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: **ICOM**

Type: **MA-500TR**

Applying test standards: IEC 62287 Sections 10,12,13, Annex C.3

Test Report No.: BSH/46162/4321440/10-1

Applicant:
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France

Hamburg, 13 December 2010
Federal Maritime and
Hydrographic Agency

by order

Heinrich Bartels
Test engineer

by order

Axel Werth
Deputy of head of
laboratory/ section

nach EN ISO/IEC 17025:2005
akkreditiertes Prüflaboratorium

Deutscher Akkreditierungs Rat
DAR
DAT-P-086/98

Federal Maritime and Hydrographic Agency
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Deutschen AkkreditierungsRat

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Federal Maritime and Hydrographic Agency
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Frankfurt/Main, 2008-12-23

Correctness of the english translation confirmed: Frankfurt/Main, 2008-12-23

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

Member in EA, ILAC, IAF

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

See notes overleaf

General

Applicant:	Pete Hizzey 5 Boulevard Libre Echange, 2AC Champs Pinsons, 31650 Saint-Orens de Gameville, France
Equipment under test:	
Type:	MA-500TR
Manufacturer:	ICOM Incorporated
	2-1-32 Kamiminami, Hirano-Ku, Osaka 547-0003, Japan
Place of test:	BSH test laboratory Hamburg, Room 916
Start of test:	8 Feburary 2010
End of test:	30 November 2010

Test standards[1]:

IEC 62287-1
Maritime navigation and radiocommunication equipment and systems-
Automatic Identification Systems
Class B shipborne equipment of the Universal Automatic Identification System (AIS) using CSTMA techniques

Summary

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
2	IEC 62287	10 Operational tests	Passed
3	IEC 62287	11 Physical tests	Not included
4	IEC 62287	12 Specific tests of link layer	Passed
5	IEC 62287	13 Specific tests of network layer	Passed
6	IEC 62287	C.3 DSC 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 information

1.1 Equipment history

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

1.1.1 EUT system no 1

Transponder				
Type	MA-500TR	Part No.:	---	
Delivery date	2010-02-04	Serial number	000027	
HW Version:	Delivery date		Version no	
	Installation date			
SW Version:	Delivery date	2010-02-04	Version no	There is no indication of the software version. Remark: A display of the software version is available in later SW versions
	Installation date	2010-02-04		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	ICOM MXG 5000	Part No.:		
Delivery date	2010-02-04	Serial number	0000314	
HW Version:	Delivery date		Version no	Includes the GPS receiver
	Installation date			

1.1.2 EUT system no 2

Transponder				
Type	MA-500TR		Part No.:	---
Delivery date	2010-05-19		Serial number	000042
HW Version:	Delivery date	2010-05-19	Version no	
	Installation date	2010-05-31		
SW Version:	Delivery date	2010-05-19	Version no	SW: 1.002
	Installation date	2010-05-31		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	ICOM MXG 5000		Part No.:	
Delivery date	2010-02-04		Serial number	0000314
HW Version:	Delivery date		Version no	Includes the GPS receiver
	Installation date			

1.1.3 EUT system no 3

Transponder				
Type	MA-500TR		Part No.:	---
Delivery date	2010-05-19		Serial number	000043
HW Version:	Delivery date	2010-05-19	Version no	
	Installation date	2010-07-23		
SW Version:	Delivery date	2010-05-19	Version no	SW: 1.002
	Installation date	2010-07-23		
SW Version:	Delivery date	2010-07-19	Version no	SW:1.005
	Installation date	2010-07-23		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	ICOM MXG 5000		Part No.:	
Delivery date	2010-05-19		Serial number	0000315
HW Version:	Delivery date		Version no	Includes the GPS receiver
	Installation date			

1.1.4 EUT system no 4

Transponder				
Type	MA-500TR	Part No.:	---	
Delivery date	2010-09-02	Serial number	0901022	
HW Version:	Delivery date	2010-09-02	Version no	
	Installation date	2010-09-30		
SW Version:	Delivery date	2010-09-02	Version no	SW: 1.007
	Installation date	2010-09-30		
SW Version:	Delivery date	2010-10-19	Version no	SW: 1.008
	Installation date	2010-10-25		
SW Version:	Delivery date	2010-11-30	Version no	SW: 1.010
	Installation date	2010-11-30		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna				
Type	ICOM MXG 5000	Part No.:		
Delivery date	2010-09-24	Serial number	0301149	
HW Version:	Delivery date	2010-09-24	Version no	Includes the GPS receiver
	Installation date	2010-09-30		

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	2010-02-08	2010-02-12	Bartels
2	2010-06-02	2010-06-09	Bartels
3	2010-07-26	2010-07-27	Bartels
4	2010-09-30	2010-01-10	Bartels
4	2010-10-26	2010-10-29	Bartels
4	2010-11-30	2010-11-30	Bartels

1.3 Composition

Display

☒ Internal ☐ Remote ☐ not available

DSC

☐ Dedicated DSC Rx ☒ Time sharing with TDMA Rx

RF Band ability

☐ Only upper band ☒ upper and lower band can be used

Channel management by msg 22

☒ Msg 22 implemented ☐ Only AIS 1 and AIS 2 can be used

Serial Interface

☒ Available ☐ Not available

Standard of serial interface:	NMEA0183 / IEC 61162, 3 ports

If not available, a serial test interface is required

Sync signal for Carrier sense test

Required for testing

Parameters	
Polarity:	Positive
Level	5 V

1.4 Legend

Result marking (in the "result" column)[2]:

Passed	Item is ok, test was successful
Not passed	Test of a required item was not successful, change required
N/T	Not tested
N/A	Not applicable

Specific remarks (in the "remark" column, marked "bold italic":)

REC	recommendation (in terms of IEC17025 "opinion"); an improvement or change is Recommended
Note	note or comment (in terms of IEC17025 "interpretation") ; rationale for specific results or interpretation of requirements as appropriate

Template for additional test notes (copy if required):

Date	Result	Status

Issue of this template: 2007-09-10

[2] Test items maybe colour marked in draft versions of the report as follows:

Passed	no colour marking
Not passed	yellow
N/T	blue
N/A	no colour marking
REC	green

1.4.1 General problems

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

General problems			
Date	Item	Remark	Result
2010-02-12 Ba	Stop of Tx	In the "Adjustment" menu item the transmission stops without any indication. This stop of transmission is acceptable only if there is a clear indication for the user that the transmission is stopped, e.g. a popup window with a warning Retest 2010-06-09 Ba: No change, transmission is stopped without indication Retest 2010-07-26 Ba: The manufacturer has provided a declaration that the Adjustment menus will not be available to the end user	Passed
2010-02-12 Ba	Area settings	The area settings are deleted when the unit is switched off. Retest 2010-06-09 Ba: The area settings are not deleted when the equipment is switched off	Passed
2010-02-12 Ba	Composition	We need a declaration giving the information of section 1.3 "Composition". This information, mainly the information about the supported marine bands (upper / lower) should be included in the manual (Technical data). Retest 2010-07-26 Ba: Information about the supported marine bands are included in the manual (upper and lower band)	Passed

2 4. General requirements

2.1 4.2 Manuals

The manuals shall include:

- *the type of external connectors if applicable;*
- *the required information for correct siting of the antennas;*
- *the required information for compass safe distance.*

It is checked that the required documentation items are available.

2010-06-09 Ba	Test details – Requirements of IEC 62287		
Test item	Check	Remark	Result
Type of external Connectors	Check that type of external connectors is included		Passed
Siting of antennas	Check that information about siting the GPS antenna is included	Not found in the manual Retest 2010-07-27 Ba: Information about siting of the GPS antenna is provided in a separate instruction sheet of the GPS antenna. In the manual there is a reference to this instruction sheet	Passed
	Check that information about siting the VHF antenna is included	Not found in the manual Retest 2010-07-27 Ba: Information about siting of the VHF antenna is included	Passed
Compass safety distance	Check that information about the compass safety distance is included	Not found in the manual Retest 2010-07-27 Ba: At 4 places in the manual a compass safe distance of 1 m (3.3 f) is mentioned.	Passed

2.2 Marking and identification

Each unit of the equipment shall be marked externally with the following information which, where practicable, shall be clearly visible when the equipment is installed in its recommended position:

- *identification of the manufacturer;*
- *equipment type number or model identification;*
- *serial number of the unit;*
- *power supply requirements; and*
- *compass safe distance.*

Alternatively, the marking may be presented on a display at equipment start-up.

The version of software shall be either marked or displayed on command on the equipment.

When the marking and the title and version of the software are presented only on the display, such information shall also be included in the equipment manual.

