (at anchor)	Check that Navstatus has no effect: EUT maintains assigned mode		Ok
In autonomous mode: NavStatus = 1 (at anchor), speed = 2 kn • Send assignment cmd	Check that the assignment command is accepted		Ok
Nav Status = 0, speed = 10 kn • Send assignment	Check that assignment command is executed		Ok
• Increase speed to 15 kn	Check that EUT maintains assignment mode		Ok
• Increase speed to 25 kn	Check that EUT reverts to autonomous mode: reporting rate = 2 s and Msg type = 1 (change with msg 3)	Does not leave assigned mode and increase the reporting rate Retest 14.05.03: EUT reverts to autonomous mode and increased reporting rate immediately to 2 s	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)	Does not increase the reporting rate Retest 14.05.03: EUT reverts to autonomous mode and increases reporting rate immediately and temporarily to 2 s. After end of heading change the reporting rate is reduced to the autonomous reporting rate as defined by speed. The additional msg 3 for increased reporting rate have the keep flag set to 0	ok

13.05.03	Test details b) – Rate assignment		
Test item	**Check**	**Remark**	**Result**
Send an assignment message 16 with offset = 100 (reporting rate = 100 msg/10 min), increment=0			
NavStatus = 0 (under way using engine), Speed = 10 kn • Send assignment cmd	Check that slot offset = 225 and reporting rate is 6 s And msg type = 2		Ok
In assigned mode • change NavStatus to 1 (at anchor)	Check that Navstatus has no effect: EUT maintains assigned mode		ok
In autonomous mode: NavStatus = 1 (at anchor), speed = 2 kn • Send assignment cmd	Check that the assignment command is accepted		Ok
Nav Status = 0, speed = 10 kn • Send assignment	Check that assignment command is executed		Ok
• Increase speed to 15 kn	Check that EUT maintains assignement 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)		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)	EUT reverts to autonomous mode and increases reporting rate immediately and temporarily to 2 s. After end of heading change the reporting rate is reduced to the autonomous reporting rate as defined by speed. The additional msg 3 for increased reporting rate have the keep flag set to 0	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.

14.02.03	**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
Wait for next msg 5	Record if the next msg 5 is transmitted: • 6 min after regular msg 5 or • 6 min after additional msg 5	Next msg 15 is 6 min after regular msg 5	
Change voyage related data using VSD sentence	Check that msg 5 is transmitted within 1 min		Ok
Change static data using MKD	Check that msg 5 is transmitted within 1 min		Ok
Change position source with different ref. point data (see 61993 6.10.3.4)	Check that msg 5 is transmitted within 1 min because of change of ref. point data	A msg 5 is transmitted at change from external to internal sensor No msg 5 is transmitted at change from internal to external sensor Retest 05.05.03	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.

9.12.02	**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	No log information found Retest 17.06.03: Security log is displayed on MKDS	OK
Read out recorded data	Check that all switch off times are correctly recorded	See below / 15.10.03	ok

Date	**Result**	**Status**
17.06.03	The first 2 entries of the 17.06.03 include the correct date, in the following entries the date is set to 00 00 00. The GPS receiver was working all the time.	
01.10.03	Retest: A more detailed test shows, that the date is set correctly if the position from the internal GPS receiver is used. If the position is used from external GPS and no date is provided (as in RMC sentence) the date of power down is set to 00-00-00. On the other hand the date is displayed correctly on the MKD (Show sensors) so is is available. Why is it not used for the security log? This function has to be changed so that the date of power down is correctly set also if the external GNSS does not provide a date (RMC is not used) or it has to be clearly indicated in the ínstallation manual that the RMC sentence **must** be provided at the external GNSS input. We recommend to change the software to be on the safe side.	
15.10.03	corrected ; date is stored together with time	0k

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.

9.12.02	**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		Ok
b) Switch off EUT for approx. 0.5 s	Check that EUT starts transmission within 2 min		Ok

2.7 14.7 Channel selection

(6.9)

Method of measurement

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

a) manually,

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

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

d) By transmission of DSC telecommand to EUT

Record the VDL messages.

Required results

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

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

13.05.03	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 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		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	When it comes in use	Ok
	Check ACA output at PI	When it comes in use	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	There is not TXT output when bandwidth is changed Retest 14.05.03: TXT output ok	ok
	Check ACA output at PI	There is not ACA output when bandwidth is changed Retest 14.05.03: ACA output 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		Ok
	Check TXT output at PI	There is not TXT channels are changed Retest 14.05.03: TXT output ok	ok
	Check ACA output at PI	There is not ACA output when channels are changed Retest 14.05.03: ACA output ok	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.

14.05.03	**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)

9.12.02	**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	There is no alarm sentence found. Recommendation : There should be an 'empty' alarm sentence send with a repetition rate of 1 min Retest 27.02.03	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".

09.12.02	**Test details - Loss of power supply**		
Test item	**Check**	**Remark**	**Result**
Switch off power supply	Check that alarm relay output is active.	Output shows high resistance like an open contact external relais needed Retest 05.05.03	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.

09.12.02	**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 not stopped Retest 05.05.03	Ok
ALR output	Check that ALR sentence ID 001 is output at PI	ALR 078 instead of 001 and 002 found Retest 05.05.03	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	With external relais ok	Ok
MKD display	Check that the alarm is displayed on the MKD	Displayed as alarm 002 and 078 Retest 05.05.03	Ok
Send an ACK sentence	Check that alarm relay deactivated		Ok
	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated		Ok
Reconnect VHF antenna	Check that ALR sentence is updated		Ok
	Check that alarm display on the MKD is updated		Ok

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.

10.12.02	**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		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.

15.10.03	**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	Rx analyses the frequency lock signal and generates alarm: Rx malfunction <=> (frequency is not locked)	ok
ALR output	Check that documentation describes that an ALR sentence with ID 003 (RX1), ID 004 (RX2) and ID 005 (DSC) is sent.	see above	ok

2.9.2.4 14.9.2.4 Loss of UTC

Method of measurement

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

Required result

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

10.12.02	**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		Ok
TXT output	Check that a TXT sentence with ID 007 is output at PI		Ok
Alarm relay	Check that the alarm relay output is not activated		Ok
MKD display	Check that the status display of the MKD is updated		Ok

2.9.2.5 14.9.2.5 Remote MKD disconnection, when so configured

Method of measurement

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

a) Disconnect the connection to the remote MKD.

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

Required result

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

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

05.05.03	**Test details - Remote MKD disconnection**		
Test item	**Check**	**Remark**	**Result**
Disconnect the connection to the remote MKD.			
Continuation of Tx	Check that transmission continues		Ok
DTE flag	Check that the DTE flag in msg 5 is set to 1	Retest 01.10.03 Ba: The disconnection of the MKD does not change the DTE flag. We recommend to set the DTE flag if MKD is disconnected. 15.10.03 changed, ok	ok
ALR output	Check that ALR sentence ID 008 is output at PI		Ok
Alarm relay	Check that alarm relay is activated		Ok
MKD display	Check that loss of connection to the transponder is displayed on the MKD	Could not check because power and data are on the same plug	--
Send an ACK sentence	Check that alarm relay deactivated	--	--
	Check that ALR sentence is updated		Ok
Reconnect MKD	Check that ALR sentence is updated		Ok
MKD display	Check that the MKD display is updated	Could not check because power and data are on the same plug	--

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.

10.12.02	**Test details - Position priority – changing downwards**		
Test item	**Check**	**Remark**	**Result**
Connect sensor inputs and correction data according to the test items			
a) • External DGNSS • Internal DGNSS if available, else internal GNSS	Check that external position is used		Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to sensor input data		Ok
b) Change from a: • External sensor mode from DGNSS to GNSS • Internal DGNSS by msg 17	Check that internal position is used	Test on 12.05.03	Ok
	Check that position accuracy flag = 1		Ok
	Check that RAIM flag is set according to documentation of internal GPS		Ok
	Check that msg 5 is output with new ref. point		Ok
	Check that TXT sentence with ID 024 is output on PI	ID 023 is output And ID 028 for SOG/COG Retest 12.05.03: ID 024 is output	ok
	Check that status display of MKD is updated according to TXT sentence	MKD display is according to ID 023 Retest 12.05.03: MKD display is accortint to ID 024	ok
c) Change from b: • Internal DGNSS by beacon • External sensor mode is GNSS	Check that internal position is used	Test on 12.05.03	Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 023 is output on PI		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
d) Change from c: • Remove correction data for Internal GNSS • External GNSS input	Check that external position is used	Test on 12.05.03	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 027 for SOG/COG	Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
d) Change from a: • Change external sensor mode to GNSS • Internal GNSS available	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 TXT sentence with ID 022 is output on PI		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
e) Change from d: • Remove external GNSS input • Internal GNSS available	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		Ok
	Check that ALR message with ID 025 (external EPFS lost) is output on PI		Ok
	Check that TXT sentence with ID 025 is output on PI		Ok
	Check that an alarm according to ALR message is displayed on MKD		Ok
	Check that status display of MKD is updated according to TXT sentence		Ok
f) Change from e: • Disable internal GNSS • No external GNSS input	Check that default position is used		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		Ok
Status change time	Check that status is changed after 5 s		Ok

10.12.02	**Test details - Position priority – changing upwards**		
Test item	**Check**	**Remark**	**Result**
Connect sensor inputs and correction data according to the test items			
f) Start with: • No external GNSS input • No Internal GNSS	Check that default position is used		Ok
	Check that position accuracy flag = 0		Ok
	Check that RAIM flag = 0		Ok

	Check that ALR message with ID 026 (No sensor position) is output on PI every 30 s		Ok
e) Change from f: • Activate internal GNSS • No external GNSS input	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		Ok
	Check that ALR message with ID 026 is updated	Not found ALR 026 is not longer send by EUT after internal GPS is fixed Retest 27.02.03	Ok
	Check that TXT sentence with ID 025 is output on PI	TXT 28 'internal SOG COG in use' instead of TXT 025 Retest 27.02.03	Ok
	Check that the alarm on MKD according to ALR ID 026 is updated		Ok
	Check that status display of MKD is updated according to TXT ID 025	Not found Retest 27.02.03	Ok
d) Change from e: • Apply external GNSS input • Internal GNSS is available	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		Ok
	Check that ALR message with ID 025 is updated		Ok
	Check that TXT sentence with ID 022 is output on PI		Ok
	Check that the alarm on MKD according to ALR ID 025 is updated		Ok
	Check that status display of MKD is updated according to TXT ID 022		Ok
c) Change from d: • Apply correction data for DGNSS by beacon • External mode is GNSS	Check that internal position is used	Test on 12.05.03	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	And ID 028 for SOG/COG	Ok
	Check that status display of MKD is updated according to TXT ID 023		Ok
b) Change from c: • Apply correction data for DGNSS by msg 17 • Beacon data available • External mode is GNSS	Check that internal position is used	Test on 15.05.03 note: for about 30 s the internal receiver is switched to GNSS mode and position source is switched to external	ok / rec
	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 024 is output on PI	ID 024 is output	ok
	Check that status display of MKD is updated according to TXT ID 024	MKD display is according to ID 024	ok
b) Change from b: • Remove correction data for DGNSS by msg 17 • Correction data from beacon available • External mode is GNSS	Check that internal position is used	Test on 15.05.03	Ok
	Check that position accuracy flag = 1		Ok
	Check that TXT sentence with ID 023 is output on PI	No TXT output Retest 09.09.03: TXT output ID 023 is ok	ok
	Check that status display of MKD is updated according to TXT ID 023	MKD display is according to ID 024	ok
a) Change from b: • Change external mode to DGNSS • Internal DGNSS	Check that external position is used	Test on 12.05.03	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 27 for SOG/COG	ok
	Check that status display of MKD is updated according to TXT ID 021		Ok
a) Change from d: • Change external mode to DGNSS • Internal GNSS	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	TXT 061 instead of TXT 021 Retest 27.02.03	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

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.

10.12.02	**Test details - Heading and ROT**		
Test item	**Check**	**Remark**	**Result**
Connect Heading and ROT input according to test items			
Start with: • Valid heading • Valid ROT	Check that heading and ROT are used in VDL message		Ok
	Check that alarm relay is inactive		Ok
	Check that no ALR output is active		Ok
a) Disconnect heading and ROT • No heading • No ROT	Check that heading in VDL = default		Ok
	Check that ROT in VDL = default		Ok
	Check that ALR message with ID 032 (heading invalid) is output on PI		Ok
	Check that ALR message with ID 035 (ROT invalid) is output on PI		Ok
	Check that alarm relay is active		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	Not found Retest 27.02.03	Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI	Not found Retest 27.02.03	Ok
	Check that alarm relay is inactive		Ok

	Check that the alarm display on MKD is updated		Ok
	Check that the status display on MKD is updated (heading and ROT valid)		ok
c) Change ROT talker • Valid heading • ROT, talker not TI	Check that ROT in VDL is + 127 for ROT > 10 °/min, turning right	EUT didn't scan the talker it use the ROT value independend from talker Retest 28.02.03	Ok
	Check that ROT in VDL is + 127 for ROT < -10 °/min, turning left		Ok
	Check that TXT message with ID 034 (other ROT in use) is output on PI		Ok
	Check that the status display on MKD is updated (other ROT)		Ok
d) Change ROT talker to TI • Valid heading • ROT, talker TI	Check that ROT in VDL ok		Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI		Ok
	Check that the status display on MKD is updated (ROT in use)		Ok
b) Disconnect ROT • Valid heading • No ROT Change heading > 5 °/30s	Check that ROT in VDL is + 127 for increasing heading	Didn't work Retest 28.02.03	Ok
	Check that ROT in VDL is - 127 for decreasing heading		Ok
	Check that TXT message with ID 034 (other ROT in use) is output on PI		Ok
c) Reconnect ROT • Valid heading • Valid ROT from TI	Check that ROT in VDL ok		Ok
	Check that TXT message with ID 033 (ROT in use) is output on PI		Ok

2.9.3.3 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.

10.12.02	**Test details - Speed sensor**		
Test item	**Check**	**Remark**	**Result**
Connect external speed sensor input according to test items. Internal GPS is available			
a) Connect external position and speed • External Position • External speed	Check that external SOG is used in VDL message 1,2,3		Ok
	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	Not found Retest 28.02.03	 Ok
	Check that alarm relay is inactive		Ok
	Check that the status according to TXT msg ID 027 is displayed on MKD		ok
b) Disconnect external position • No external Position • External speed	Check that SOG from internal GPS is used in VDL message 1,2,3	EUT didn't use internal COG and SOG Retest 28.02.03	 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
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	See above Retest 28.02.03	 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

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

10.12.02	**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	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	Ok
	PA (Position accuracy) flag	Not required	Ok
	SOG and COG	Recommended	Ok
	True heading	Recommended	Ok
	Navigational status	Recommended	Ok
	RAIM flag	Not required	Ok
MSG 5 Display of static and voyage related ship data - required -	MMSI	recommended	Ok
	IMO number	Not required	--
	Call sign	Recommended	Ok
	Name of ship	Required	Ok
	Type of ship and cargo	Recommended	Ok
	Dimension/Reference for position	Length recommended	Ok
	Type of EPFD	Not required	--
	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	---
	PA flag	Not required	Ok
	RAIM flag	Not required	Ok
MSG 9 SAR aircraft position report - optional -	MMSI	Recommended	Ok
	Position (RNG, BRG); Check values	Recommended	Ok
	Position (Lat,Lon)	Recommended	Ok
	Time	Not required	---
	PA flag	Not required	Ok
	SOG and COG	Recommended	Ok
	RAIM flag	Not required	Ok
	DTE flag	Not required	Ok

MSG 12/14 Safety related text message - Required -	MMSI	Required EUT shows sender only with call sign Retest 13.05.03: If callsign is available it is diplayed otherwise MMSI is displayed	acc
	Text content	Required	Ok
	Broadcast or selective	Recommended	Ok
MSG 18,19 Class B position report - required -	MMSI	Required	Ok
	Position (RNG, BRG); Check values	required	Ok
	Position (Lat,Lon)	recommended	Ok
	Time	Not required	---
	PA flag	Not required	Ok
	SOG and COG	Recommended	Ok
	True heading	Recommended	Ok
	RAIM flag	Not required	Ok
	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	Ok
	Type of Aids to navigation	Recommended	Ok
	Name of Aids to navigation	Recommended	Ok
	Position (RNG, BRG); Check values	Recommended	Ok
	Position (Lat,Lon)	Recommended	Ok
	PA flag	Not required	Ok
	RAIM flag	Not required	Ok
	Virtual/Pseudo AtoN flag	Recommended	----
	Dimension/Reference for position	Length recommended Values A,B,C,D indicated	ok
	Type of EPFD	Not required	Ok
	Off position indicator	Recommended	
	SOG, COG are not displayed or show default values	“Undef” is displaed	ok
Means to select messages	Check that means to select received messages are available	By UP/DOWN button	Ok
Means to select data fields	Check that means to select data fields are available	By UP/DOWN button and a “more” button	Ok

10.12.02	**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	Not protected Retest 28.02.03	 Ok
Type of ship and cargo	Check that data can be input		Ok
	Check if input by number or by selection of items	By number	Ok
Dimension/Reference for position	Check that data for internal GPS antenna position can be input		Ok
	Check that data for external EPFSD position can be input		Ok
Maximum static draught	Check that data can be input		Ok
Destination	Check that name of destination can be input		Ok
	Check that estimated time of arrival can be input		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.