2010-06-09 Ba	Test details – Marking and identification		
Test item	Check	Remark	Result
Type of marking and identification	Check if the equipment is marked		Passed
	Check if the marking and identification is shown on a display		N/A
Marking items	Check that the Identification of the manufacturer is available	ICOM	Passed
	Check that the equipment type number or model identification is available	MA-500TR	Passed
	Check that the serial number of the unit is available	00000042, 00000043	Passed
	Check that power supply requirements information is available	12 V DC	Passed
	Check that the compass safety distance is available	1 m	Passed
Software version	Check that the software version is displayed	Not displayed on the label	Passed
	Note if the software version is displayed on the equipment or on the display	The software version is displayed on the equipment display	Passed
	If displayed only on the display: check that the software version is also included in the manual	The software version is not found in the manual: This is a deviation from the requirements of the standard but we accept it because it is more reliable to check the software version on the display	Passed

3 10 Operational tests

3.1 10.2 Modes of operating

(see 4.1.5)

3.1.1 10.2.1 Autonomous mode

(see 4.1.5.1)

3.1.1.1 10.2.1.1 Transmit Position reports

10.2.1.1.1 Method of measurement

Set up standard test environment. Record the VDL communication and check for messages transmitted by the EUT.

10.2.1.1.2 Required results

Confirm that the EUT transmits Messages 18 and 24 following the nominal schedule and alternates between channel A and channel B.

2010-02-08 Ba	Test details – Transmission of Position reports		
Test item	Check	Remark	Result
Set up standard test environment			
Msg 18	Check that message 18 is transmitted continuously		Passed
	Check the transmission schedule of msg 18		Passed
	Check that msg 18 alternates between channel A and B		Passed
Msg 24	Check that message 24 is transmitted continuously		Passed
	Check that msg 24 part A and B are transmitted.		Passed
	Check the transmission schedule of msg 24		Passed
	Check that msg 24 alternates between channel A and B		Passed

3.1.1.2 10.2.1.2 Receive Class A position reports

10.2.1.2.1 Method of measurement

Set up standard test environment.

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

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

c) Transmit test targets using same time periods on channel A and channel B.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

10.2.1.2.2 Required results

Confirm that EUT receives continuously under conditions 10.2.1.2.1 a), b) and c) and, where provided, outputs the received messages on the external interface or display.

2010-02-08 Ba	Test details a)– Receive Position reports, Target started first		
Test item	Check	Remark	Result
Switch on Test targets, then start operation of the EUT Check the following items on external interface and display			
Check for continuos receiving	On test output		N/A
	On external interface	If implemented	Passed
	On display	If implemented	Passed
Channels	Check that the position reports are received on channel A		Passed
	Check that the position reports are received on channel B		Passed

2010-02-08 Ba	Test details a)– Receive Position reports, EUT started first		
Test item	Check	Remark	Result
Switch on EUT, then start Test targets Check the following items on external interface and display			
Check for continuous receiving	On test output		N/A
	On external interface	If implemented	Passed
	On display	If implemented	Passed
Channels	Check that the position reports are received on channel A		Passed
	Check that the position reports are received on channel B		Passed

2010-02-09 Ba	Test details a)– Receive Position reports in same time periods		
Test item	Check	Remark	Result
Start 2 test targets using the same time slots on channel A and B Check the following items on external interface and display			
Check for continuous receiving	On test output		N/A
	On external interface	If implemented	Passed
	On display	If implemented	Passed
Channels	Check that the position reports of one target are received on channel A		Passed
	Check that the position reports of the other target are received on channel B		Passed
Remark:	This test result has been derived from the Rx performance test (3.1.1.5) because in this test the EUT is receiving in the same time slots on both channels.		

3.1.1.3 10.2.1.3 Receive Class B"CS" position reports

This test is only applicable if a display or display interface for the received messages is provided.

10.2.1.3.1 Method of measurement

Set up standard test environment. Simulate at least one additional Class B"CS" test target (bit stuffing shall not increase 4 bit)

Check the VDL communication, test output, and display or external interface of the EUT.

10.2.1.3.2 Required results

Confirm that EUT receives the Class B"CS" test target continuously and, where provided, outputs the received Messages 18 and 24 on the external interface.

2010-02-08 Ba	Test details a)– Receive Class B "CS" position reports		
Test item	Check	Remark	Result
Switch on Test targets, then start operation of the EUT Check the following items on external interface and display			
Check for continuous receiving of msg 18	On test output		N/A
	On external interface	If implemented	Passed
	On display	If implemented	Passed
Check for continuous receiving of msg 24	On test output		N/A
	On external interface	If implemented	Passed
	On display	If implemented	Passed
	Check that msg 24 A and B are received		Passed
Channels	Check that the position reports are received on channel A		Passed
	Check that the position reports are received on channel B		Passed

3.1.1.4 10.2.1.4 Receive in adjacent time periods

10.2.1.4.1 Method of measurement

Set up standard test environment. Simulate additional targets so that the first 4 of each 5 time periods are used. The reporting rate may be increased for the purpose of this test.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

10.2.1.4.2 Required results

Confirm that EUT continuously receives messages in the time periods adjacent to own transmission period with an acceptable loss of 5 %.

2010-02-09 Ba	Test details - Receive in adjacent time periods		
Test item	Check	Remark	Result
Simulate targets in 4 of 5 time periods (80 % channel load, VDL tester set "test 80% 4-1") Check the following items on external interface			
Received targets	Check that the targets transmitting in the time periods before the EUT transmission slot are received	All targets on both channel in the slot before the own transmisssion are not received Retest 2010-06-07 Ba: Targets in the time periods before the EUT transmission slot are received	Passed
	Check that the targets transmitting in the time periods after the EUT transmission slot are received		Passed
	Check that the Rx loss is < 5 %	The loss is 3.3% (3.3% (3 of 90) before and 3.3% (3 of 90) after own transmission)	Passed

3.1.1.5 10.2.1.5 Rx performance test

10.2.1.5.1 Method of measurement

Set up standard test environment. Simulate additional targets so that 9 of 10 time periods are used.

Check the VDL communication, test output, and where provided, display or external interface of the EUT.

10.2.1.5.2 Required results

Confirm that EUT continuously receives messages and, where provided, outputs the received messages on the external interface with a loss of not more than 5 %.

2010-02-09 Ba	Test details - Receive in adjacent time periods		
Test item	Check	Remark	Result
Simulate targets in 9 of 10 time periods (90 % channel load), record the test or external interface			
Rx probability	Check that at least 95 % of the target position reports are received	About 95% on channel A and 82% on channel B are output. This seems to be not a performance problem because with normal reporting rate (10s) the receiving probability was similar: VDL-Tester: A=81%, B=76% Class A: A= 89%, B= 76% <u>Retest 2010-06-07 Ba:</u> • Outside the DSC sharing time the receiving rate meets the requirements (A=96.2%, B=97.6%). • During the DSC sharing time the receiving behaviour is not correct. <u>Retest 2010-07-26 Ba:</u> • During the DSC sharing time the EUT receives AIS messages on the channel not used for DSC. • It is alternating between A and B. • The DSC sharing times are correct.	Passed Passed

3.1.2 10.2.2 Assigned mode

(see 4.1.5.2)

3.1.2.1 10.2.2.1 Group assignment

10.2.2.1.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a group assignment command Message 23 to the EUT addressing stations by

- *region,*
- *station type and*
- *type of ship*

and commanding for

- *Tx/Rx mode,*
- *reporting rate,*
- *quiet time.*

Record transmitted messages.

10.2.2.1.2 Required results

Confirm that the EUT transmits position reports Message 18 according to the defined parameters and reverts to standard reporting rate after 4 min to 8 min.

Confirm that the operation of the EUT is not affected when not addressed.

2010-02-08 Ba	Test details - Group assignment, addressed		
Test item	Check	Remark	Result
Test 1: Send a msg 23 with the following parameters: speed = 12 kn			
Region: inside Station type: 0 = all types Type of ship: 0 = all types Tx/ Rx mode = 0: Tx A and B Reporting interval: 8 = 5 s Quiet time: 0 = no quiet time Msg "B Msg 23 Test 10.2.2.1 T1"	check that the reporting rate = 5 s	UTC 11:25	Passed
	Check that EUT reverts to standard reporting rate after 4...8 min	After 7 and 5 minutes	Passed
Test 2: Send a msg 23 with the following parameters:			
Region: inside Station type: 2 = all class B Type of ship: 37 = pleasure craft Tx/ Rx mode = 0: Tx A and B Reporting interval: 9 = next shorter Quiet time: 0 = no quiet time Msg "B Msg 23 Test 10.2.2.1 T2"	check that the reporting rate = 15 s	UTC 11:46 (8=5s) With reporting interval 8=5 s the reporting rate is correct UTC 11:56 (9) With reporting interval 9 = next shorter the reporting interval remains at 30 s Retest 2010-06-02 Ba: UTC 10:30 The reporting interval is 15 s	Passed Passed
	Check that EUT reverts to standard reporting rate after 4...8 min		Passed
Test 3: Send a msg 23 with the following parameters:			
Region: inside Station type: 5 = all class B CS Type of ship: 37 = pleasure craft Tx/ Rx mode = 0: Tx A and B Reporting interval: 7 = 10 s Quiet time: 0 = no quiet time Msg "B Msg 23 Test 10.2.2.1 T3"	check that the reporting rate = 10 s		Passed
	Check that EUT reverts to standard reporting rate after 4...8 min		Passed
Test 4: Send a msg 23 with the following parameters:			
Region: inside Station type: 5 = all class B CS Type of ship: 37 = pleasure craft Tx/ Rx mode = 1: Tx A Reporting interval: 6 = 15 s Quiet time: 0 = no quiet time Msg "B Msg 23 Test 10.2.2.1 T4"	check that the reporting rate = 30 s	UTC 12:8 The reporting interval = 15 s. It sould be 30 s according to the note to Table 17 of IEC 62287-1 Retest 2010-06-02 Ba: UTC 10:33 The reporting interval is 30s	Passed
	Check that all transmissions are on channel A		Passed

After 3 minutes send the same msg 23 but Tx/ Rx mode = 2: Tx B Msg "B Msg 23 Test 10.2.2.1 T4", manually change Tx/Rx mode to 2	check that the reporting rate = 30 s	UTC 12:21 Reporting interval = 15 s Retest 2010-06-02 Ba: UTC 10:38 The reporting interval is 30s	Passed
	Check that all transmissions are on channel B		Passed
Test 5: Send a msg 23 with the following parameters:			
Region: inside Station type: 5 = all class B CS Type of ship: 37 = pleasure craft Tx/ Rx mode = 0: Tx A and B Reporting interval: 0 = auto. Quiet time: 8 = 8 min Msg "B Msg 23 Test 10.2.2.1 T5"	Check that EUT stops transmission for 8 min	UTC 12:31 EUT continues transmission UTC 12:36 Retest 2010-06-02 Ba: UTC 10:45 The EUT stops transmission Remark: The EUT displays: "Coast station inhibiting AISTx for x min", x counting down from 8 to 0.	Passed
	Check that the EUT reverts to 30 s reporting rate after 8 min.		Passed

2010-02-08 Ba	Test details - Group assignment, not addressed		
Test item	Check	Remark	Result
Send a msg 23 with the following parameters: speed = 10 kn, EUT ship type = 0 Tx/ Rx mode = 0: Tx A and B Reporting interval: 8 = 5 s Quiet time: 0 = no quiet time			
Test 6: Region: outside Station type: 0 = all types Type of ship: 0 = all types Msg "B Msg 23 Test 10.2.2.1 T6"	check that the reporting interval = 30 s		Passed
Test 7: Region: inside Station type: 4 = AtoN Type of ship: 0 = all types Msg "B Msg 23 Test 10.2.2.1 T7"	check that the reporting interval = 30 s	Tested with types 1, 3, 4, 6	Passed
Test 8: Region: inside Station type: 0 = all types Type of ship: 70 = cargo vessel Msg "B Msg 23 Test 10.2.2.1 T8"	check that the reporting interval = 30 s	UTC 13:48	Passed

3.1.2.2 10.2.2.2 Base station reservations

10.2.2.2.1 Method of measurement

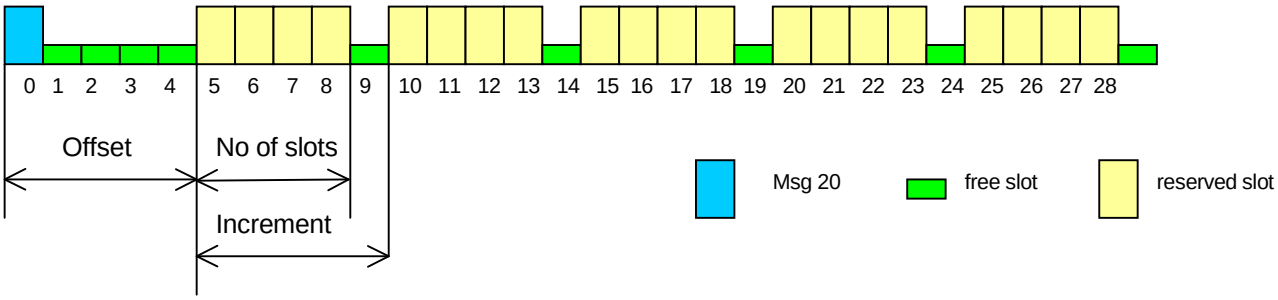
Set up standard test environment and operate EUT in autonomous mode. Transmit a reservation Message 20 to the EUT specifying reserved time periods.

Record transmitted messages.

10.2.2.2.2 Required results

Confirm that the EUT transmits position reports Message 18 without using reserved time periods.

2010-02-08 Ba	Test details - Base station reservations		
Test item	Check	Remark	Result
Test 1: Send a msg 20 with the following parameters: Msg: “B Msg 20 Test 10.2.2.2”			
Tx-slot: 0 offset number: 5 number of slots: 4 slot increment: 5 time-out = 7 Repetition of msg 20: 10 times	Check that only the time periods 0,1..4, 9, 14, 19 ... are used for transmissions	UTC 12:52 Reserved slots are used Always slot 443 is used which is one of the reserved slots <u>Retest 2010-06-02 Ba:</u> • Basically reserved slots are not used for transmission. • One transmission used a reserved slot (Slot 823) <u>Retest 2010-07-26 Ba:</u> No reserved slots are used	Passed Passed
	check that after 18 minutes (Tx of msg 20 + time-out) all time periods are used for transmissions		Passed



3.1.3 10.2.3 Polled mode/interrogation response

(see 4.1.5.3)

3.1.3.1 10.2.3.1 Interrogation for Messages 18 and 24

10.2.3.1.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (Message 15; EUT as destination) to the VDL according to message table (ITU-R M.1371 table13) for responses with Message 18, Message 24:

a) with transmission offset = 0,

b) with transmission offset = defined value,

c) with a Message 23 "quiet time" command transmitted before the interrogation.

Record transmitted messages and frame structure.

10.2.3.1.2 Required results

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

2010-02-08 Ba	Test details - Interrogation for msg 18, 20		
Test item	Check	Remark	Result
a) Test 1: Send a msg 15 transmission offset = 0:			
Interrogation for msg 18 and 24 for destination 1, on channel A Msg: "B Msg15 Test 10.2.3.1 T1",	Check that msg 18 is responded	UTC 14:48	Passed
	Check that the response was within 30 s	Within 3 slots	Passed
	Check that the response is transmitted on channel A		Passed
	Check that msg 24 A is responded within 60 s		Passed
	Check that msg 24 B is responded within 90 s		Passed

b) Test 2: Send a msg 15 transmission offset = 10:			
Interrogation for 24 for destination 1, offset = 20, 30 and for msg 18, destination 2, offset = 10 Request on channel B Msg: "B Msg15 Test 10.2.3.1 T2",	Check that msg 18 is responded with the defined offset	18 is responded 11 slots after message 15 instead of 10 slots, so one slot too late Retest 2010-06-02 Ba: UTC 10:55 Message 18 is transmitted in the defined slot	Passed
	Check that msg 24 A is responded with the defined offset	Message 24 A is transmitted one slot too late. Retest 2010-06-02 Ba: UTC 10:55 Message 24A is transmitted in the defined slot	Passed
	Check that msg 24 B is responded with the defined offset	Message 24 B is not transmitted in the defined slot but some time after Message 24 A. See note) Retest 2010-06-02 Ba: UTC 10:55 Message 24B is transmitted in the defined slot	Passed
	Check that the responses are transmitted on channel B		Passed
c) Test 3: Send a msg 23 commanding quiet time for 8 min, (setting "B Msg23 Test 10.2.2.1 T5") Send a msg 15 with transmission offset = 10: (setting "B Msg15 Test 10.2.3.1 T2", same as Test 2)			
Interrogation for msg 18 for destination 2	Check that msg 18 is responded with the defined offset	Test 2010-06-02 Ba: UTC 10:59 Message 18 and 24 is transmitted in the defined slot	Passed

Note) If there are 2 slots in message 15 for message 24 then the first should be used for message 24 A and the second for message 24 B.

3.1.3.2 10.2.3.2 Interrogation for Message 19

10.2.3.2.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (Message 15; EUT as destination) to the VDL according to message table (M.1371 Table13) for responses with Message 19:

a) with transmission offset = 0,

b) with transmission offset = defined value.

Record transmitted messages and frame structure.

10.2.3.2.1 Required results

Check that

a) the EUT does not respond,

b) the EUT transmits the appropriate interrogation response message as requested after defined transmission offset.

Confirm that the EUT transmits the response on the same channel as that received and the data content is identical with that in Message 24.

2010-02-08 Ba	Test details - Interrogation for msg 19		
Test item	Check	Remark	Result
Test 1: Send a msg 15 transmission with interrogation for msg 19: (setting “B Msg 15 Test 10.2.3.2”);			
Offset = 0, destination 1	Check that msg 19 is not responded	Message 19 is responded This is not allowed because it is a 2 slot message, and the Class B cannot check if the second slot of the message is free. Retest 2010-06-02 Ba: UTC 10:55 Message 19 is not transmitted	Passed
Offset = 15, destination 1 channel = B	Check that msg 19 is responded		Passed
	Check that msg 19 is responded with the defined offset		Passed
	Check that the response is transmitted on channel B		Passed

3.2 10.3 Messages extending one time period

(see 4.1.5)

10.3.1 Method of measurement

Check the documentation for a possibility to initiate transmission of messages longer than one time period.