10.12.02	**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		--
	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.

13.05.03	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	10 Areas can be stored 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	In tune mode	ok
Entry of a new area	Check selection between changing an existing area and creating a new regional area entry	Is selected automatically depending on if the changed area is overlapping the old one	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		Ok
Enter too small area (<20 nm)	Check that entry is refused	Not checked	acc
Enter too large area (> 200 nm)	Check that entry is refused	Not checked	acc
Enter a region according to M.1371-1 A2/4.1 figure 4.1.5A (4 adjacent areas)	Check that entry is refused	Not checked. The EUT can handle up to 4 areas adjacent to 1 corner point. Therefore there is no need to reject this areas	Acc
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	Can not be changed	Ok
	Check change of RX/TX mode	Can not be changed	Ok

	Check change transmission power	Can not be changed	Ok

	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 channel 1 malfunction	Check documentation		ok
004	Rx channel 2 malfunction	Check documentation		ok
005	Rx channel 70 malfunction	Check documentation		ok
006	General AIS failure	Check documentation		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		

13.05.03	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		
022	External GNSS in use	Check is done in 2.9.3.1		
023	Internal DGNSS in use (beacon)	Check is done in 2.9.3.1		
024	Internal DGNSS in use (msg 17)	Check is done in 2.9.3.1		
025	internal GNSS in use	Check is done in 2.9.3.1		
027	External SOG/COG in use	Check is done in 2.9.3.3		
028	Internal SOG/COG in use	Check is done in 2.9.3.3		
031	Heading valid	Check is done in 2.9.3.2		
033	Rate of Turn indicator in use	Check is done in 2.9.3.2		
034	Other ROT source in use	Check is done in 2.9.3.2		
036	Channel management parameters changed	Check that status change is displayed if channel management parameters are changed.		ok

2.10.4 Ergonomic aspects

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

Topic	Description

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

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

4.1.2 16.1.2 Synchronisation test without UTC, semaphore

(M.1371 A1/3.1.1.4)

Method of measurement

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

Required results

Transmitted CommState shall fit the Synchronisation mode.

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

09.01.03	**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

07.01.03	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	Changes reporting rate to 2 s (semaphore mode). No other AIS station received, ID of base station is higher than ID of EUT 12.02.03 Retest: Reporting rate is not changed	ok
• GPS disabled • Remove Base station	Check that sync state is 3 (no UTC source)		Ok
• Operate without GPS • Other Transponders all without GPS, • Not semaphore 1)	Check that sync state is 3		Ok
	Check that report rate is 10 s		Ok
• Enable GPS • 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.

09.01.03	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 flag is at about 24.2 to 24.4 ms. So the slot lenght is not exceeded	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 .

14.05.03	Test details - Synchronisation jitter		
Test item	**Check**	**Remark**	**Result**
Operate device at 25 kHz bandwidth at a reporting rate of 2 s (speed = 25 kn). C heck the slot start time T2 using the VDL analyser.			
UTC direct	Check that T2 is in the range of 3.328 ms +/- 0.108 ms The measured value of the VDL analyser (in units of 10 µs) should be in the range of 330 ... 360 (RMS, inc. Tolerance of VDL analyser)	Measured values is in the range of 341 ... 348	ok
UTC indirect	Check that T2 is in the range of +/- 0.312 ms compared to the T2 value of the sync source The measured value of the VDL analyser (in units of 10 µs) should be in the range of +/- 31 of the measured values of the sync source	Measured values is in the range of 365 to 371, synchronised to a Unit with the value of about 345 (range is 314...376)	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

09.01.03	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.

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

4.6 16.6 Slot allocation (Channel access protocols)

(M.1371 A1/3.3.1)

4.6.1 16.6.1 Network entry

Method of measurement

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

Required results

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

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

06.01.03	**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	First transmission after 1min20s	ok
Initial message type	Check that the network entry is done with msg 3	Only the first 4 messages are done with msg 3, the next 2 message are of type 1. According to ITU-R M1371, 3.3.5.3.5 the transmissions in the first frame should be ITDMA packets, which are of msg type 3. See note) Functionally this works correctly because the last 2 msg of the first frame phase do not allocate further slots. Therefore the ITDMA com state is not required and msg type 1 could be used. Therefore this solution can be accepted	acc
Keep flag	Check that the keep flag is set in msg 3		Ok
Slot offsets	Check that the slot offsets of msg 3 are in the range 750 +/- 75= 675...825		ok
Slot use	Check that the allocated slots are used in the next frame		ok
Message type	Check that the message type is changed to 1 after initial frame		ok
Timeout	Check that the time-out in the 2nd frame is between 2 and 6 (decremented from initial 3..7)	Values 3...6 are used	ok

4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)

(M.1371 A1/3.3.2)

Method of measurement

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

Required results

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

06.01.03	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	Values 3....7 are used	ok
Slots used	Check that the slots indicated in CommState match the slots used	There is a constant offset of –37 slots Note: If in UTC indirect mode (mode 1) the slot number in commState is correct! 08.01.03 Retest: Slot numbers in the position reports are correct now	ok
Slots allocated at time-out 0	Check that the slots are used in the next frame		ok
	Check the slot offset is 2250 +/- Selection Interval (2175...2325)		ok
CommState sub message	Check that for time-out 3,5,7 the number of received stations is indicated		Ok
	Check that for time-out 2,4,6 the slot number is indicated		Ok
	Check that for time-out 1 the correct value of UTC is indicated		Ok
	Check that for time-out 0 the slot increment is indicated		Ok
Alternating channels	Check that the position reports are transmitted on alternating channels		Ok
Msg 5	Check that the channel alternating of position report is not impaired by msg 5		Ok
Others	Check the recorded data for other possibly incorrect items	No other incorrect items found	ok

4.6.3 16.6.3 Single message transmission (RATDMA)

(M.1371 A1/3.3.2)

Method of measurement

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

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

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

Required results

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

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

09.01.03	**Test details – RATDMA transmission**		
Test item	**Check**	**Remark**	**Result**
Apply an binary broadcast message 8 to the PI port of the EUT. File name is: AIBBM_bin.sst			
Standard test environment	Check that msg 8 is transmitted within 4 s		ok
90 % channel load Generate channel load as described below 1).	Check that msg 8 is transmitted within 4 s	Not yet tested, because EUT restarts at 90% load Retest 13.05.03: transmission within 1..2 s	ok

09.01.03	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	More than 20 msg are transmitted in one frame (24 in 1 frame, 28 in next frame) 12.02.03 Retest: ok, not more than 20 msg/frame are transmitted	ok
ABK output	Check that ABK sentence is output with acknowledgement type = 2 for the rejected sentences.	No ABK output and no VDO for missing transmissions, No ABK with type 2 found 12.02.03 Retest: The msg which can not be transmitted because of the 20 slot rule are not refused but delayed. Therefore no ABK with type 2 is output.	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.

09.01.03	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	Does not use a regular reporting rate, channels are not alternating, First test: channels are alternating after 5 msg (5msg on ch1, 5 msg on ch2 ...) Repetition: see PI log 12.02.03 Retest: ok, 12 msg/min	ok
Offset value = 1000 (> 600 msg/10 min	Check that the reporting rate is 600/10min = 60/min = 1s	The reporting rate is 1000 msg/min. It is not limited to 600 msg/min 12.02.03 Retest: ok, 60 msg/min	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).

*08.01.03	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	The assigned mode does not start at the assigned offset but the EUT releases the old slots in a first frame and then starts assigned mode with msg 2. Assigned mode should start at the assigned slot offset, and release of old slots should be done in parallel in the first frame 12.02.03 Retest: ok	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	See "First message"	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	EUT uses the assigned slots only if the slot increment is directly included in the msg 16, not the index as defined in Technical clarifications to M1371, Ed 1.3, number 2.45 12.02.03 Retest: ok, slot increment of 4 is used correctly	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	The timeout is 6	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		ok

	Check that EUT initialises autonomous mode like network entry		ok

08.01.03	**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	In the first frame the old slots are released, in the next frame the new slots are allocated. This should be done in parallel in the first frame 12.02.03 Retest: ok	ok
Message type	Check that message type of position report is 2 instead of msg 1		Ok
Reporting rate	Check that the reporting is 300 msg/10 min = 30msg/frame = 2 s		Ok
Alternating channels	Check that position report is sent alternating on channel A and B		Ok
Initialisation	Check that the Initialisation is according to changing reporting rate using msg 3 to allocate new slots		Ok
Timeout	Check that the assigned timeout is between 2 and 6	All slots get the same timeout of 6	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	Assigned mode is finished 12 minutes after the first msg 16 and 6 min after the last msg 16	ok
Switch back to autonomous mode	Check that the EUT reverts to normal reporting rate between 4 and 8 minutes after last msg 16		ok
Excel table line 156 and 157	2 unallocated slots are used for the start of rescheduling to the new autonomous reporting rate. The last 2 slot of the assigned mode should be used for this purpose 12.02.03 Retest: ok, slots of the previous frame are used		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.

09.01.03	**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	A VDM sentence of the received msg 16 has been output. We recommend to output only messages addressed to the own station. 11.02.03 This output is correct because EUT evaluates this message to mark the slots assigned to another station as busy	ok
Wrong MMSI	Check that the EUT does not change the reporting rate	EUT did 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.

11.02.03	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

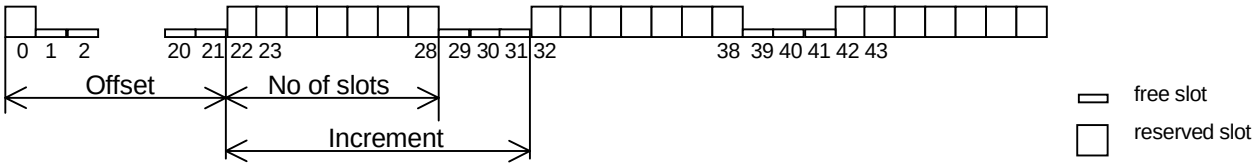
Confirm that EUT does not use slots allocated by msg 20 for own transmissions until timeout of 4 to 8 min.

11.02.03	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 according to the description below. To get enough new slot allocations within time-out time set reporting rate to 2 s (speed > 25 kn)			
Record VDL messages	Check that the reserved slots are not used by the EUT within a time-out of 4-8 minutes		Ok
End of reservation	Check that after end of reservation all slots are used again.		Ok

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

- Msg 20 is transmitted in slot 0 in each frame
- Offset number 1: 22
- Time out 1: 3
- Number of slots: 7
- Increment: 10

FATDMA reservation



4.7 16.7 Message Formats

(M.1371 A1/3.3.7)

4.7.1 16.7.1 Received messages

Method of measurement

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

Required results

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

14.02.03	Test details – Content of msg 1,2,3 Position report		
Test item	**Check**	**Remark**	**Result**
Transmit a message 1,2 or 3 from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
Repeat indicator	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
Navigational status	Check the field content		Ok
Rate of Turn	Check the field content		Ok
SOG	Check the field content		Ok
Position accuracy flag	Check the field content		Ok
Longitude	Check the field content		Ok
Latitude	Check the field content		Ok
COG	Check the field content		Ok
True heading	Check the field content		Ok
Time stamp	Check the field content		Ok
RAIM flag	Check the field content		Ok
Communication state	Check the field content		
	The communication state is checked in 4.6.2 16.6.2 Autonomous scheduled transmissions (SOTDMA)		

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

14.02.03	**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	EUT is counting up in steps of 2 30.09.03 Ba: EUT is counting correctly in steps of 1	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

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

14.02.03	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

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

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

14.02.03	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		Ok
Msg11 response	No response if addressed to other station		ok

14.02.03	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

14.02.03	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

14.02.03	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

14.02.03	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

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

14.02.03	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

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

14.02.03	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		---
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

14.02.03	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

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

14.02.03	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		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

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

Message content result overview

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

Message type	PI out Yes/no	PI output Result	Response required (in addition to PI output)	Response result
Msg1,2,3	Yes	Ok	No	
Msg 4	Yes	Ok	No	
Msg 5	Yes	Ok	No	
Msg 6	Yes	Ok	Tx of ackn. msg 7	(6.1.2)
Msg 7	Yes	Ok	ABK output, no further repetitions	(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	(6.2)
Msg 13	Yes	Ok	ABK output, no further repetitions	(2.1.4.1)
Msg 14	Yes	Ok	Display on MKD	(2.10.1)
Msg 15	Yes	Ok	Tx of requested message 3, 5	(6.3)
Msg 16	Yes	Ok	Change of TDMA mode, position report using msg 2	(4.6.4)
Msg 17	Yes	Ok	Internal GNSS receiver shall switch to differential mode	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

14.02.03	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

14.02.03	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	EUT is counting up in steps of 2 30.09.03 Ba: EUT is counting correctly in steps of 1	ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 2		Ok

14.02.03	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

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

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

14.02.03	Test details – Content of msg 11 UTC date response		
Test item	**Check**	**Remark**	**Result**
Transmit a msg 10 from VDL generator to request transmission of msg 11 by EUT Check the field content of the fields listed under Test item.			
Number of sentences	Check that value = 1		Ok
Check sentence number	Check that value = 1		Ok
Sequential message ident.	Check that field is empty (NULL)		Ok
Channel	Check that the correct value A and B is output		Ok
Fill bits	Check that value = 0		Ok
Message id	Check the field content		Ok
User ID (MMSI)	Check the field content		Ok
UTC year, month, day, hour, minute, second	Check the field content	Date is 0,0,0 Retest 13.05.03: If date is available it is provided correctly in msg 11.	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

14.02.03	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

14.02.03	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		---

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

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

Date	Result	Status
14.02.03 13.05.03	The date in msg 11 is taken from the position source which is actually in use. We recommend to use the date also from another source (e.g. internal GPS) if it is not available from the position source which is actually in use.	rec

5 17 Specific tests of Network Layer

(7.4)

5.1 17.1 Dual channel operation

(M.1371 A1/4.1)

5.1.1 17.1.1 Alternate transmissions

Method of measurement

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

Required results

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

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

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*

11.02.03	**Test details – Channel management by VDL msg 22**		
Test item	**Check**	**Remark**	**Result**
Set-up EUT in autonomous mode transmitting on channel AIS1/AIS2, send 2 Msg 22 by VDL generator, defining 2 adjacent areas with channels A1, B1 and A2, B2. Use external sensor input to simulate a voyage through both areas. Set transitional zone to 4nm. Set the position outside the areas. Set the positions near the limits of the transitional zones to check the dimensions			
PI output	Check that the msg 22 are output on PI		Ok
MKD display defined area	Check that the defined area is correctly displayed on MKD		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 (only at border of are) TXT ID 36 is output	Ok
	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 for Tx		ok
	Check that channel AIS 1 and A2 are used for Rx		Ok
	Check that reporting rate is doubled		Ok

Item 3: Move position into region 2	Check ACA output	No ACA output (only at border of are) TXT ID 36 is output	ok
	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 for Tx		Ok
	Check that channel A2 and B2 are used for Rx		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 4: Move position into transitional area between region 1 and 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 5: Move position into region 1	Check that channels A1 and B1 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Move position into transitional area of region 1	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the transitional zone of region 1	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

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.