10.3.2 Required results

It shall not be possible for the user to initiate the transmission of messages longer than one time period.

2010-06-09 Ba	Test details - Tx of msg with more than 1 slot		
Test item	Check	Remark	Result
Check documentation	Check that there is no way to initiate the transmission of message longer than 1 time period	ABM and BBM input sentences are ignored. Retest 2010-07-26 Ba: The manufacturer has provided a declaration that the EUT cannot initiate any message longer than one period by user operations.	Passed Passed

3.3 10.4 Channel selection

(see 6.2)

3.3.1 10.4.1 Valid channels

10.4.1.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Switch the EUT to different channels within the operating band as specified in 6.2 by transmission of channel management message (Message 22) broadcast and addressed to EUT,

Record the VDL messages on the designated channels and check "band flag" and "Message 22 flag" in Message 18. (note that DSC command is covered in Annex C)

10.4.1.2 Required results

Confirm that the EUT switches to the required channel accordingly.

2010-06-02 Ba	Test details - Channel selection by msg 22		
Test item	Check	Remark	Result
Test 1: Send a msg 22 broadcast, EUT inside the area			
Channels 2060, 2062 (msg "B Msg 22 Test 10.4.1 a")	Check that EUT transmits on the assigned channels		Passed
	Check that EUT receives on the assigned channels		Passed
	Check and note the band flag	= 1	Passed
	Check that the Msg 22 flag = 1	= 1	Passed
Send an addressed msg 22 to the EUT, channels 2084, 2086 (msg "B Msg 22 Test 10.4.1 b")	Check that EUT transmits on the assigned channels		Passed
	Check that EUT receives on the assigned channels		Passed

3.3.2 10.4.2 Invalid channels

10.4.2.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Check units capability on the "band flag" and "Message 22 flag" in Message 18. Switch the EUT to channels outside the operating band as specified in 6.2..

Record the VDL messages on the designated channels.

10.4.2.2 Required results

Confirm that the EUT does not switch to the respective channels and stops transmissions.

2010-06-02 Ba	Test details - Channel selection by msg 22		
Test item	Check	Remark	Result
Test 1: Send a msg 22 broadcast, EUT inside the area			
If the EUT is able to operate in the lower band: Channels 1060, 1062 (msg "B Msg 22 Test 10.4.1 a"), modify channels manually	Check that EUT transmits on the assigned channels		Passed
	Check that EUT receives on the assigned channels		Passed
	Check the band flag = 1		Passed
	Check that the Msg 22 flag = 1		Passed
If the EUT is not able to operate in the lower band: Channels 1084, 2084 (msg "B Msg 22 Test 10.4.1 a"), modify channels manually	Check that EUT stops transmission	The EUT can operate in the lower band	N/A
	Check that EUT receives on AIS 1 and AIS 2 (default)		N/A
	Check the band flag = 0		N/A
	Check that the Msg 22 flag = 1		N/A
Send a msg 22 broadcast with invalid channels (msg "B Msg 22 Test 10.4.1 a"), modify channels manually	Check that EUT stops transmission		N/A
	Check that EUT receives on AIS 1 and AIS 2 (default)		N/A

3.4 10.5 Internal GNSS receiver

(see 6.3)

Relevant tests according to IEC 61108-1shall be performed with regard to

- *position accuracy, static;*
- *position accuracy, dynamic;*
- *COG/SOG accuracy;*
- *position update;*
- *status indications (including RAIM, where fitted).*

Note: The GNSS receiver test is not part of this test report. The GNSS receiver is tested in a separate test with a separate test report.

3.5 10.6 AIS information

(see 6.5)

3.5.1 10.6.1 Information content

(see 6.5.1)

3.5.1.1 10.6.1.1 Defaults

10.6.1.1.1 Method of measurement

Set up the standard test environment and reset the equipment to enable the manufacturers static data delivery defaults. Attempt to set the equipment to operate in autonomous mode.

10.6.1.1.2 Required results

Confirm that the default MMSI is set at 000000000 and that other static data defaults unambiguously identify that the equipment has been properly initialised. Confirm that the transmissions are inhibited and that an indication is given that transmissions are inhibited.

2010-02-08 Ba	Test details - Defaults		
Test item	Check	Remark	Result
Reset the EUT to the default settings			
Default settings	Check that the MMSI is 00000000		Passed
	Check that the other static data are set to default values		Passed
	Check that the EUT does not transmit		Passed
	Check that the transmission stop is indicated on the EUT	The transmission stop is not indicated but a window is shown requesting the input of the MMSI	Passed

3.5.1.2 10.6.1.2 Required information

10.6.1.2.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply all static data to the EUT.

Record all messages on VDL and check the contents of position report Message 18 and static data report Messages 24 A and B.

10.6.1.2.2 Required results

Confirm that data transmitted by the EUT complies with static data and position sensor data.

2010-02-08 Ba	Test details - Required information		
Test item	Check	Remark	Result
Apply all necessary data to the EUT			
Required information of msg 18	Check the MMSI		Passed
	Check the SOG		Passed
	Check the PA-flag		Passed
	Check the Longitude		Passed
	Check the Latitude		Passed
	Check the COG		Passed
	Check the Heading	Default value, the external HDT sentence is not used	Passed
	Check the Time stamp	Time stamp is always 60. The time stamp from the position source (e.g. RMC) should be used Retest 2010-06-02 Ba: Time stamp is according to the time of external position	Passed
	Check the class B unit flag	= 1 (= Class B CS)	Passed
	Check the Display flag		Passed

	Check the DSC flag	= 0 (no DSC) Declaration required Retest 2010-06-02 Ba: The DSC flag is 1	Passed
	Check the band flag	= 0 (only upper band) Declaration required Retest 2010-06-02 Ba: The band flag is 1	Passed
	Check the msg 22 flag	= 0 (No frequency management via message 22) This is incorrect because channel management by message 22 works Retest 2010-06-02 Ba: The msg 22 flag is 1	Passed
	Check the Mode flag	1 in Assigned mode 0 in autonomous mode	Passed
	Check the RAIM flag	• External data: RAIM flag = 0, an external GBS sentence is applied, so it should be 1 • Internal sensor: RAIM flag = 0. Retest 2010-06-02 Ba: Raim flag for external data is 1	Passed Passed
Required information of msg 24A	Check the MMSI		Passed
	Check the Part number = 0		Passed
	Check the Name		Passed
Required information of msg 24B	Check the MMSI		Passed
	Check the Part number = 1		Passed
	Check the Type of ship and cargo		Passed
	Check the Vendor ID		Passed
	Check the Call Sign		Passed
	Check the Dimension of ship/ reference for position (A, B, C, D)		Passed

3.5.1.3 10.6.1.3 External sensor information

(see 6.3, 6.6.3)

*This test is applicable if an **optiona**l interface for external sensors is provided.*

10.6.1.3.1 Method of measurement

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

a) Apply external position data with expected error <10m (from GBS sentence) and within 26 m of internal position.

b) Simulate unavailable/invalid external sensor data and missing/incorrect checksum.

c) Apply a non-WGS-84 or unspecified (no DTM) position input.

d) Apply a low accuracy position input with expected error >10m or without RAIM information (no GBS).

e) Apply position data with more than 26 m apart from internal position

Record all messages on VDL and check the contents of position report Message 18 for position and COG/SOG.

10.6.1.3.2 Required results

a) Confirm that data transmitted by the EUT complies with external sensor inputs.

b), c), d), e) Confirm that external data is not used.

Confirm that accuracy and RAIM flags are set accordingly; confirm that position and COG/SOG are of the same source.

2010-07-26 Ba	Test details - Check for implementation		
Test item	Check	Remark	Result
Check the manufacturers documentation			
Implementation of optional function	Check if the input of external sensor data is implemented	External sensor is implemented	Passed

2010-09-30 Ba	Test details - External sensor input not implemented		
Test item	Check	Remark	Result
<u>This test is applicable only if external sensor input is not implemented</u> Apply Position sentences, GBS and DTM sentence to the EUT: • Valid position data, • Position within 26 m from internal GPS • GBS < 10 m • GBS = WGS 84			
Apply GLL sentence	Check that external position is not used	External sensor input is implemented	N/A
	Check that external speed is not used		N/A
	Check that external heading is not used		N/A
Apply GGA sentence	Check that external position is not used		N/A
	Check that external speed is not used		N/A
Apply GNS sentence	Check that external position is not used		N/A
	Check that external speed is not used		N/A
Apply RMC sentence	Check that external position is not used		N/A
	Check that external speed is not used		N/A

2010-09-30 Ba	Test details - External GNSS data		
Test item	Check	Remark	Result
<u>This test is applicable only if external sensor input is implemented.</u> Apply a RMC, GBS and DTM sentence to the EUT, if not other specified: • Valid GLL data, • Position within 26 m from internal GPS • GBS < 10 m • GBS = WGS 84			
Valid data as above	Check that external Lat is used	Remark: External sensor data have to be in differential mode to be accepted if the internal GPS works in differential mode	Passed
	Check that external LON is used		Passed
	Check that external SOG is used		Passed
	Check that external COG is used		Passed
Set RMC status flag to invalid	Check that internal Lat is used		Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed
Checksum incorrect	Check that internal Lat is used		Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed
DTM not WGS 84	Check that internal Lat is used		Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed
Remove DTM	Check that internal Lat is used	The external sensor data are used if there has been a DTM with WGS 84 and this has been stopped. If there has not been a DTM inoput the internal GPS is used	Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed
Set GBS > 10 m	Check that internal Lat is used	Only if the extimated error in both direction (lon and lat) is > 10 m the internal position is used.	Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed

Remove GBS	Check that internal Lat is used		Passed
	Check that internal LON is used		Passed
	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed
Set external position more than 26 m from the internal position	Check that internal Lat is used	The external data are used Retest 2010-10-26 Ba: The internal LAT is used	Passed
	Check that internal LON is used	The result is the same with both settings of "GPS 26m" setting Remark: if the internal position is not available the external positon is not used if "GPS 26m" is on. It is used if "GPS 26m" is off. Retest 2010-10-26 Ba: The internal LON is used	Passed
	Check that internal SOG is used	Retest 2010-10-26 Ba: The internal SOG is used	Passed
	Check that internal COG is used	Retest 2010-10-26 Ba: The internal COG is used	Passed

For the following test information about supported sensor sentences is required.

2010-10-01 Ba	Test details - External GNSS sentences		
Test item	Check	Remark	Result
This test is applicable only if external sensor input is implemented Apply other Position sentences, GBS and DTM sentence to the EUT, if not other specified: • Valid position data, • Position within 26 m from internal GPS • GBS < 10 m • GBS = WGS 84			
Apply GGA sentence	Check that external Lat is correct		Passed
	Check that external LON is correct		Passed
	Check that external SOG is correct		Passed
	Check that external COG is correct		Passed
Apply GNS sentence	Check that external Lat is correct		Passed
	Check that external LON is correct		Passed
	Check that external SOG is correct		Passed
	Check that external COG is correct		Passed
Apply GLL sentence	Check that external Lat is correct		Passed
	Check that external LON is correct		Passed
	Check that external SOG is correct		Passed
	Check that external COG is correct		Passed

3.5.2 10.6.2 Information update rates

(see 6.5.2)

3.5.2.1 10.6.2.1 Nominal reporting interval

10.6.2.1.1 Method of measurement

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

a) Start with own SOG of 1 kn; record all messages on VDL for 10 min and evaluate reporting rate for position report of EUT by calculating average transmission offset over test period.

b) Increase speed to 10 kn.

c) Reduce speed to 1 kn.

Record all messages on VDL and check transmission offset between two consecutive transmissions.

10.6.2.1.2 Required results

a) Reporting interval shall be 3 min (±10 s).

b) Confirm that the reporting interval of 30 s (±5 s) has been established after the next transmission in the old schedule at the latest. The average reporting interval calculated over at least 25 transmissions shall be 30 s (±2 s).

c) Confirm that the reporting rate is reduced after 3 min (speed reduction).

2010-02-08 Ba	Test details - Autonomous reporting rate		
Test item	Check	Remark	Result
Apply SOG according to the test items and check the reporting rate			
a) SOG = 1 kn for 10 min	Check that the reporting rate = 3 min +/- 10s		Passed
b) Change SOG to 10 kn for 15 min	Check that the reporting rate = 30 s +/- 5s	• The reporting rate is 30 s. • The two transmissions on channel B before and after each quarter of an hour (xx:00, xx:15, xx:30, xx:45) are missing This has been observed in several tests Retest 2010-06-03 Ba: In a test over 12 hours no message was missing	Passed Passed
	Check that the reporting rate is established after the next transmission of the old schedule	It is established immediately, not waiting for the next transmission of the old schedule. In our interpretation of the standard this is acceptable.	Passed
	Change of reporting rate		Passed
	Check that the average reporting rate of 25 Tx = 30 s +/- 2s		Passed
c) SOG = 1 kn for 10 min	Check that the reporting rate = 3 min +/- 10s		Passed
	Check that the reporting rate is reduced after 3 min	The reporting rate is reduced immediately, not waiting for 3 minutes Retest 2010-06-02 Ba: UTC 11:37 The reporting rate is reduced after 3 min	 Passed

3.5.2.2 10.6.2.2 Assigned reporting interval

10.6.2.2.1 Method of measurement

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

a) Transmit an assigned mode command Message 23 to the EUT with designated reporting intervals of 5 s to 3 min according to Table 17.

b) Transmit an assigned mode command Message 23 to the EUT with designated reporting interval of 10 min.

c) Transmit Messages 23 with a refresh rate of 1 min with designated reporting intervals of 6 min and 10 min.

d) Transmit Messages 23 designated reporting interval field settings of 11-15

e) Change course, speed. Record transmitted messages.

10.6.2.2.2 Required results

a) Confirm that the EUT transmits position reports Message 18 according to the parameters defined by Message 23. The EUT shall revert to autonomous mode with nominal reporting interval after 4 min to 8 min.

b) Confirm that the EUT reverts to autonomous mode with nominal reporting interval after 4 min to 8 min.

c) Confirm that the EUT transmits position reports Message 18 according to the parameters defined by Message 23.

d) Confirm that the EUT does not change its nominal behaviour.

e) The reporting interval shall not be affected by course or speed.

Remark: Reporting rates 5, 10, 15 s are tested in 10.2.2.1

2010-02-10 Ba	Test details - Assigned reporting interval		
Test item	Check	Remark	Result
Test a: Send a msg 23 with the following parameters: speed = 1 kn			
Region: inside Reporting interval: 5 = 30 s Msg "B Msg 23 Test 10.6.2.2. Ta1"	Check that the reporting interval = 30 s	UTC 13:18	Passed
	Check that EUT reverts to standard reporting rate after 4...8 min	UTC 13:25	Passed
Test a: Send a msg 23 with the following parameters: speed = 10 kn			
Region: inside Reporting interval: 3 = 3 min Msg "B Msg 23 Test 10.6.2.2. Ta2"	check that the reporting interval = 3 min	UTC 14:07	Passed
	Check that EUT reverts to standard reporting rate after 4...8 min	UTC 14:11	Passed
Test b: Send a msg 23 with the following parameters:			
Reporting interval: 1 = 10 min Msg "B Msg 23 Test 10.6.2.2. Tb"	Check that EUT reverts to standard reporting rate after 4...8 min	UTC 14:36 Reverts at UTC 14:43	Passed

Test c1: Send a msg 23 with the following parameters and repeat it every minute for at least 15minutes			
Reporting interval: 2 = 6 min Msg "B Msg 23 Test 10.6.2.2. Tc1"	check that the reporting rate = 6 min	UTC 14:49 It seems that the reporting interval is 6 min but it is not really clear. Transmissions: 14:49 ch B ok 14:55 ch A ok 15:01 ch B is missing (No VDO, not received) 15:07 ch A ok This may be the same problem as reported in 10.6.2.1. Retest 2010-06-02 Ba: UTC 13:23 Tx : A 13:28, B 13:34, A 13:40, B 13:46, A 13:50 (End of assigned rate)	Passed
	Check that EUT reverts to standard reporting rate 4...8 min after last msg 23	Last Msg 23 : UTC 15:03 Reverting: UTC 15:09	Passed
Test c2: Send a msg 23 with the following parameters and repeat it every minute for at least 22 minutes			
Reporting interval: 1 = 10 min Msg "B Msg 23 Test 10.6.2.2. Tc2"	check that the reporting rate = 10 min	UTC 15:41 There is a similar problem as with 6 min reporting interval 15:40 Ch B ok 15:50 Ch A ok 16:00 Ch B missing 16:10 Ch A ok Retest 2010-06-02 Ba: UTC 12:34 Tx: A 12:43, B 12:53, A 13:03	Passed
	Check that EUT reverts to standard reporting rate 4...8 min after last msg 23	Last Msg 23: UTC 16:05 Reverting at 16:12 Retest 2010-06-02 Ba: Last msg 23: UTC 13:04 Reverting at: 13:10	Passed

Test d: Send a msg 23 with the following parameters:			
Reporting interval:10 Msg "B Msg 23 Test 10.6.2.2. Td1"	check that the reporting rate is 1 min (next longer)	UTC 12:21 The reporting interval of 30 s continues. Retest 2010-06-02 Ba: UTC 11:46 Reporting rate = 60 s	Passed
Reporting interval:11 Msg "B Msg 23 Test 10.6.2.2. Td1"	check that the reporting rate is not affected	UTC 12:21 The reporting interval of 30 s continues.	Passed
Reporting interval:15 Msg "B Msg 23 Test 10.6.2.2. Td2"	check that the reporting rate is not affected	UTC 12:56	Passed
Test e: Send a msg 23 with the following parameters: Reporting rate: 4 = 1 min, Msg "B Msg 23 Test 10.6.2.2. Te"			
Speed = 1 kn	Check that the reporting rate is 1 min	UTC 12:34 The reporting interval is 1 min	Passed
Change speed to 15 kn	check that the reporting rate is not affected	UTC 12:38	Passed
Change heading with 20 deg/min	check that the reporting rate is not affected	UTC 12:41	Passed

3.5.2.3 10.6.2.3 Static data reporting interval

10.6.2.3.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Record the transmitted messages and check for static data (Message 24).