11.02.03	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 channel AIS 1 and A2 are used		Ok
	Check that reporting rate is doubled		Ok
Item 3: Move position into region 2	Check that channel A2 and B2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 4: Move position into transitional area between region 1 and 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 5: Move position into region 1	Check that channels A1 and B1 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Move position into transitional area of region 1	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the transitional zone of region 1	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

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.

11.02.03	**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		Ok
Power low	Check that the transmitting power is changed from high to low		Ok
MKD	Check the low power settings are displayed on MKD		Ok
Transmitt the same message 22, but power setting to 0 = high power			
Power high	Check that EUT reverts to high power		Ok

11.02.03	**Test details – Power setting by ACA**		
Test item	**Check**	**Remark**	**Result**
Apply the following message at PI: File name = AIACA_region_in_ch86.sst. Set power flag to 1 = low power and channels to actually used channels			
Power low	Check that the transmitting power is changed from high to low		Ok
MKD	Check the low power settings are displayed on MKD		Ok
Transmitt the same ACA sentence, but power setting to 0 = high powerok			
Power high	Check that EUT reverts to high power		Ok

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

13.05.03	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	Transmissions are done in the following order: - 1. Msg 8 - msg 12 - 2. Msg 8 - repetition of msg 12 - repetition of msg 12 - repetition of msg 12	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.

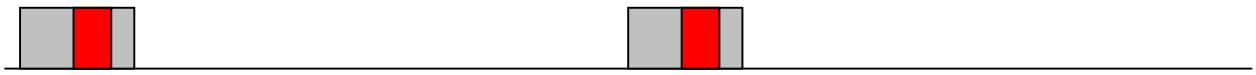
Required results

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.

13.05.03	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	Targets are in a range of 47 to 59 slots (13 slots interval)	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		Ok
Reserved Slot	Check that slots reserved by msg 20 are not used		

Date	Result	Status
09.01.03	Test could not be performed because often the transmission was stopped because of VSWR alarm and EUT restarted because of the high VDL load	
09.05.03	Test could be performed now. In 2 or more successive frames the slots with slot reuse conditions use the time-out value 0. In this case other slots than the allocated slots are used in the next frame. Other slots (no slot reuse condition) are ok.	
13.05.03	Retest: ok	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.

12.02.03	**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	Check that area 1...7 are displayed on MKD		Ok
• 7 areas not overlapping, not including own position File name: AIACA_8_regions_17_7_1.sst	Check that all 8 areas are output on PI after request by sentence xxAIQ,ACA	Up to 10 areas can be stored	Ok Acc
a) Send a 9. msg 22 to the EUT	Check that the first area is deleted	The most distant area is deleted instead of the oldest area	Acc
	Check that the EUT returns to the default operating settings	Does not return to default settings because the area in use is not deleted	Acc
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	Areas are not deleted if the position is more than 500 miles away. New areas are accepted if they are more than 500 miles away 11.02.03 Retest: Areas are deleted	ok
Check of erasure: Set own position of EUT to within all regions defined by the previous telecommands.	Check that the EUT operates with the default settings because the areas are deleted		Ok

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.

11.02.03	**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.		ok
	Step 2: Check, that the EUT allows the user to edit the displayed regional operating settings.		Ok
	Check, that the EUT does not accept incomplete or invalid regional operating settings.	Size of area is not checked Size of area is mainly in the responsibility of the base stations. A check in the mobile station is not explicitely required	acc
	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		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.	Not implemented It will be accepted if a warning with an indication of the consequences by the change is displayed before accepting the change Retest 14.05.03: Anwarning has been added that this change is normally not allowed, and a confirmation has to be given by the operator that he is absolutely shure that he wants to do this change. After the confirmation the change is accepted	acc

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.

13.02.03	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 DSC msg to the EUT with different regional operating settings	Check, that the EUT uses the regional operating settings commanded to it		ok
	Check, that the EUT does not use the regional operating settings commanded to it if not within a region		ok
b) Send an addressed msg 22, addressed **as ID 1**, to the EUT with different regional operating settings	Check, that the EUT uses the regional operating settings commanded to it		Ok
	Check, that the EUT does not use the regional operating settings commanded to it if not within a region		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.

13.02.03	**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	The 3rd and 4th area is accepted. According to the manufacturer description that the EUT has no problems to handle such a setting correctly. Therefore it is accepted that the EUT does not refuse these areas. It is mainly the responsibility of the shore stations to take care of the correct definition of the areas	acc
b) Move own position to the first 2 areas	Check, that the EUT uses the operational settings of these areas		ok

5.7.5 17.7.5 Self-Certification of other conditions

(7.4.1)

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

Date	**Result**	**Status**
14.05.03	No self-Certification required	ok

5.8 17.8 Continuation of autonomous mode reporting rate

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

Method of test

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

Required result

Ensure that the autonomous reporting rate is maintained.

13.02.03	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	Assignment command is not ignored Retest 14.05.03: Assignment command is ignored	ok
Slot assignment command in a transitional zone	Check that an slot assignment command is ignored in a transitional zone	Assignment command is not ignored Retest 14.05.03: Assignment command is ignored	ok

6 18 Specific tests of Transport Layer

(7.5)

6.1 18.1 Addressed messages

(M.1371 A1/5.3.1)

6.1.1 18.1.1 Transmission

(M.1371 A1/5.3)

Method of measurement

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

Required results

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

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

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

10.12.02	**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

10.12.02	**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

11.12.02	**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		
TX of ackn. msg 7 (VDO)	Check that ackn msg 7 is transmitted by addressed transponder (VDO)		Ok
RX of msg 7 (VDM)	Check that the ackn. msg 7 is received by EUT (VDM)		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,6003,A,6,3,0*1D $AIABK,6003,A,6,1,0*1F $AIABK,6003,B,6,2,0*1F $AIABK,6003,B,6,0,0*1D	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.

11.12.02	**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		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**"**

11.12.02	**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	Ok
Repetition timing	Record the repetition timing. Note the time between repetitions and check that it is 4...8 s	6 s	Ok
ABK sentence	Note and check the ABK sentence Confirm the type = 1 (broadcast but no acknowledgement)	$AIABK,1005,A,6,2,1	Ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

11.12.02	**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	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,1005,A,12,2,1*29	Ok
Message sequence numbers	Check message sequence numbers of transmissions and ABK		Ok

6.2 18.1.4 Acknowledgement of Addressed safety related messages

Repeat test under 18.1.2 with addressed safety related message.

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

11.12.02	**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

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

Method of measurement

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

Required results

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

A simple operational test is made in 2.1.3.2 14.1.3.2 Interrogation response

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

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

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

14.02.03	**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		Ok
Response channel	Check that the response is transmitted on the request channel		Ok

14.02.03	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		Ok
Response channel	Check that the response is transmitted on the request channel		Ok

14.02.03	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		Ok
TX of response 2 (VDO)	Check that response is transmitted by EUT (VDO)		Ok
Response 2 on VDL	Check the response on VDL with the VDL analyser		Ok
Slot selection	Check that the slot offset 2 defined in the request is used		Ok

14.02.03	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		Ok

14.02.03	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		Ok

6.4 18.3 Broadcast messages

(M.1371 A1/5.3)

Method of measurement

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

Required results

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

Test of multislot broadcast messages is done in 2.2 14.2 Multiple slot messages

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

11.12.02	**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	No response from EUT 14.02.03 Retest: ok	ok
Channel	Check Tx alternating channels A and B		Ok
AIABK acknowledgement	Record and check the AIABK acknowledgements	$AIABK,B,8,7,3 $AIABK,A,8,8,3 $AIABK,B,8,9,3 $AIABK,A,8,0,3 $AIABK,B,8,1,3	ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence		Ok
MMSI	Check Transmitter MMSI		Ok
Remark	There is delay of about 3 s from msg to msg		acc

11.12.02	**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	No response from EUT 14.02.03 Retest: ok	ok
Channel	Check Tx alternating channels A and B	No response from EUT 14.02.03 Retest: ok	ok
AIABK acknowledgement	Record and check the AIABK acknowledgements		Ok
Message sequence number	Check that message sequence number in ABK = Sequential message identifier of BBM sentence	$AIABK,B,14,6,3 $AIABK,A,14,7,3 $AIABK,B,14,8,3 $AIABK,A,14,9,3 $AIABK,B,14,03	ok
MMSI	Check Transmitter MMSI		Ok
Remark	There is delay of about 3 s from msg to msg		acc

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.

11.12.02	**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*

30.09.03 Ba	Test details - Check of manufacturers documentation		
Test item	**Check**	**Remark**	**Result**
Approved sentences	Check approved sentences against IEC 61162	Sentences are not described in detail	ok
Proprietary sentences	Check proprietary sentences against IEC 61162	No proprietary sentences are used	ok
Usage of Fields	Check usage of fields	Information about unused fields is missing 15.10.03 inst manual 89-041	ok
Transmission intervals	Check transmission intervals	Max sensor input rates are listed	ok
Hardware configuration	Check hardware configuration		ok
Output drive capability	Check output drive capability		Ok
Input load	Check input load		Ok
Electrical Isolation	Check electrical isolation	No information about electrical isolation found. Measurement shows no current indicating electrical isolation. 15.10.03 inst manual 89-041	ok

7.3 19.3 Electrical test

(7.6.1)

Method of test

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

Required results

The interfaces shall fulfil the requirements of the relevant standards.

14.05.03	**Test details - Electrical test of inputs**		
Test item	**Check**	**Remark**	**Result**
Minimum voltage	Check that input works with minimum input voltage	Input data with a level of 0.3 V are not accepted Retest 17.06.03: Data are accepted on serial inputs with a level of 0.3 V	ok
Maximum voltage	Check that input is not damaged by maximum input voltage		ok
Input current	Check the input current against the IEC 61162-1 or IEC 61162-2	Input current without termination: Sensor input: 5 V: 1.1 mA/ - 0.04 mA 10V: 1.7 mA/ - 0.57 mA 15 V: 2.3 mA/ - 0.75 mA High speed port: 5 V: 1.2 mA/ - 0.06 mA 10V: 1.8 mA/ - 0.7 mA 15 V: 2.4 mA/ - 1.3 mA	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

11.12.02	**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	It is not possible to install the third sensor port Retest 3.03.03	Ok
VDO output	Check that VDO outputs on both high speed ports agree with the sensor input data		Ok
Loss of data	Check that VDL messages are transmitted without loss of sensor data		Ok
	Check that output data at VDO output are sent without loss of sensor data		Ok
Delay of data	Check that there is no delay from sensor input change to VDL messages		Ok
	Check that there is no delay from sensor input change to VDO output		Ok

7.5 19.5 Test of sensor input

(7.6.2)

Method of measurement

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

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

b) simulate invalid and unavailable data

Required results

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

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

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

Fall back behaviour at sensor fail is checked in another test (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

11.12.02	**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		Ok
Set status/mode to **A,D** (differential mode)	Check PA-Flag = 1 on VDL		Ok
	Check PA-Flag = 1 in VDO		Ok
	Check display of differential mode on MKD		Ok
Set status/mode to **V,N** (invalid data) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Check on VDO output of PI	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Check display on MKD	Check latitude = "-----"		Ok
	Check longitude = "-----"		Ok
	Check PA-Flag = 0		Ok
Set status/mode to A,A Change for latitude the number 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

11.12.02	**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		Ok
Set mode =4 (RTK fixed) Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL	Still PA = 0 Retest 28.02.03	 Ok
Set mode =5 (RTK float Check on VDL	Short check data ok		Ok
	Check PA-Flag = 1 on VDL	Still PA = 0 Retest 28.02.03	 Ok
Set mode = 6 (dead reck.) Check on VDL	Short check default data	Still valid data Retest 28.02.03	 Ok
Set mode = 7 (manual) Check on VDL	Short check default data	Still valid data Retest 28.02.03	 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

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

7.5.4 RMC sentence

11.12.02	**Test details – RMC position input**		
Test item	**Check**	**Remark**	**Result**
Apply simulated RMC sentence to the sensor input File name is ais04_rmc_hdt_rot.sst			
Set status/mode to **A,A** Check on VDL	Check latitude		Ok
	Check longitude		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **A,D** (differential mode)	Short check of valid data		Ok
	Check PA-Flag = 1 in VDO		Ok
Set status/mode to **V,N** (invalid data) Check on VDL	Check latitude = 91º		Ok
	Check longitude = 181º		Ok
	Check PA-Flag = 0		Ok
Set status/mode to **V,A** (invalid data) Check on VDL (Test if also status is evaluated)	Check latitude = 91º	Shows valid data Retest 28.02.03	Ok
	Check longitude = 181º	See above Retest 28.02.03	Ok
	Check PA-Flag = 0		Ok
	Check SOG = 102.3	See above Retest 28.02.03	Ok
	Check COG = 360°	See above Retest 28.02.03	Ok

7.5.5 DTM sentence

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

7.5.6 GBS sentence

18.06.03	**Test details – GBS input**		
Test item	**Check**	**Remark**	**Result**
Apply simulated gll sentence with GBS sentence to the sensor input File name is ais01g_gll_vtg_gbs_hdt_rot.sst			
Fields with expected error of Lat and Lon contain values	Check that RAIM-Flag = 1		Ok
Fields with expected error of Lat and Lon are empty (NULL fields)	Check that RAIM-Flag = 0	If the expected error of Latitude is not empty the RAIM flag is set to 1	Acc

7.5.7 VTG sentence

11.12.02	**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 SOG = 102.3 (default)		Ok
Check on VDL	Check COG = 360 (default)		Ok
Check VDO output on PI	Check SOG = 102.3 (default)		Ok
	Check COG = 360 (default)		Ok
Check Display on MKD	Check SOG = "-----"		Ok
	Check COG = "-----"		Ok
Set mode to E (estimated)	Short check SOG/COG default	Still valid data Retest 28.02.03	Ok
Set mode to M (manual)	Short check SOG/COG default	See above Retest 28.02.03	Ok
Set mode to S (simulated)	Short check SOG/COG default	See above Retest 28.02.03	Ok
Delete SOG-N field and add SOG K-Field (speed in km/h)	Check SOG value in VDL It has to be converted into knots or set to default	Default	ok

7.5.8 VBW sentence

11.12.02	**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	COG is use from VTG Retest 28.02.03	 Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value		Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = VDL COG value		Ok
Status of bottom track: **V** (invalid) Ahead and across speed not empty. Water speed valid ! Check on VDL	SOG from VTG		Ok
	COG from VTG		Ok
Check on VDO output of PI	SOG from VTG		Ok
	COG from VTG		Ok
Check on MKD	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG from VTG		Ok
	COG from VTG		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VTG	SOG from VBW Retest 28.02.03	 Ok
	COG from VTG		Ok