Repeat the test at an assigned reporting interval of 5 s.

10.6.2.3.2 Required results

Confirm that the EUT transmits submessages 24A and 24B every 6 min (24B following 24A within 1 min). Transmission shall alternate between channel A and channel B and be independent of the Message 18 reporting interval.

2010-02-11 Ba	Test details - Static data reporting interval		
Test item	Check	Remark	Result
Speed = 1 kn			
Msg 18 reporting rate	check that the msg 18 reporting rate = 3 min		Passed
Msg 24 reporting rate	check that the reporting rate of msg 24 A and B is 6 min		Passed
	Check that the distance between msg 24 A and B is < 1 min		Passed
	Check that 24 A/B alternate between channel A and B		Passed
Speed = 10 kn			
Msg 18 reporting rate	check that the msg 18 reporting rate = 30 s		Passed
Msg 24 reporting rate	check that the reporting rate of msg 24 A and B is 6 min		Passed
	Check that the distance between msg 24 A and B is < 1 min		Passed
	Check that 24 A/B alternate between channel A and B		Passed
Send a msg 23 with the reporting interval: 8 = 5s. Msg "B Msg 23 Test 10.2.2.1 T1"			
Msg 18 reporting rate	check that the msg 18 reporting rate = 5 s	UTC 13:03	Passed
Msg 24 reporting rate	check that the reporting rate of msg 24 A and B is 6 min		Passed
	Check that the distance between msg 24 A and B is < 1 min		Passed
	Check that 24 A/B alternate between channel A and B		Passed

3.6 10.7 Initialisation period

(see 6.5.3)

10.7.1 Method of measurement

Set up standard test environment with SOG>2 kn.

a) Switch on the EUT from cold (off-time minimum 1 h) with EUT operating in autonomous mode.

b) Switch off the EUT for a period of time between 15 min to 60 min and switch on again.

c) Make the GNSS sensor unavailable for a period of time between 1 min to 5 min

Record transmitted messages.

10.7.2 Required results

Confirm that the EUT starts regular transmission of Message 18 including valid position:

a) within 30 min after switch on;

b) within 5 min;

c) stops transmitting after the next transmission and resumes within 1 min after enabling the position source.

2010-02-11 Ba	Test details - Initialisation period		
Test item	Check	Remark	Result
Switch the On and Off according to the test items			
a) Switch the EUT on in the morning (> 1 h off)	Check that the EUT starts msg 18 within 30 min	EUT starts transmission within 2 minutes	Passed
b) Switch the unit of for 15 ... 60 min and on again	Check that the EUT starts msg 18 within 5 min	UTC 14:20 EUT starts transmission within 2 minutes	Passed
c) Disable GNSS for 1 ... 5 min	Check that the EUT stops transmission after the next transmission	Retest 2010-10-27 Ba: The EUT stops transmission immediately, not after the next transmission. See also 10.8.3.4 Retest 2010-11-30 Ba: The EUT stops transmission of position report after the next scheduled position report	Passed
Enable GNSS again	Check that the EUT starts msg 18 within 60 s	UTC 12:20 The position output starts immediately after reconnection of the antenna. Transmission starts after 1min 50s Retest 2010-06-09 Ba: Could not be retested because the EUT did not get a GPS position. Retest 2010-10-01 Ba: UTC 08:28 The first message 18 is transmitted after 5 s, when the GPS positon becomes available	Passed Passed

3.7 10.8 Alarms and indications, fall-back arrangements

(see 6.6)

3.7.1 10.8.1 Built in integrity test

(see 6.6.1)

10.8.1.1 Method of measurement

Check manufacturer's documentation on built-in integrity test.

10.8.1.2 Required result

Verify that an indication is provided if a malfunction is detected.

2010-06-09 Ba	Test details - Built in integrity test		
Test item	Check	Remark	Result
Check manufacturer's documentation			
Malfunction detection	Check that the EUT indicates the detection of a malfunction		Passed
	Note the kind of indication	Popup message boxes on the display	Passed

3.7.2 10.8.2 Transceiver protection

10.8.2.1 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 5 min each.

10.8.2.2 Required results

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

2010-06-09 Ba	Test details - Transceiver protection		
Test item	Check	Remark	Result
Open circuit of VHF antenna terminal for > 5 min	Check that the EUT generates an antenna VSWR exceeded alarm	UTC 13:17	Passed
	Check that EUT starts transmission within 2 min after refitting the antenna	The next scheduled message is received by other station	Passed
Short circuit of VHF antenna terminal for > 5 min	Check that the EUT generates an antenna VSWR exceeded alarm	UTC 13:31	Passed
	Check that EUT starts transmission within 2 min after refitting the antenna	The next scheduled message is received by other station	Passed

3.7.3 10.8.3 Transmitter shutdown procedure

(see 6.6.2)

10.8.3.1 Method of measurement

Check manufacturer's documentation on transmitter shutdown procedure.

10.8.3.2 Required result

Verify that a transmitter shutdown procedure independent of the operating software is provided.

2010-07-26 Ba	Test details - Transmitter shutdown procedure		
Test item	Check	Remark	Result
Check manufacturer's documentation			
Malfunction detection	Check that the transmitter shutdown procedure is described		Passed
	Check that the transmitter shutdown procedure is independent of the software		Passed

3.7.4 10.8.3.4 Position sensor fallback conditions

(see 6.6.3)

10.8.3.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Where an option for an external GNSS sensor is not provided, then the respective tests shall be omitted.

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

a) external DGNSS in use if implemented;

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

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

d) external GNSS in use if implemented;

e) internal GNSS in use ;

f) no sensor position in use.

Check the position accuracy and RAIM flag in the VDL Message 18 and, where provided, the ALR sentence.

10.8.4.2 Required result

Verify that the use of position source, position accuracy flag, RAIM flag and position information complies with Table 1

Verify that the position sensor status is maintained for the next scheduled report and changed after that.

2010-10-27 Ba	Test details - Position priority – Position sensor fallback with external sensor input		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01_gll_vtg_hdt_near.sst Internal GPS: RAIM expected, external: RAIM.			
Changing downwards			
a) Set: • Internal DGNSS available • External DGNSS	Check that external position is used		Passed
	Check that position accuracy flag = 1		Passed
	Check that the RAIM flag = 1		Passed
b) Change from a: • Internal DGNSS available msg 17 • External GNSS	Check that internal position is used	If implemented Not implemented	N/A
	Check that position accuracy flag = 1		N/A
	Check that RAIM flag = 1		N/A
	Check that sensor source is changed after the next scheduled position report		N/A
c) Change from a: • Internal DGNSS available beacon input • External GNSS	Check that internal position is used	If implemented SBAS implemented	Passed
	Check that position accuracy flag = 1		Passed
	Check that RAIM flag = 1	RAIM flag = 0	Passed
	Check that sensor source is changed after the next scheduled position report	The position is not maintained for the next scheduled report but the position of the internal sensor is transmitted in the next report (see “Required result” and 6.6.3 last section) Retest 2010-11-30 Ba: The sensor source is changed after the next scheduled position report	Passed
d) Change from a): • Internal GNSS • External GNSS	Check that external position is used		Passed
	Check that position accuracy flag = 0		Passed
	Check that RAIM flag = 1		Passed
	Check that sensor source is changed after the next scheduled position report	The position is not maintained for the next scheduled report but the position of the internal sensor is transmitted in the next report Retest 2010-11-30 Ba: The sensor source is changed after the next scheduled position report	Passed

e) Change from d: • Internal GNSS • Remove external GNSS	Check that internal position is used		Passed
	Check that position accuracy flag = 0		Passed
	Check that RAIM flag = 1	RAIM flag = 0	Passed
	Check that there is an ALR output ID 025 (External EPFS lost)		Passed
	Check that sensor source is changed after the next scheduled position report	The position is not maintained for the next scheduled report but the position of the internal sensor is transmitted in the next report Retest 2010-11-30 Ba: The sensor source is changed after the next scheduled position report	Passed
f) Change from e: • Inhibit internal GNSS • No external GNSS	Check that there is an ALR output ID 026 (no sensor position in use) - optional	No ALR 26 output	Passed
	Check that EUT stops transmission of position report after the next scheduled position report	The EUT stops transmission immediately, not **after** the next scheduled position report. Retest 2010-11-30 Ba: The EUT stops transmission of position report after the next scheduled position report	Passed

Changing upwards			
e) Change from f: • Internal GNSS • No external GNSS	Check that the EUT starts transmission		Passed
	Check that internal position is used		Passed
	Check that position accuracy flag = 0		Passed
	Check that RAIM flag = 1	RAIM flag = 0	Passed
	Check that the ALR output ID 025 (External EPFS lost) is updated - optional		Passed
d) Change from e: • Internal GNSS • External GNSS	Check that external position is used		Passed
	Check that position accuracy flag = 0		Passed
	Check that RAIM flag = 1		Passed
	Check if there is an indication of the source change - optional	There is a TXT output	Passed
c) Change from d: • Internal DGNSS available beacon input • External GNSS	Check that internal position is used	If implemented SBAS function	Passed
	Check that position accuracy flag = 1		Passed
	Check that RAIM flag = 1	RAIM flag = 0	Passed
	Check if there is an indication of the source change - optional	UTC 07:30	Passed
b) Change from d: • Internal DGNSS available msg 17 • External GNSS	Check that internal position is used	If implemented Not implemented	N/A
	Check that position accuracy flag = 1		N/A
	Check that RAIM flag = 1		N/A
	Check if there is an indacation of the source change - optional		N/A
a) change from b: • DGNSS available • External DGNSS	Check that external position is used	UTC 07:32	Passed
	Check that position accuracy flag = 1		Passed
	Check that the RAIM flag = 1		Passed
	Check if there is an indacation of the source change - optional	There is a TXT output	Passed

3.7.5 10.8.5 Speed sensors

(see 6.6.4)

10.8.5.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Where an option for an external GNSS sensor is not provided, this test shall be omitted.