11.12.02	**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	COG is shown as default Retest 28.02.03	 Ok
Check on VDO output of PI	Check SOG = VDL SOG value		Ok
	Check COG = calculated from SOG vector and heading	See above Retest 28.02.03	 Ok
Check on MKD	Check SOG = VDL SOG value		Ok
	Check COG = calculated from SOG vector and heading	See above Retest 28.02.03	 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		Ok
	COG = default		Ok
Status of bottom track: A (valid) Ahead available, **across speed empty (**e.g. single axis log)	SOG = default		Ok
	COG = default		Ok
Status of bottom track: A (valid) Ahead and across speed available, **Heading invalid**	SOG from VBW or default		Ok
	COG = default		Ok

7.5.9 OSD sentence

11.12.02	**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	Still valid data Retest 28.02.03	Ok
	Check COG = default	See above Retest 28.02.03	Ok
	Check heading from OSD	See above Retest 28.02.03	Ok
Set speed reference to M (Manual)	Check SOG = default	See above Retest 28.02.03	Ok
	Check COG = default	See above Retest 28.02.03	Ok
	Check heading from OSD	See above Retest 28.02.03	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

11.12.02	**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**		Ok
Delete heading value (empty field)	Check that heading = default on VDL		Ok
	Check that heading = default on VDO		Ok
	Check that heading = default on MKD		Ok

7.5.11 ROT sentence

11.12.02	**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)	Displayed as 720.0 The value 720 has to be used for turn indecators with other talker id than TI Retest 28.02.03	Ok
	-20 converted to 19.7 (-21)		Ok
	-720 converted to –708.7 (-126)	See above Retest 28.02.03	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		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 makes no difference between HE and TI Retest 28.02.03	Ok
	11 converted to 720		ok
	- 9 converted to 0		ok
	-11 converted to -720		ok

7.5.12 Additional Tests

11.12.02	**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 = default	Sentences is used, see note	Rec
	Check SOG/COG = default	Sentences is used, see note	Rec
	Check heading = default	Sentences is used, see note	Rec
	Check ROT = default	Sentences is used, see note	Rec
Send sentences with false checksum, check on VDL	Check position = default		Ok
	Check SOG/COG = default		Ok
	Check heading = default		Ok
	Check ROT = default		Ok
Back to valid checksum Set baud rate of simulator to 38400 Bd, The purpose is to check if input survives wrong baudrate.	Check position = default		Ok
	Check SOG/COG = default		Ok
	Check heading = default		Ok
	Check ROT = default		Ok
Set baud rate of simulator and sensor input also to 38 400, check on VDL	Check position		Ok
	Check SOG/COG		Ok
	Check heading		Ok
	Check ROT		Ok

Note: Sentences without checksum should normally not be used. For compatibility to existing equipment (e.g. old gyros) we accept if sentences without checksum are processed. In this case we strongly recommend to enable this function in the setup; the factory default should be that sentences without checksum are not accepted.

7.5.13 Check of different inputs

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

7.5.14 Sensor sentences overview

11.12.02	**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 are checked in

- 4.7.1 16.7.1 Received messages and
- 4.7.2 16.7.2 Transmitted Messages

7.6.1 VDM – Received message

	Test details – Content of received messages		
Test item	**Check**	**Remark**	**Result**
Transmit all types of messages from other AIS transponder or VDL generator . Check the field content of the fields listed under Test item.			
Message id	8 binary broadcast message, multiy slot File name: AIBBM_multi_bin.sst		
Number of sentences	Check that value = 3		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	EUT is counting in steps of 2 (only odd numbers) Retest 30.09.03 Ba: EUT is counting correctly in steps of 1	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 File name: AIBBM_multi_safety.sst		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	EUT is counting in steps of 2 (only odd numbers) Retest 30.09.03 Ba: EUT is counting correctly in steps of 1	Ok
Channel	Check that the correct value A and B is output		Ok

Fill bits	Check that value = 2 (msg length = 1000)		Ok
	Additional checks		
Length of sentence	Confirm that no sentence exceeded the length of 82 character (no warning from monitor program)	Some messages exceed the maximal length of 82 charachter. (msg 5, msg 8, msg 14, msg 17 depending of the actual length of the message Retest 30.09.03 Ba: length of sentences is ok now	Ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

7.6.2 VDO Transmitted messages

18.06.03	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 File name: AIBBM_multi_bin.sst		
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	EUT is counting in steps of 2 (only odd numbers) Retest 30.09.03 Ba: EUT is counting correctly in steps of 1	
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 File name: AIBBM_multi_safety.sst		
Number of sentences	Check that value = 3		Ok
Check sentence number	Check that value = 1,2,3		Ok
Sequential message ident.	Check that counting from 0...9 modulo 10	EUT is counting in steps of 2 (only odd numbers) Retest 30.09.03 Ba: EUT is counting correctly in steps of 1	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)	Some messages exceed the maximal length of 82 charachter. (msg 5, msg 8, msg 14, msg 17 depending of the actual length of the message Retest 30.09.03 Ba: length of sentences is ok now	ok
Checksum	Confirm that no sentence had a wrong checksum (no warning from monitor program)		Ok

EUT is counting up in steps of 2 Retest 30.09.03 Ba: EUT is counting correctly in steps of 1	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
11.02.03	Restart after the first 60 targets	
09.05.03	Retest: Test ok, more than 97 % of msg received	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

11.12.02	**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	Retest 01.10.03 Ba: The DTE flag cannot be changed by SSD sentence	Acc

11.12.02	**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.

10.01.03	**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		Ok
Start DSC transmission of area addressed call (Position and name request) File name is "area_pos_name_rq.sst"	Check that the call is answered within 20 s Contents are checked in a special test		ok
	In general the DSC function is not very reliable. Very often the reception and response of DSC calls stopped and could only be reactivated by restart (switch off and on) 12.02.03 Retest: No problems wth the reliablity of DSC RX or TX found		ok

10.01.03	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) Transmit test signal 1	Check that no responses are transmitted by the EUT		Ok
Repetition	In the first 2 tests: After one run of the sequence of the 5 test calls there is no further response on any DSC calls. After switching off and on the EUT it works again. In 2 following tests it was ok. 12.02.03 Retest: no problems with further response		ok

10.01.03	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		Ok
Change course to a value differing > 2 degrees	Check that call is not answered		Ok
Delete course, add matching type of ship	check that call is answered		Ok
Change type of ship to All ships	check that call is answered	A call to all types of a ship is	

of this type		not received. It should be possible for the VTS centers to call e.g. all tanker or al container vessels independent of the type of cargo. E.g. a ship of type 72 should also be addressed by a call to 70 12.02.03 Retest: ok, request to all ships of this type is responded	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 not received: Area: 00°30N, 179°30E, size 60x60min Pos: 00°01N/S and 179°50E/W (all 4 combinations of N/S and E/W) 12.02.03 Retest: ok, call is responded	ok
Change position to outside the area,	check that call is not answered		ok
Start DSC transmission of Selective call with command “Activate alternate system” File name is “eut\sel_act_alt_system.sst”			
Sel. Call with symbols: 104+03+01+120 (68+03+01+78)hex	Check that EUT does not transmit a response		ok

8.2 20.2 Regional area designation

(M.1371 A3/5)

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

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

10.01.03	**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		Ok
	Check that an ACA sentence is output at PI port	No ACA output, not required	ok

	Check that new region is stored in the region list of the EUT	Remark: The area is also accepted if the area is more than 500 miles away. This is not ok. 12.02.03 Retest: ok	Ok
	Check that transition zone is 5 nm		Ok
Send a area addressed region setting call File name “area_set_region.sst”	Check that an acknowledgement is received		Ok
	Check that an ACA sentence is output at PI port	No ACA output, not required	ok
	Check that new region is stored in the region list of the EUT		Ok
Send a all ship region setting call File name “all_ship_set_region.sst”	Check that an ACA sentence is output at PI port	No ACA output, not required	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

13.02.03	**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	Displayed on MKD, no ACA output	ok
Item 1:	Check that channels AIS1 and AIS2 are in use		Ok
Item 2: Move position into transitional area of region 2	Check that EUT keeps old channels for 1 min. timing out the transmissions of AIS2		ok

	Check that channel AIS 1 and A2 are used		Ok
	Check that reporting rate is doubled		Ok
Item 3: Move position into region 2	Check that EUT keeps transtional channels for 1 min. timing out the transmissions of AIS 1		Ok
	Check that channel A2 and B2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Item 4: Move position into transitional area between region 1 and 2	Check that channels A2 and A1 are used		Ok
	Check that reporting rate is doubled		Ok
Item 5: Move position into region 1	Check that channels A1 and B1 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok
Move position into transitional area of region 1	Check that channels A1 and AIS1 are used		Ok
	Check that reporting rate is doubled		Ok
Move position out of the transitional zone of region 1	Check that channels AIS1 and AIS2 are used		Ok
	Check that reporting rate is changed back to normal reporting rate		Ok

8.3 20.3 Scheduling

(M.1371 A3/2)

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

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

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

10.01.03	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		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	Remark: after about 30 calls the EUT stopped response. Did also not receive other calls.	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	Response is transmitted after end of the 25s DSC signal. The check of free channel seem to work correctly. Response should not be transmitted if transmission is not possible within 20 s 12.02.03 Retest: In 3 requests no response	ok

8.4 20.4 Polling

(M.1371 A3/3)

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

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

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

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

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

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

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

10.01.03	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	The direct answer is transmitted on channel 70 12.02.03 Retest: ok,	ok
	Check if following answers on channel xx	EUT switches DSC transmitter (ok) and receiver (nok) to the commanded channel. Note: it is very important that an AIS transponder is receiving always on channel 70 to be reachable by channel management commands 12.02.03 Retest: The receiver remains on channel 70	ok
Request automatic position report (102+xx)	Check that immediate response with EOS=BQ is received		Ok
	Check automatic reporting rate	For reporting rate = 1 min: Time between pos reports is: 71s, 41s, 41s, 42, 41, 80 should be 60 s 12.02.03 Retest: ok	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)	The automatic reporting is not finished after 5 TX (checked for 11 transmissions) In a second test the Tx was finished after 5 transmissions 12.02.03 Retest: in 3 tests automatic reporting stopped after 5 unconfirmed TX	ok
	Check that the automatic reporting is not finished with ackn. by base station.		Ok
Send message with 102+00	Check that the automatic position report is finished	The automatic position report is not finished by this message. The message is also not acknowledged, but received (VDM,,,C output) The acknowledgement of these message (3 TX) were transmitted when a Position request (symbol 103) was transmitted (some minutes later) In a second test after TX of	

		102+00 also a position request (103) was not responded but automatic report was continured. After some time all the missing messages were transmitted in 1 block (see log file) 12.02.03 Retest: During the time of 30 s when the EUT is waiting for the confirmation by the base station it does not respond but delays the response to the end of the waiting for confirmation phase.	acc
Request position (103)	Check position in response		Ok
	Check time		Ok
	Check type of ship	Not provided	ok
Request length of ship (108=6Ch)	Check length of ship (124=7Ch)	124 01 20	Ok
Request course (109=6Dh)	Check course (119=77h)	119 03 50	Ok
Request ships name (111=6Fh)	Check name (115=73h)	The characters are correct but only 12 characters (of 14 and 17) are responded. Up to 20 charachters should be responded 12.02.03 Retest: ok, up to 20 characters are responded	ok
Request ackn. (112=70h)	Check ackn. (110=6Eh)		Ok
Request speed (116=74h)	Check speed (120=78h)	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	64h...77h....78h....73h...	ok
Send test signal 1 (101+72)=(65h+48h) (set DSC channel to a simplex channel) + Geographically addressed call. File: sel_check_channel.sst	Check that the communication on selected simplex channel is working	12.02.03 Retest: ok,	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	12.02.03 Retest: ok,	ok

10.01.03	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	10 x Symbol 126 is responded. According to ITU-R M.825-3 §8.1.12 only a single symbol 126 should be transmitted if information not available 12.02.03 Retest: 1 symbol 126 is transmitted	ok
Request length of ship (108)	Check length of ship (124)	Can not be deleted	---
Request course (109)	Check course (119)	2 x Symbol 126 see position only 1x 126 should be transmitted 12.02.03 Retest: 1 symbol 126 is transmitted	ok
Request ships name (111)	Check name (115)	Only symbol 115 is transmitted, 1 x symbol 126 should be added	ok
Request speed (116)	Check speed (120)	Same as course 12.02.03 Retest: 1 symbol 126 is transmitted	Ok

12.02.03	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	Response is transmitted on channel 87 = 1087 (157.375 kHz)	ok
Set channel (101+88) (65 58)	Check that response is transmitted on channel 70	Response is transmitted on channel 88 = 1088 (157.425 kHz)	ok
Set channel (104+00+2087) (68 00 14 57)	Check that response is transmitted on channel 70	Response is transmitted on channel 70	ok
Set channel (104+00+2088) (68 00 14 58)	Check that response is transmitted on channel 70	Response is transmitted on channel 70	ok

10.01.03	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.		----

10.01.03	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	The response is transmitted with high power (the previous power setting) but the following communication is done with low power (according to the setting)	acc
Ad symbols to set power = 12.5 watt (high power) (Symbols 104+ 01+ 12)	Check that response is transmitted with high power	The response is transmitted with low power (the previous power setting) but the following communication is done with high power (according to the setting)	acc

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*

28.02.03	**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.)	EUT transmit 3 = not av. For 'Date and Time of msg comp.' Rec.: EUT is not able to use date from internal GNSS. System should configure internal GNSS for a sentence witch contains date (RMC...) Retest 05.05.03	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	Date Only with external GNSS. Should also work with internal GNSS Retest 05.05.03	Ok
	Check Lat, Lon		Ok
	Check COG		Ok
	Check SOG		Ok
Contents of LR3 response	Check output of LR3 sentence		Ok
	Check that sequence number = request = LRF		Ok
	Check MMSI of responder = responder of request		Ok
	Check destination		Ok
	Check ETA		Ok
	Check draught		Ok
	Check ship/cargo		Ok
	Check length of ship	Calculated from external GNSS antenna pos.	Ok
	Check breadth of ship	Calculated from external GNSS antenna pos.	Ok
	Check ship type		Ok
	Check persons		Ok

3.03.03	**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		Ok
	Check that only requested fields are not empty		Ok

3.03.03	**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

3.03.03	**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	Not implemented	

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.

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

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

9.3 21.3 Consecutive LR "all ships" interrogations

(9.2)

Method of measurement

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

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

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

Required results

Check that EUT outputs a LR position report message

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

12.05.03	**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

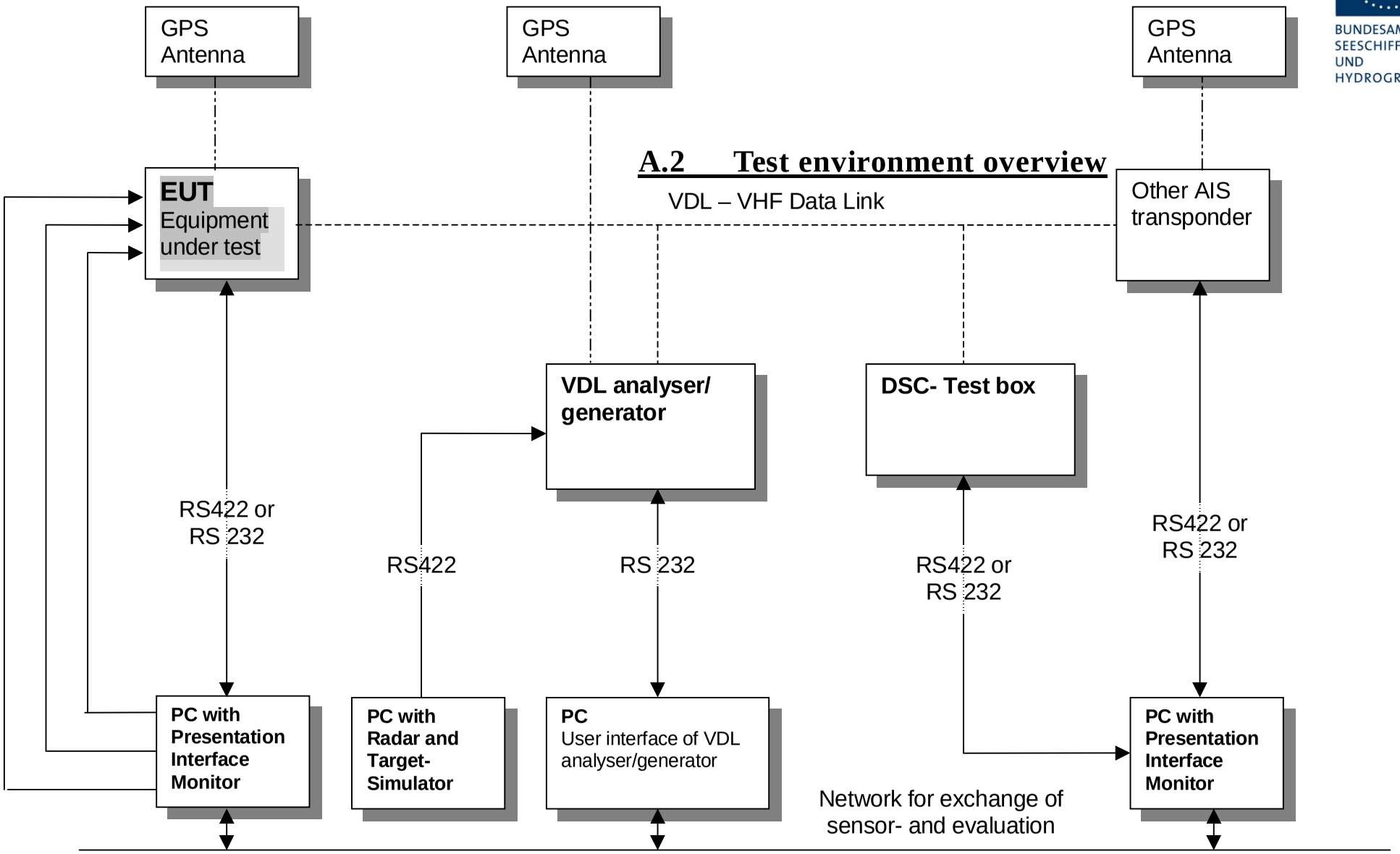
The software modification of the DSC controller comprises a remote control input/output facility

- 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,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,012345678901234567890123456789012345678901,4	
AIBBM_multi_safety.sst	Long 5 slot safety related broadcast message
!AIBBM,4,1,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,14,0123456789012345678901234567890123456789,0	
AIBBM_multi_bin_1.sst	Longer than 5 slots binary broadcast message, all bits 1
!AIBBM,4,1,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,2,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,3,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,4,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0	
AIBBM_ABM_17_5.sst	Set of 2 long messages 8 and 12 for message priority test
!AIBBM,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,0123456789012345678901234567890123456789,0 !AIABM,4,1,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,2,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,3,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,4,2,000001005,1,12,0123456789012345678901234567890123456789,0	
AIBBM_25.sst	25 broadcast message to check 20 slots per frame rule

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

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

B.1.4 Regional operational settings (ACA)

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

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

B.1.5 Long range requests

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

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

B.2 DSC sentences

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

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

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

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

DSC Sentences

File name	Description
Sentences	
Test_Signal_1.sst	Standard test signal no 1, selective position and name request.
$PDEBT,CCDSC,T,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,000146006700030001 4F1E003C003C0067150A27271E676F75FF	
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

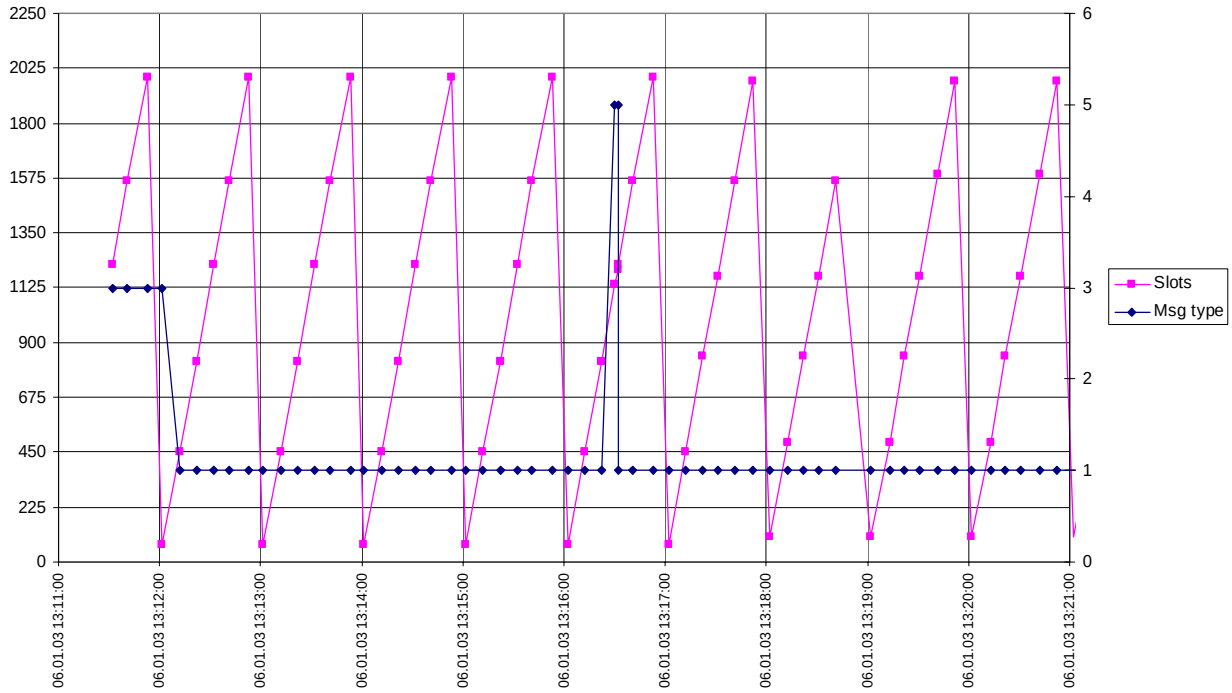
$PDEBT,CCDSC,T,000146006705320000091E003C003C0067150A27271E676F75FF $PDEBT,CCDSC,T,000846007800000000167150A27271E676F75FF	
Sel_act_alt_system	Activate an alternative system
$PDEBT,CCDSC,T,0001460078000000A0567150A27271E6803017875FF	
all_ship_set_channel.sst	All ship call setting DSC channel
$PDEBT,CCDSC,T,000146007467150A27271E65467FFF	

Annex C test diagrams

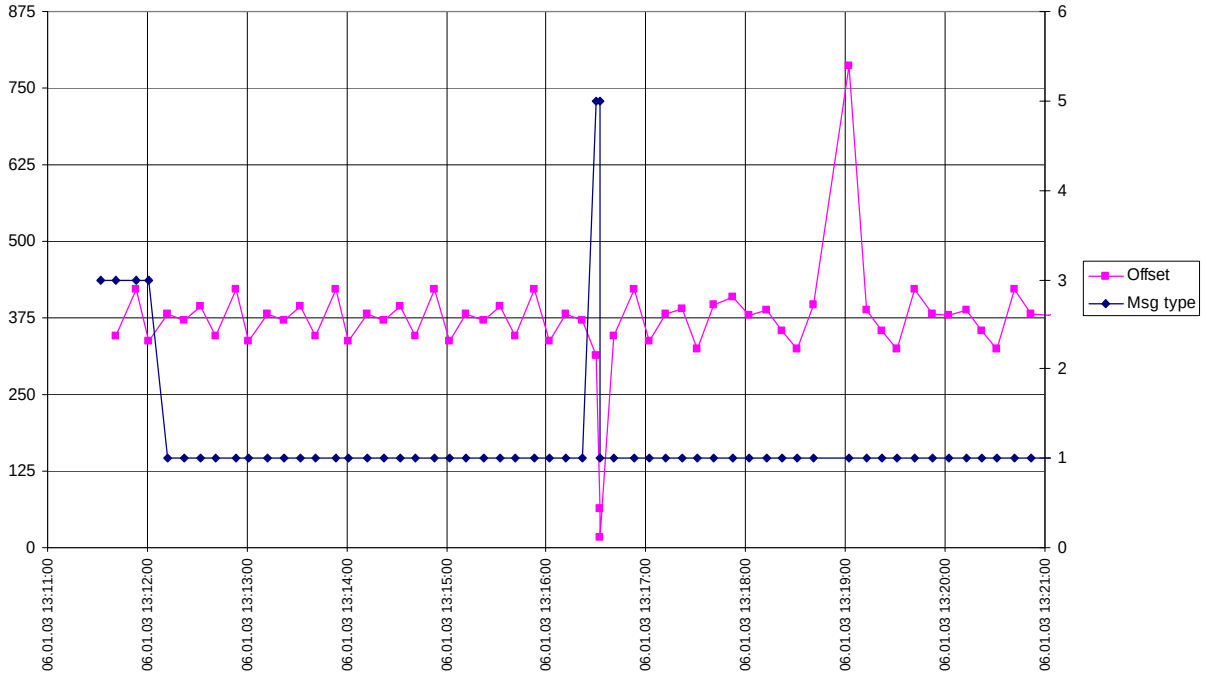
C.1 GMSK modulation 12.5 and 25 kHz bandwidth

C.2 Network entry phase

06.01.03 - Transas MT-1 - 16.6.1 - Slot allocation at Network entry

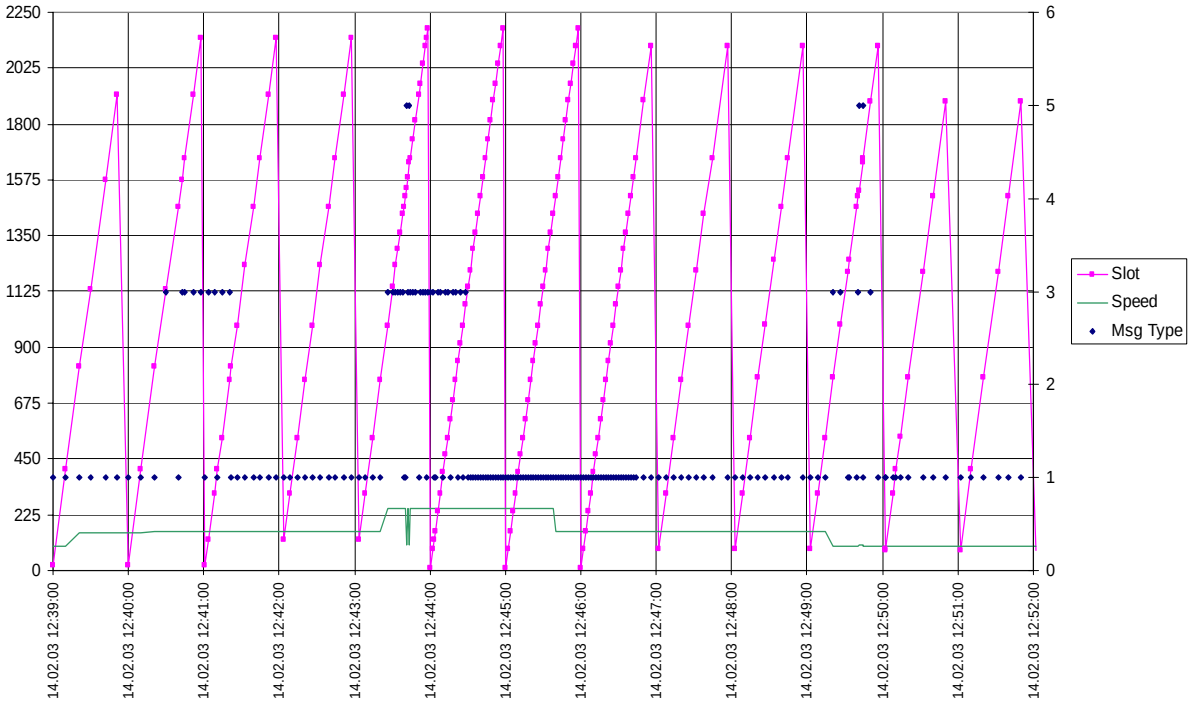


06.01.03 - Transas MT-1 - 16.6.1 - Slot offsets at Network entry

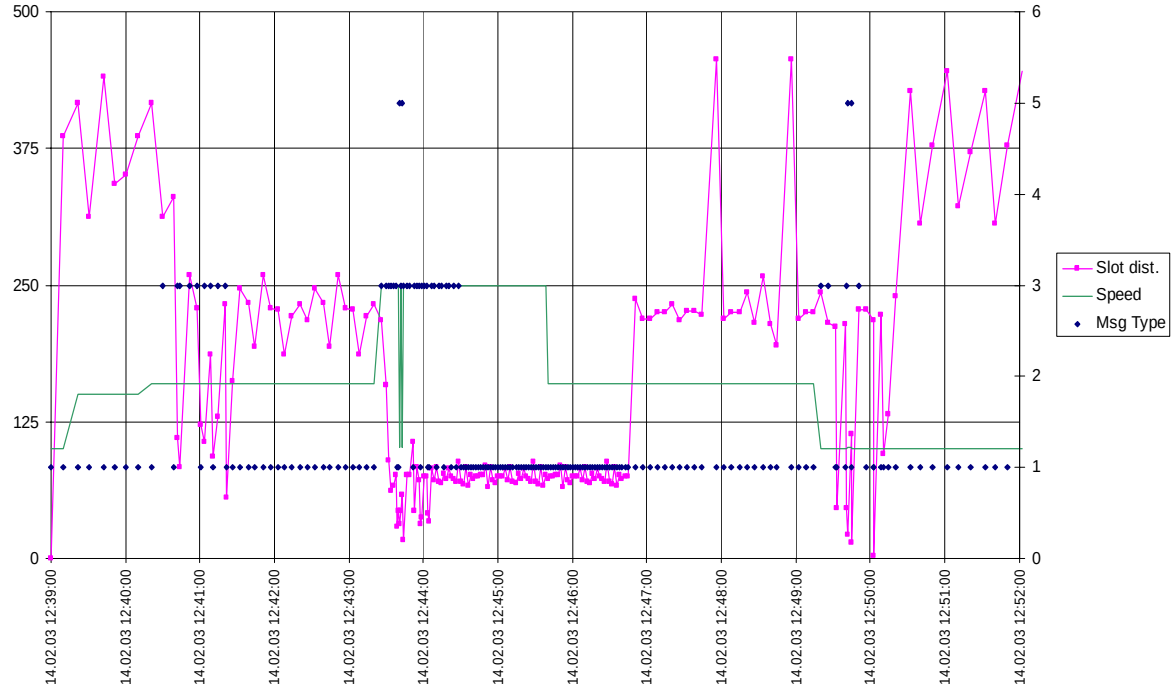


C.3 Reporting rate by speed

14.02.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate by speed - Slots

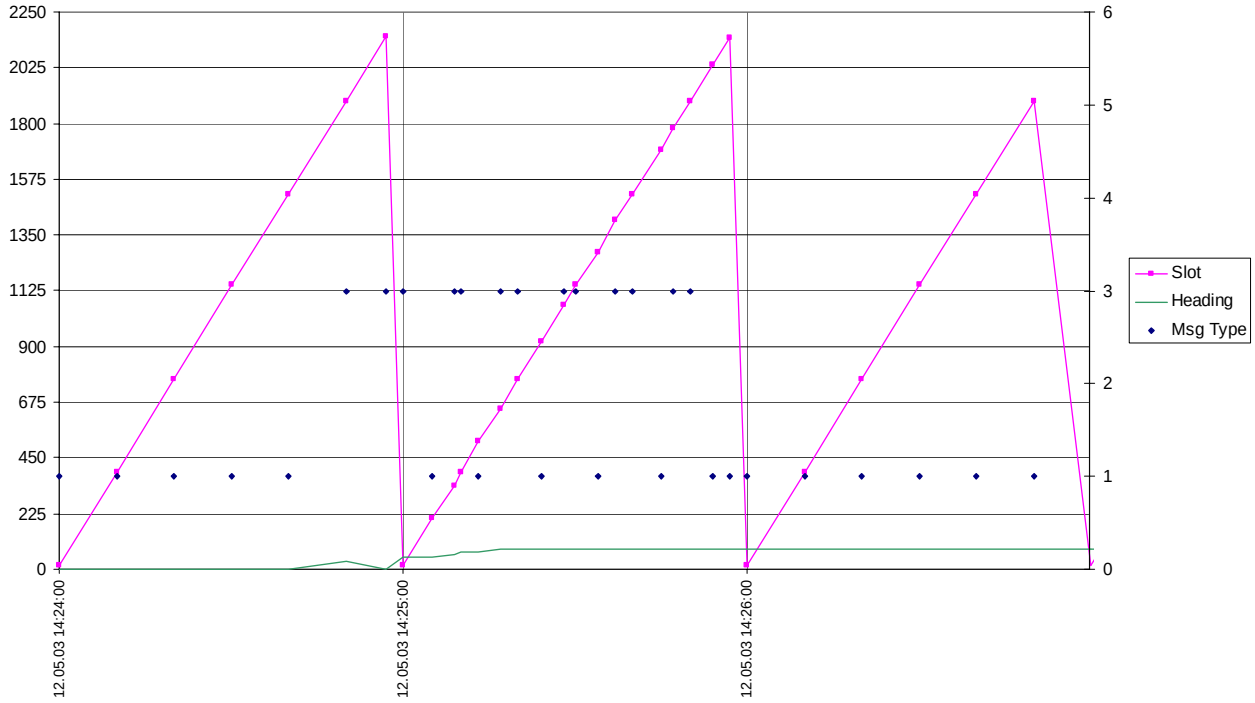


14.02.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate by speed - Slot offset