Apply valid external DGNSS position and speed data.

Make external DGNSS position invalid (for example. by wrong checksum, "valid/invalid" flag) .

10.8.5.1 Required result

Check that the external data for SOG/COG is transmitted in Message 18.

Check that the internal data for SOG/COG is transmitted in Message 18.

2010-10-27 Ba	Test details - Speed sensors		
Test item	Check	Remark	Result
Connect sensor inputs and correction data according to the test items. Sensor input file name: AIS01_gll_vtg_hdt_near.sst Internal GPS: RAIM expected, external: RAIM active.			
Set: • Internal GNSS available • External DGNSS	Check that external SOG is used		Passed
	Check that external COG is used		Passed
Change to: • Internal GNSS available • External DGNSS invalid	Check that internal SOG is used		Passed
	Check that internal COG is used		Passed

3.8 10.9 User interface

(see 6.7)

3.8.1 10.9.1 Display

(see 6.7.1)

10.9.1.1 Method of measurement

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

a) Check status indications for power, Tx timeout, Error.

b) Apply Message 23 "quiet time" of >7 min.

c) Simulate VDL load in order to make it impossible for the EUT to find free candidate periods.

10.9.1.2 Required results

a) Indicators shall be available and working correctly according to manufacturer's documentation.

b) Check that the Tx timeout indication is activated.

c) Check that the Tx timeout indication is activated.

2010-02-10 Ba	Test details - Display		
Test item	Check	Remark	Result
Operate EUT in autonomous mode			
a) Check for indicators	Check that a power indicator is available	There is no power indicator but the display and display illumination clearly indicates that the power is on.	Passed
	Check that the power indicator is on		Passed
	Check that a TX timeout indicator is available	There is no indication of tx time-out See note) <u>Retest 2010-06-09 Ba:</u> Tx time-out is displayed as a popup message on the display. Addtionally a label "Tx off" is displayed permanently on all operational screens.	Passed
	Check that an error indicator is available.	Errors are indicated with popup error message boxes	Passed
b) Apply msg 23 for quiet time > 7 min Msg "B Msg 23 Test 10.2.2.1 T5"	Check that the Tx indicator is on	There is no indication of tx time-out See note) <u>Retest 2010-06-09 Ba:</u> There is a popup message: "Coast station inhibiting AIS Tx for x min", X counting down A label "Tx off" is displayed on all operational screens.	Passed
c) Simulate high channel load to disable transmission	Check that the Tx indicator is on	Will be tested whin Tx indicator is implemented Retest 2010-06-09 Ba: There is a message box: "Priority interrupted last attempts" and an error message "Rx malfunction Ch x noise level"	Passed
Disable position	Check that the Tx indicator is on	There is an permanent popup message "Searching GPS" and an error message "GPS malfunction, no GPS data".	Passed
Simulate an error according to documentation, if possible	Check that the error indicator is on	Simulated "GPS malfunction no GPS data" and "Ant malfunction open or short" (VHF antenna disconnection)	Passed

Note)
It is very important for the user to be able to recognize that the AIS transponder does not transmit and therefore cannot seen by other ships.

AIS Class B transponders without display normally provide for this purpose a LED which clearly and permanently indicates that the unit does not transmit.

This function has to be performed by the display if no LED is available. There must be

- either a permanent indication of no Tx on all operational screens (e.g. in a kind of status line),
- or there must be a popup window/screen indicating that the transmission has stopped and an indication in one of the submenues where the user can verify if the transmission is still stopped.

3.8.2 10.9.2 Message display

This test is only applicable if a message display is provided.

10.9.2.1 Method of measurement

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

Transmit a Message 14.

10.9.2.2 Required results

Verify that the EUT displays the message.

2010-02-11 Ba	Test details - Message display		
Test item	Check	Remark	Result
Only applicable if a message display is provided			
Send a msg 14 from another station	Check that the msg 14 is correctly displayed		Passed

3.8.3 10.9.3 Static data input

(see 6.7.2)

10.9.3.1 Method of measurement

Verify that static data can be input to the unit according to the manufacturer's documentation. Set up standard test environment and operate EUT in autonomous mode.

10.9.3.2 Required results

Check that static data are transmitted correctly by the EUT and that the MMSI cannot be altered by the user.

2010-02-11 Ba	Test details - Static data input		
Test item	Check	Remark	Result
Input static data according to manufacturers documentation, as far as not yet set by the manufacturer			
Check the static data transmitted in msg 18 and 24	Check the User ID (MMSI)		Passed
	Check the Name		Passed
	Check the Type of ship and cargo		Passed
	Check the Vendor ID		Passed
	Check the call sign		Passed
	Check the dimension of ship/reference for position		Passed
Input protection	Check that the MMSI cannot be altered by the user	The MMSI can be set only once	Passed
	Check that the Vendor ID cannot be changed by the user	The Vendor ID can be changed by the user. The standard says "As defined by the manufacturer". Therefore in our opinion it should not be able for the user to change the Vendor ID. The Vendor ID should be preset by the manufacturer Retest 2010-06-02 Ba: The Vendor ID cannot be changed	Passed

3.8.4 10.9.4 External interfaces

(see 6.7.3)

3.8.4.1 10.9.4.1 Display interface

This test only applies if a display interface is provided.

10.9.4.1.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply a safety related broadcast Message 14 through the VDL to the EUT.

Check the output on the display interface.

10.9.4.1.2 Required results

The interface shall be compliant with IEC 61162 series protocol and the manufacturer's documentation of interface hardware.

2010-02-11 Ba	Test details - Display interface		
Test item	Check	Remark	Result
Only applicable if a display interface is provided			
Send a msg 14 from another station	Check that the msg 14 is correctly output on the display interface		Passed
	Check that the format is according to IEC 61162		Passed
Other interface	Check that the format of all output sentences is according to IEC 61162	The VDO outputs of transmitted messages do not contain the channel ("A" or "B"). The channel field is a null field (empty field) Retest 2010-06-02 Ba: The VDO outputs contain the correct channel	Passed

4 11 Physical tests

Physical test are not part of this test document.

The physical tests are covered by the notification according to R&TTE

5 12 Specific tests of Link Layer

(see 7.3)

5.1 12.1 TDMA synchronisation

5.1.1 12.1.1 Synchronisation test sync mode 1

12.1.1.1 Definition

Synchronisation jitter (transmission timing error) is the time between nominal start of the transmission time period as determined by a UTC synchronisation source ($T_{\circ\ ref}$) and $T_\circ$ of the EUT ($T_{\circ\ EUT}$).

12.1.1.2 Method of measurement

Set up standard test environment and set the EUT to assigned mode for a reporting rate of 5 s. Enable test conditions for the following:

a) station transmitting Message 1 or 2, 3, 4, 18, 19 not subject to a CS-delay, with repeat indicator = 0, with no propagation delay and with position available is received by the EUT;

b) no sync source (switched off);

c) with the internal clock of the EUT out of sync (sync jitter > 1000 µs), transmit messages not to be used as sync source (see 7.3.1.1) to the EUT;

d) repeat test a) using a sync source transmitting Message 4; simulate the position of the station providing the sync source (for example a base station 60 NM = 416 µs away from EUT position) in order to simulate a propagation delay;

e) Repeat test d) with an additional source transmitting Message 1 or 2, 3, 4, 18 not subject to a CS-delay, with repeat indicator = 0, with no propagation delay and with position available is received by the EUT.

Record VDL messages and measure the time between $T_{\circ\ ref}$ of the synchronisation source and the initiation of the "transmitter on" function T_A and calculate back to $T_{\circ\ EUT}$ (a sync output may be used for the purpose of this test). Alternative methods, for example by evaluating the start flag are allowed.

12.1.1.3 Required results

a) The EUT shall synchronise on the received source and the synchronisation jitter shall not exceed ±312 µs (sync mode 1).

b) The synchronisation jitter shall not exceed ±312 µs during a 30 s period from the time a proper sync source was last received.

c) The EUT shall not synchronise on these received messages.

d) The synchronisation jitter of the EUT shall be within –416 µs ±312 µs .

e) The synchronisation jitter of the EUT shall be –208 µs ±312 µs within 60 s.