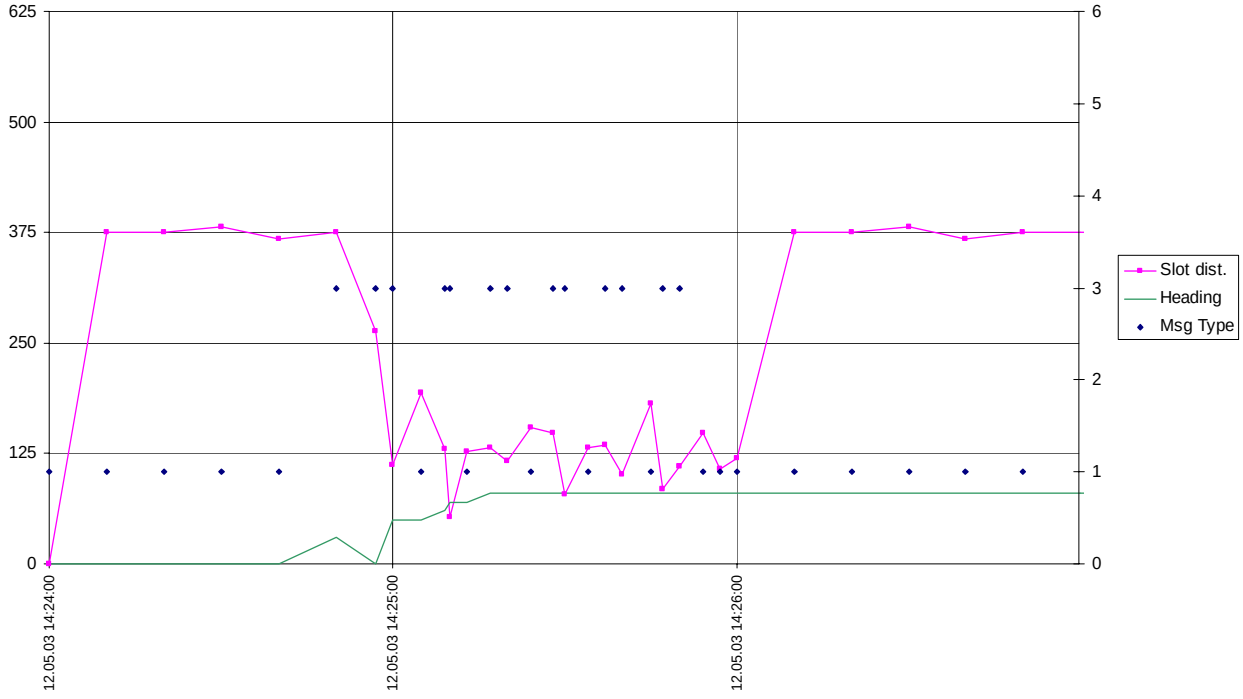


C.4 Report rate by heading

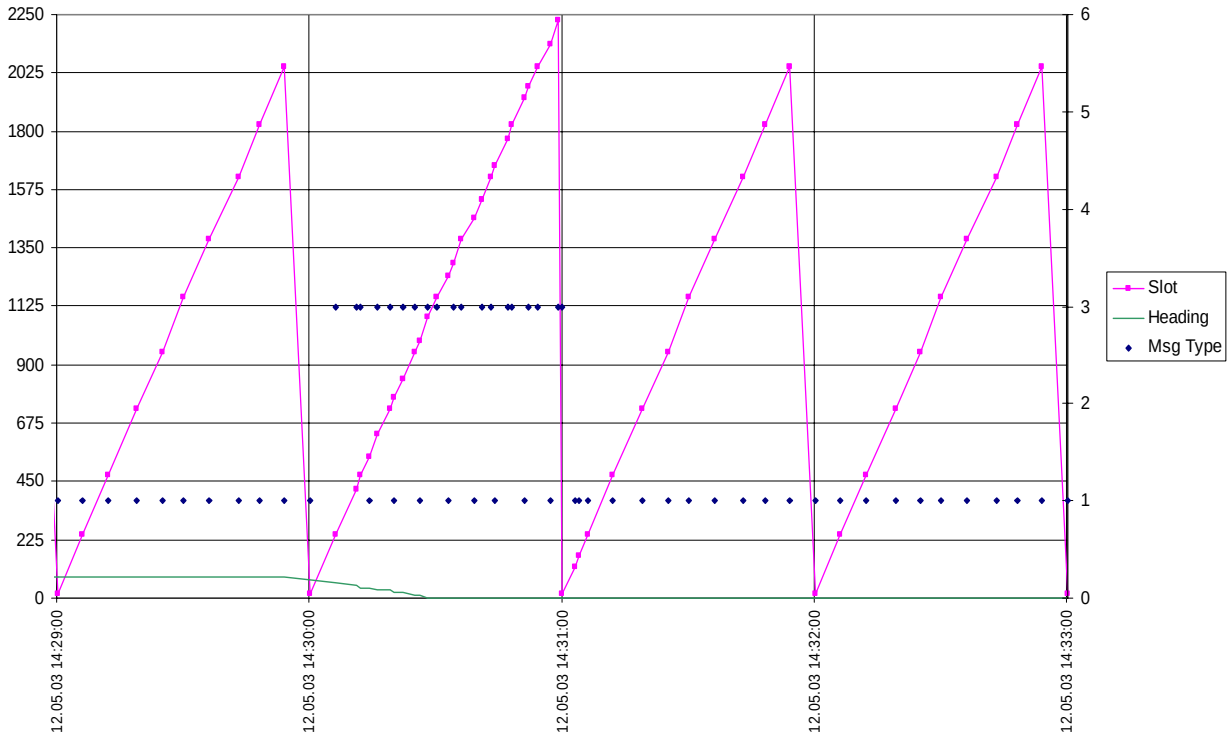
12.05.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate change by heading at 10 kn - Slots



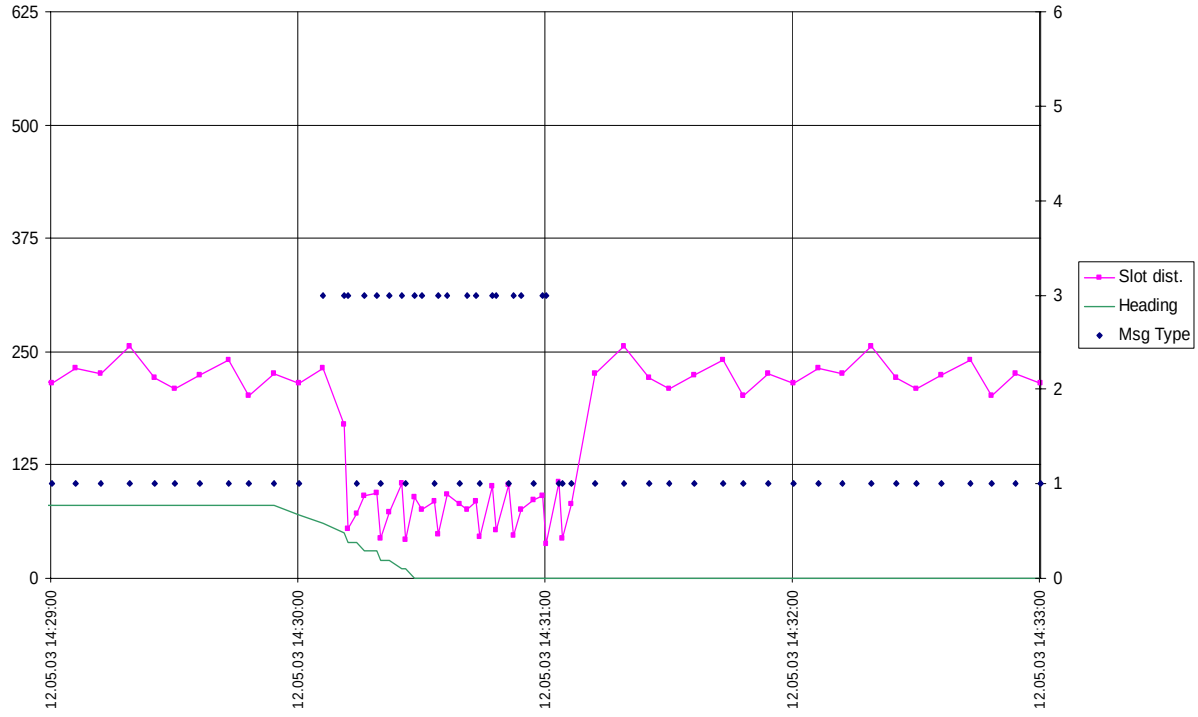
12.05.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate change by heading at 10 kn - Slot offset



12.05.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate change by heading at 15 kn - Slots

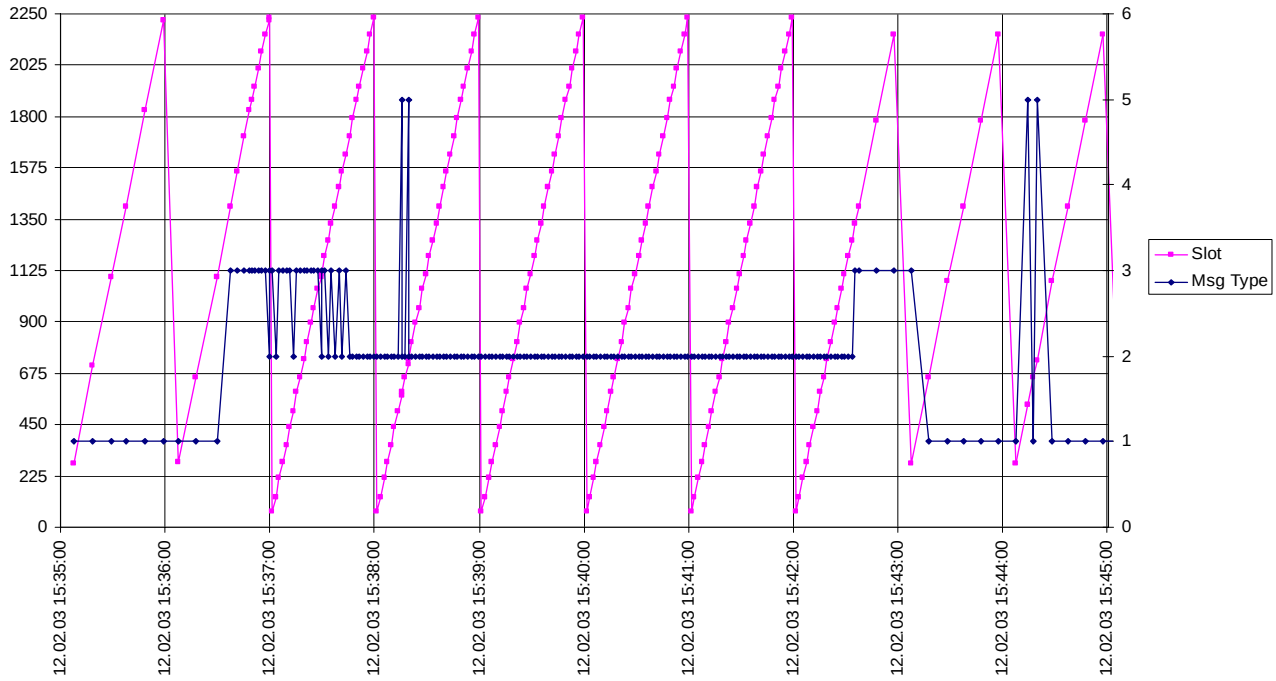


12.05.03 McMurdo/Transas MT-1 - 14.4.1 - Reporting rate change by heading at 15 kn - Slot offset

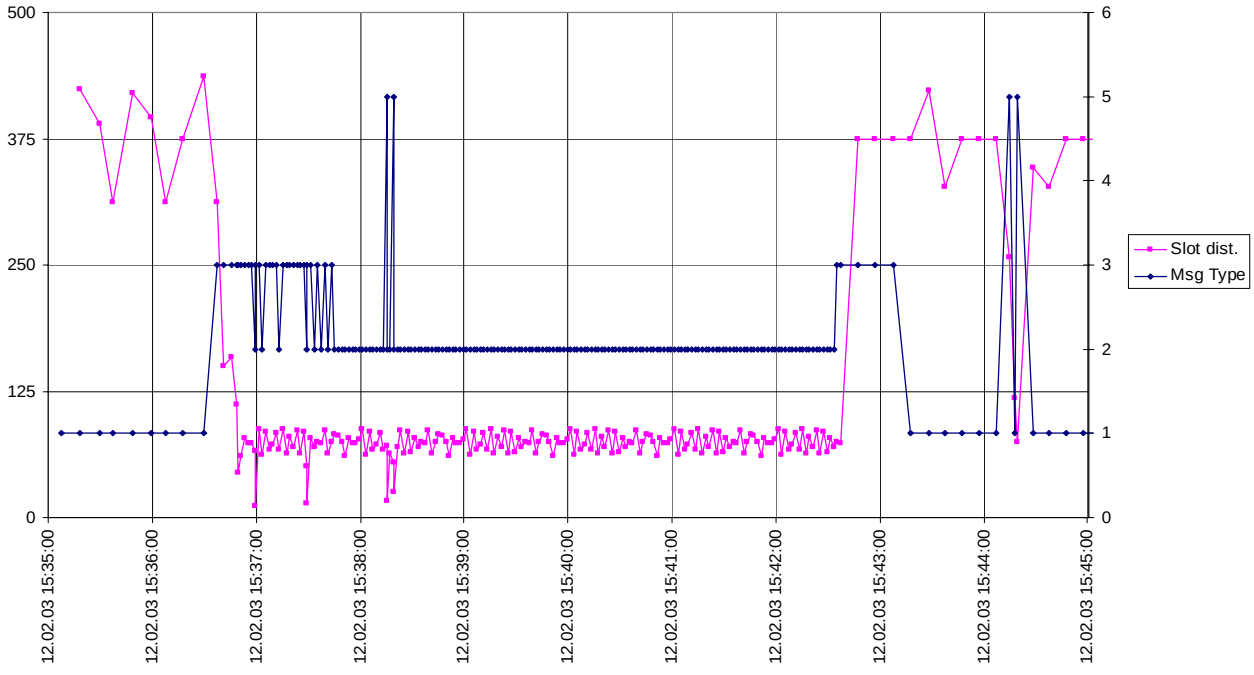


C.5 Assigned mode / rate assignment

12.02.03 - McMurdo/Transas MT-1 - 16.6.4.2 - Rate assignment - Slots

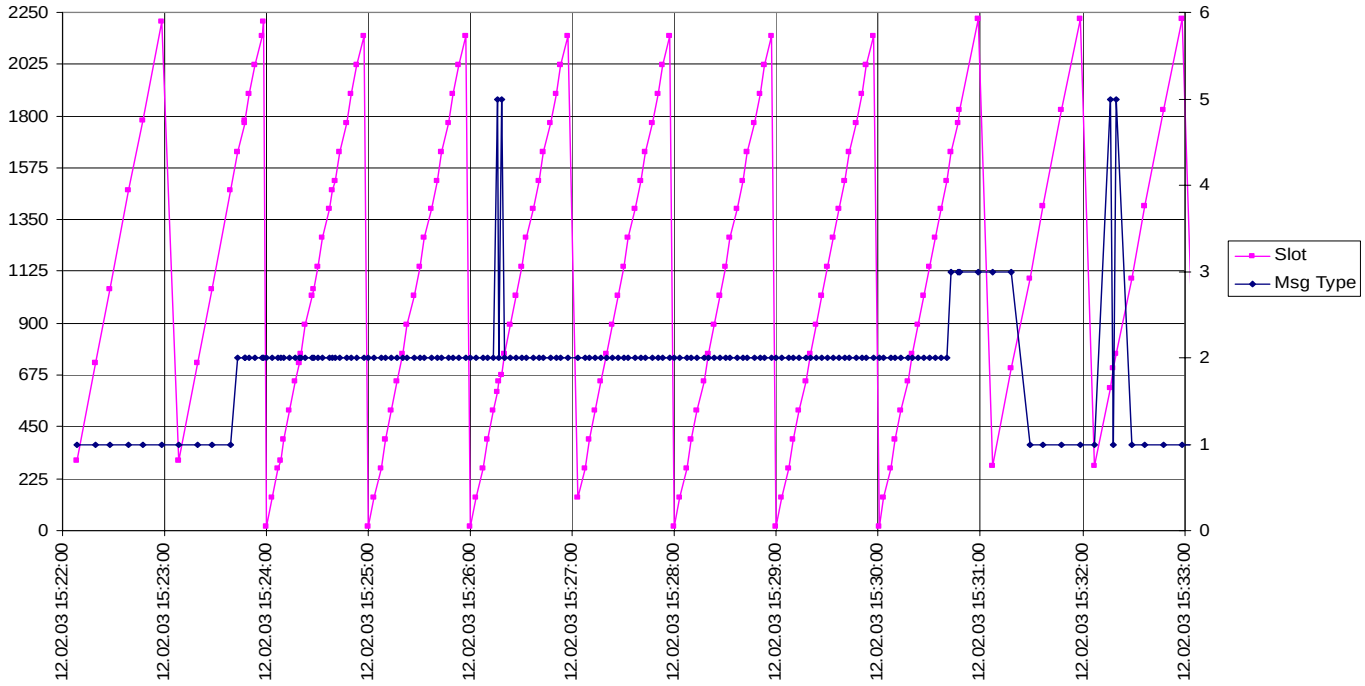


12.02.03 - McMurdo/Transas MT-1 - 16.6.4.2 - Rate assignment - Slot offset

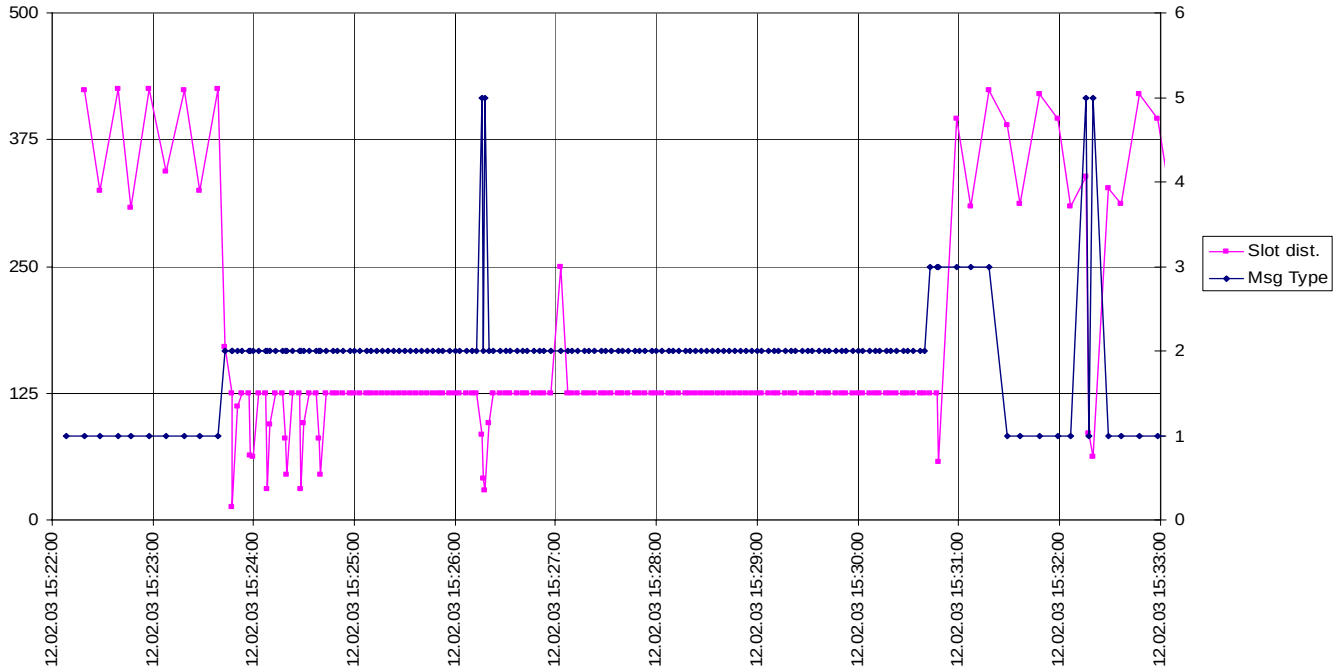


C.6 Assigned mode / slot assignment

12.02.03 - McMurdo/Transas MT-1 - 16.6.4.2 - Slot assignment - Slots

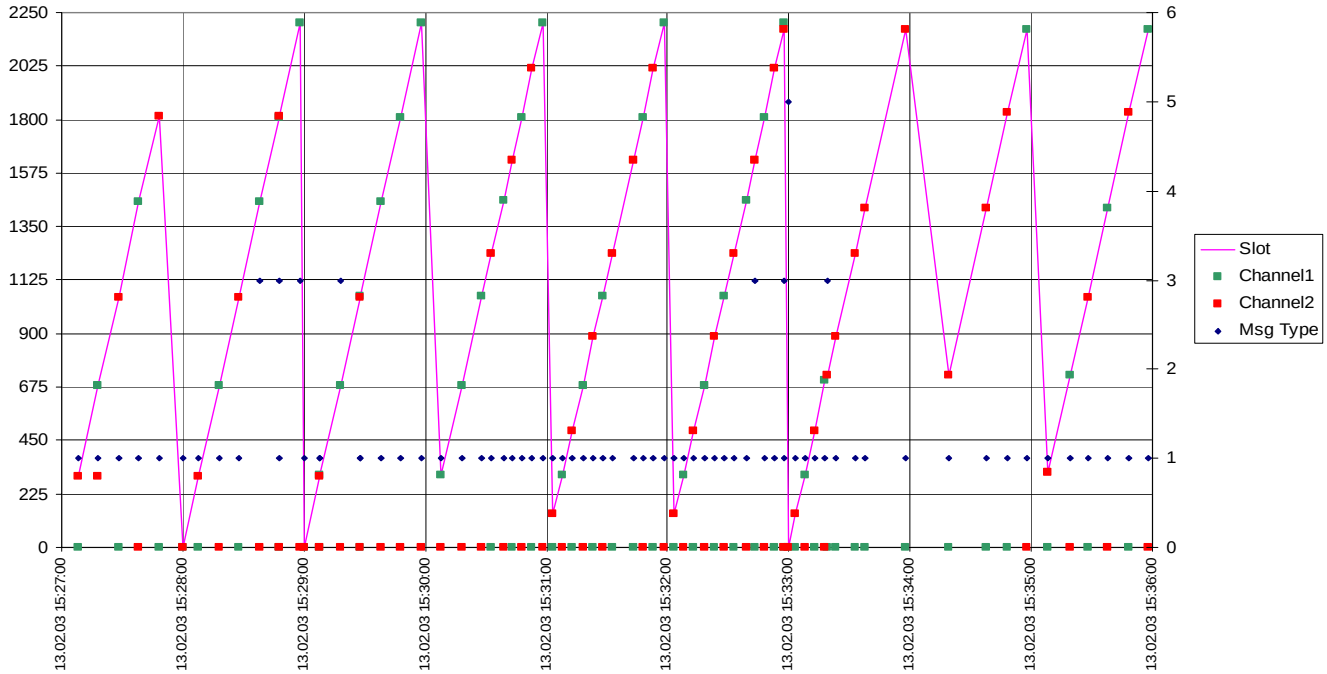


12.02.03 - McMurdo/Transas MT-1 - 16.6.4.2 - Slot assignment - Slot offset

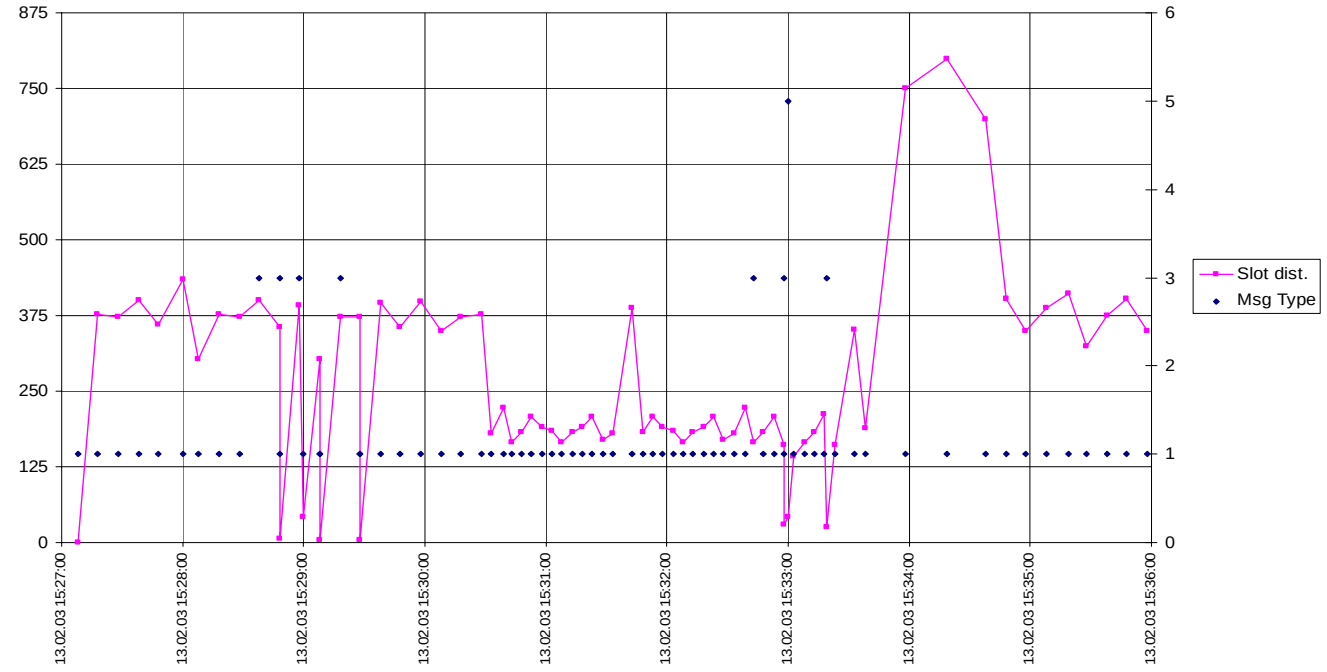


C.7 Area entry through transitional zone

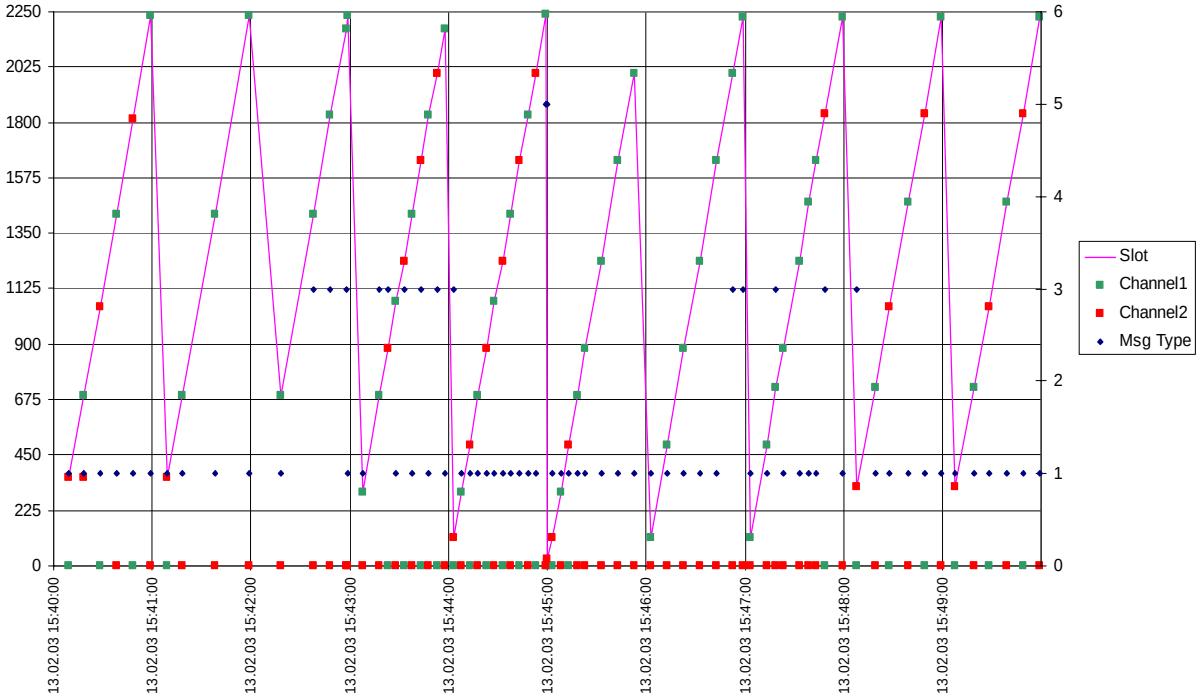
13.02.03 - Transas MT1 - 17.2 - Area Entry, previous channels - Slots



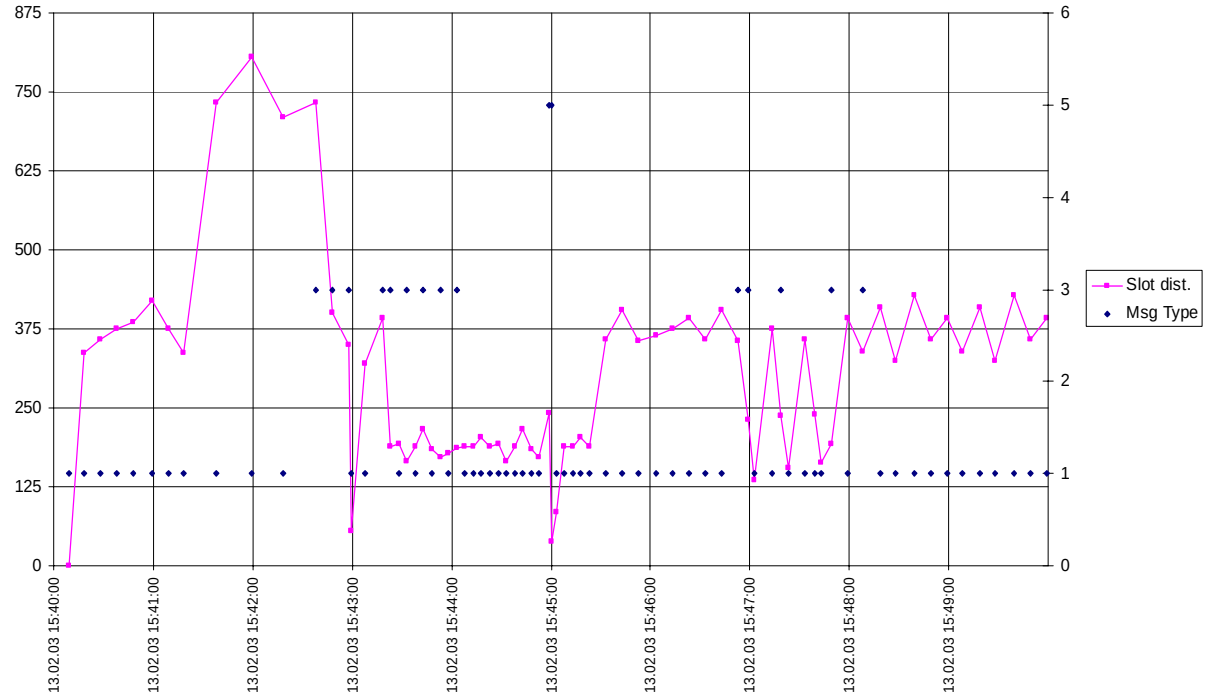
13.02.03 - Transas MT1 - 17.2 - Area Entry, previous channels - - Slot offset



13.02.03 - Transas MT1 - 17.2 Area Entry, new channels - Slots



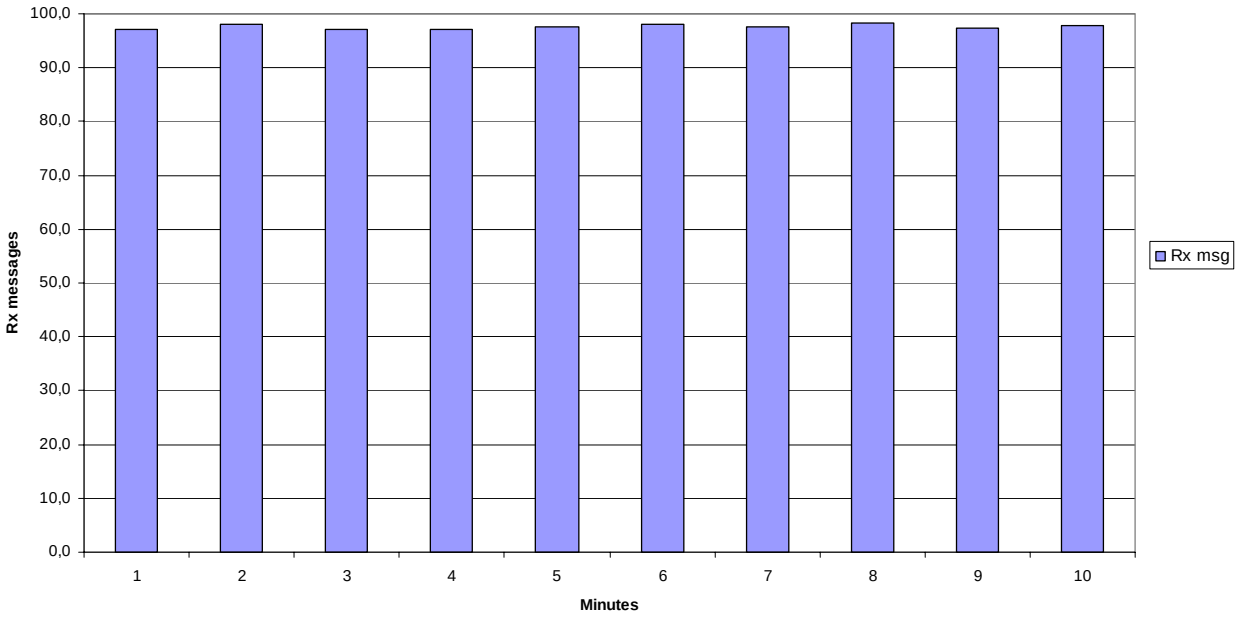
13.02.03 - Transas MT1 - 17.2 - Area Entry, new channels - - Slot offset



C.8 High speed output performance

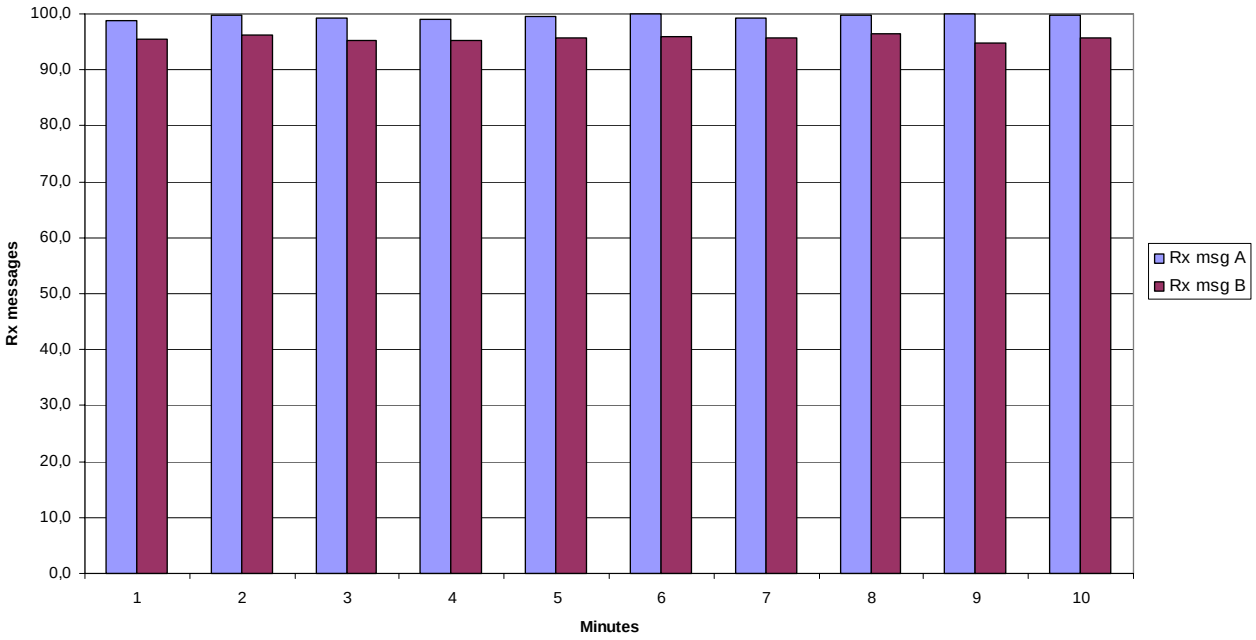
09.05.03 - Transas/McMurdo MT-1 - 19.7 PI output performance

Result: Average = 97.6 % Ch A: 1086 Ch B: 2086



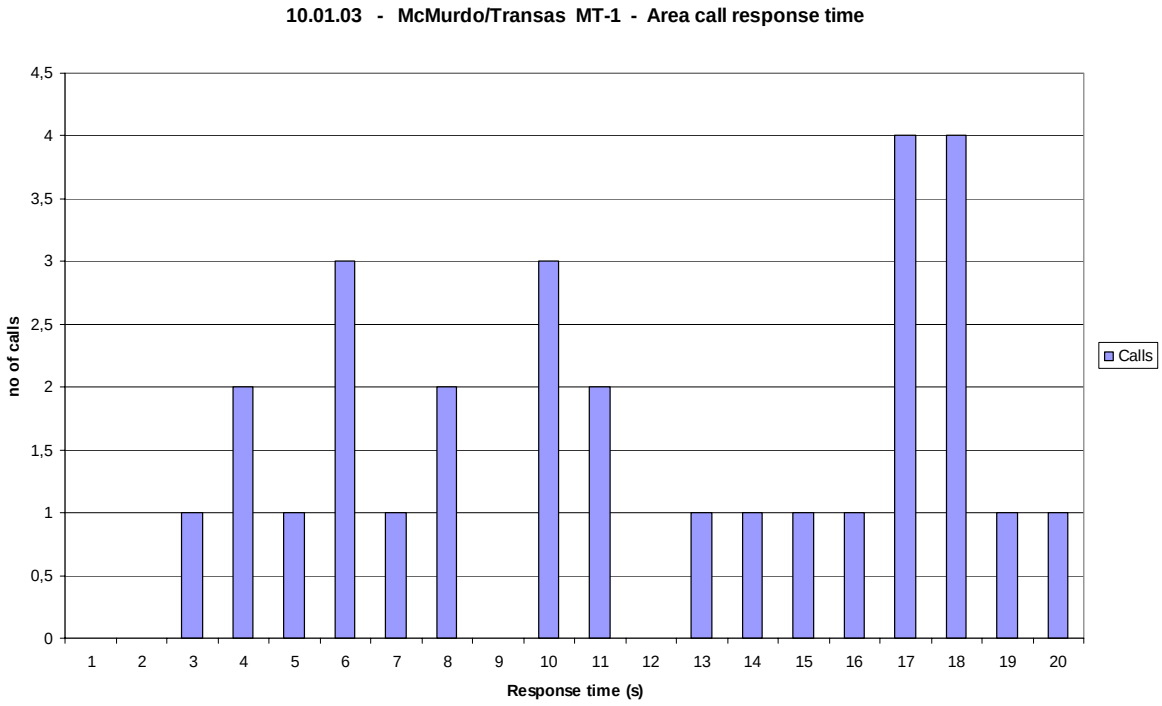
09.05.03 - Transas/McMurdo MT-1 - 19.7 PI output performance

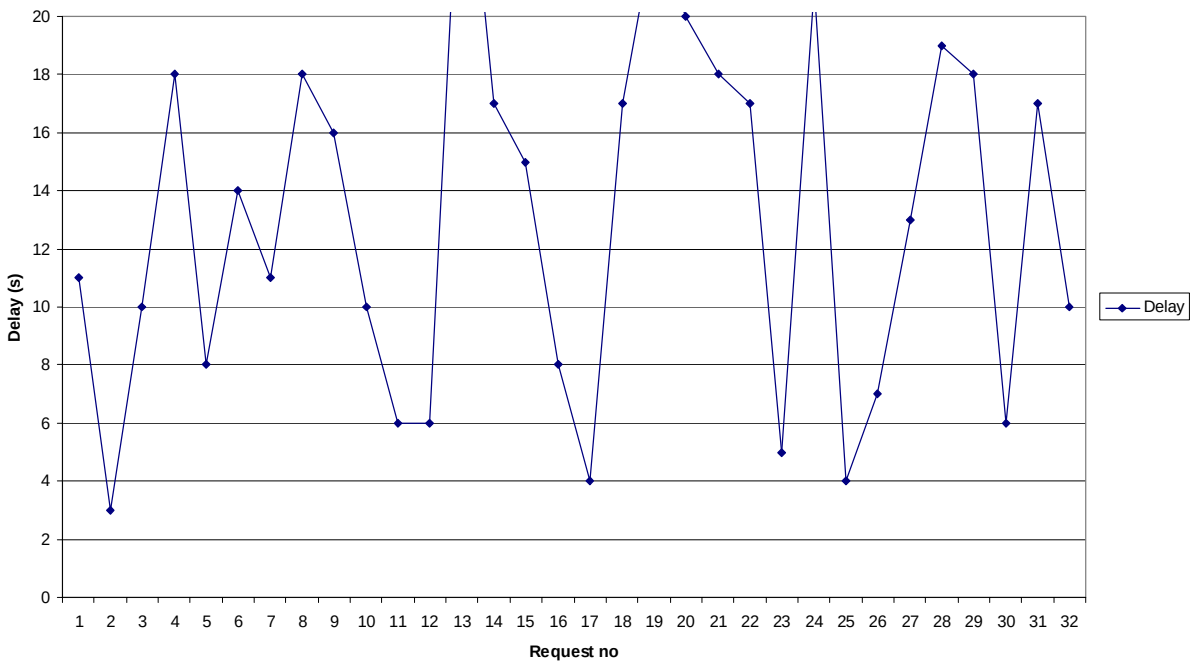
:sult: Average = A=99.5 %, B=95.7% Ch A: 1086 Ch B: 2086



C.9 DSC response time

see test clause 8.4

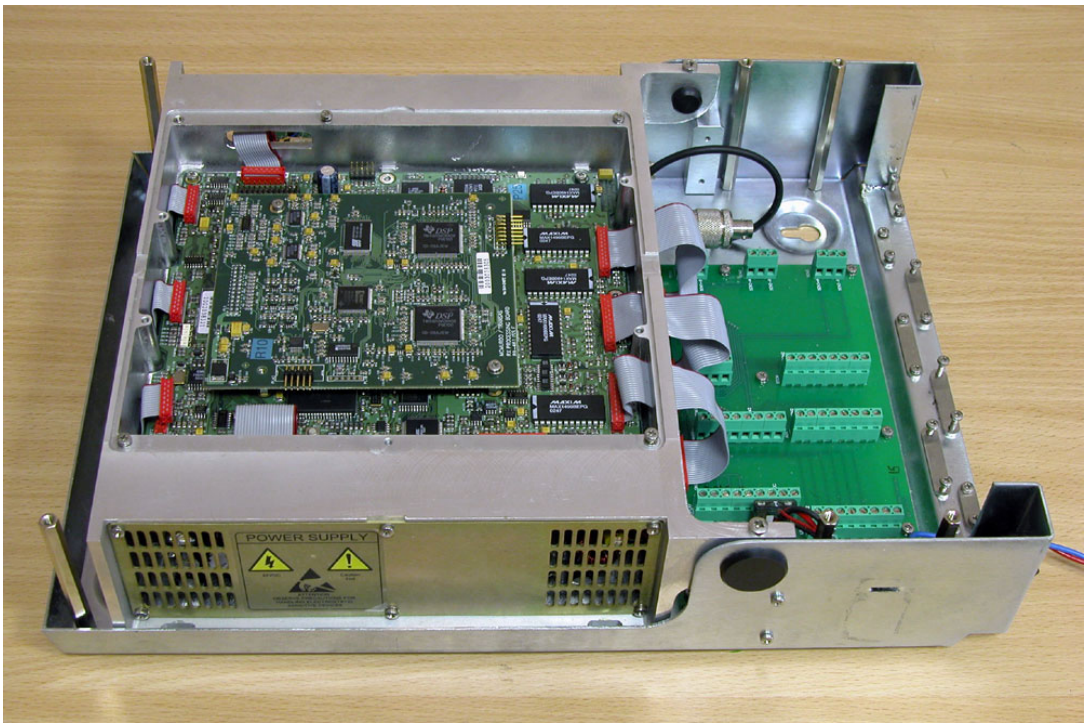




Annex D Photos of equipment under test

D.1 System overview

D.2 Transponder Unit



D.3 MKD unit

D.4 GPS antenna