2010-02-10 Ba	Test details - Synchronisation test sync mode 1		
Test item	Check	Remark	Result
Setup an assigned reporting rate of 5 s The correct timing is T_{classA}+ 1568 µs			
a) Transmit an appropriate position report as sync source Msg "B Msg 23 Test 10.2.2.1 T1"	Check that the EUT does synchronise to the sync source	The EUT does not synchronise to the sync source Retest 2010-06-02 Ba: The EUT synchronizes to the sync source	Passed
	Check that the sync jitter does not exceed ±312 µs from the sync source	The sync jitter limit is exceeded Retest 2010-06-02 Ba: The sync jitter limit is not exceeded	Passed
	Check that the sync mode value in the comm state is 3		Passed
b) Remove sync source	Check that the sync jitter does not exceed ±312 µs for the next 30 s after last received sync msg	The timing drift is very low so that the timing does not change more than ±312 µs for the next 30 s	Passed
	Check that the sync mode value in the comm state is 3		Passed
c) Restart the EUT to get it out of sync (>1000µs) Transmit a position report with repeat indicator not 0. Msg "B Msg 1 Test 12.1.1 c"	Check that EUT does not synchronise to the msg	Test 2010-06-03 Ba: UTC 13:38	Passed
d) Transmit msg 4, range to EUT = 60 NM Msg "B Msg 4 Test 12.1.1 d"	Check that the sync jitter of the EUT is within –416 µs ±312 µs from the msg 4	The sync jitter is inside the limits. The timing jumps about every 2 minutes between two timing values with a difference of about 150 µs. We recommend to evaluate this and implement a more smooth timing Retest 2010-07-26 Ba: The timing is stable and with the correct timing.	Passed
e) Transmit msg 4, range to EUT = 60 NM, and msg 1/3, range = 0 Msg "B Msg 1 Test 12.1.1 d"	Check that the sync jitter of the EUT is within –208 µs ±312 µs from the msg 1, after 60 s	The timing is very instable and is for some time out of the limits. It seems that the averaging does not work very well. Retest 2010-07-26 Ba: The timing is stable and with the correct timing.	Passed

Note)
To make the behaviour clearer I performed test e) in 3 phases:

- Phase 1: Msg 4 with 60 NM distance only, like in test d)
- Phase 2: Msg 4 with 60 NM distance + Msg 1 with 0 NM distance, as e) requirement
- Phase 3: Msg 1 with 0 NM distance only, like in test a)

5.1.2 12.1.2 Synchronisation test sync mode 2

12.1.2.1 Method of measurement

Set up standard test environment and enable test conditions for the following:

a) operate EUT in sync mode 2 for more than 5 min.

b) Switch on sync source immediately after scheduled transmission of EUT. Sync source shall be a station transmitting Message 1 or 2,3,4,18,19 not subject to a CS-delay, with repeat indicator = 0 and with position available with a reporting rate of 10 s.

Record VDL messages and measure the time between $T_{o\ ref}$ of the synchronisation source and the initiation of the "transmitter on" function T_A and calculate back to $T_{o\ EUT}$ (a sync output may be used for the purpose of this test). Alternative methods, for example by evaluating the start flag are allowed.

12.1.2.2 Required results

Verify that the EUT synchronises its next scheduled transmission on the sync source. The synchronisation jitter shall not exceed ±312 µs.

2010-06-03 Ba	Test details - Synchronisation test sync mode 2		
Test item	Check	Remark	Result
Operate in autonomous mode The correct timing is T_{classA}+ 1568 µs			
a) Operate in sync mode 2 for more than 5 min	Check that the EUT is not synchronised		Passed
b) After scheduled transmission start appropriate sync source	Check that the sync jitter of the next transmission does not exceed ±312 µs from the sync source	• It seems that the EUT ignores message 3. There is no reason not to use message 3 for synchronisation • After receiving the first message 1 the EUT synchronizes immediately and does not exceed the limits Retest 2010-07-26 Ba: After receiving the first message 3 from the other station the EUT synchronizes immediately and does not exceed the limits	Passed

5.1.3 12.1.3 Synchronisation test with UTC

This test is only relevant if optional synchronisation sources providing UTC are implemented.

12.1.3.1 Method of measurement

Set up standard test environment and enable test conditions in a way that EUT operates in UTC synchronised mode.

12.1.3.2 Required results

The synchronisation jitter shall not exceed ±312 µs.

2010-07-27 Ba	Test details - Synchronisation test sync mode 1		
Test item	Check	Remark	Result
Connect the optional synchronisation source The correct timing is T_{classA}+ 20 bit (2083µs)			
Optional synchronisation	Check that the sync does not exceed ±312 µs from the correct UTC timing	There is a declaration from the manufacturer that syncronisation by internal GPS is not implemented	Passed

5.2 12.2 Carrier-Sense tests

5.2.1 12.2.1 Threshold level

12.2.1.1 Definition

Carrier-Sense threshold is the signal level below that which a time period shall be regarded as unused and a transmission may take place.

12.2.1.2 Method of measurement

The test configuration is described here in its most basic form, using three signal sources with RF (PIN) switches selecting when each signal is applied to the EUT. Other equipment configurations may be used if they fulfil the same requirements (for example a single RF source fed via a switched attenuator, which is controlled by a timing circuit).

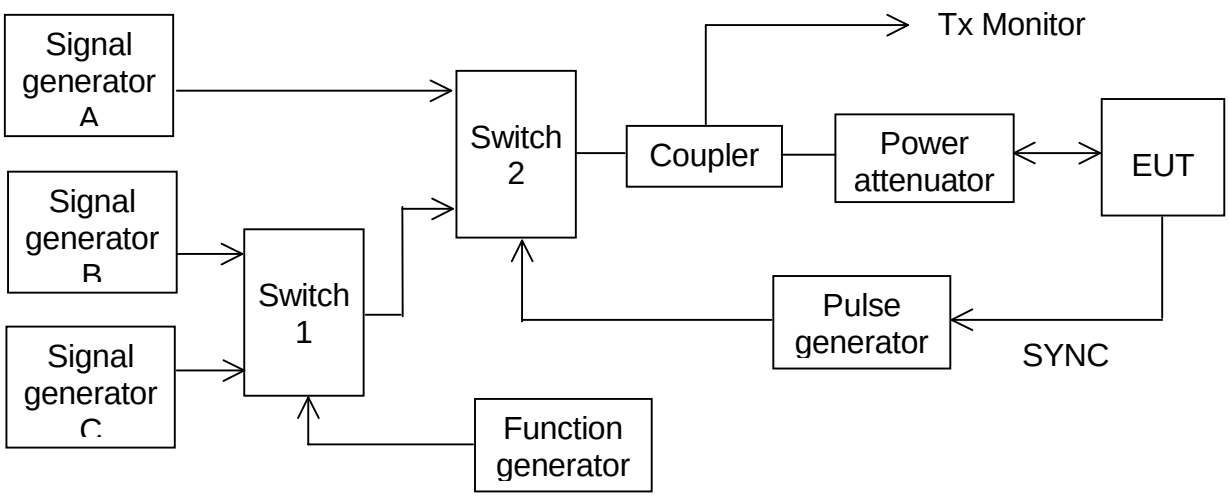


Figure 1 – Configuration for Carrier-Sense threshold test

a) Signal C is a carrier modulated with a 400 Hz FM signal with a deviation of 3 kHz equivalent to –60 dBm at the EUT. The switches connect this signal to the EUT most of the time to mimic 100 % channel loading with strong traffic.

b) Signal B is a carrier modulated with a 400 Hz FM signal with a deviation of 3 kHz equivalent to –87 dBm at the EUT. Switch 1 replaces signal C with signal B for 26,67 ms. The function generator makes this happen once every 2 s. This imitates one vacant time period in a 99 % loaded channel. The level of Signal B can be manually switched between –87 dBm and OFF to mimic high and low background levels (resulting in a threshold level of –77 dBm and –107 dBm).

c) Signal A is a carrier modulated with a 400 Hz FM signal with a deviation of 3 kHz equivalent to –104 dBm at the EUT. When the EUT attempts a transmission, switch 2 replaces the 'background traffic' with signal A to imitate an incoming message intended to inhibit the transmission attempt. The level of signal A can be manually set to –74 dBm, –104 dBm and OFF (defined as less than –117 dBm).

d) All three signal generators are tuned to the same frequency. The test shall be carried out on the lowest frequency declared by the manufacturer and AIS 2 (162,025 MHz).

e) For the purposes of this test, the EUT will be equipped with a test signal (SYNC) indicating the start of each time period that it intends to transmit into. This is used to trigger the pulse generator which after a delay of 0,8 ms (8 bits) generates a 23,3 ms (224 bits) pulse for switch 2.

f) With the signal levels set to the levels shown in the first row of the following table, the EUT shall be observed making routine scheduled position reports. Levels shall then be adjusted as per subsequent steps and the EUT monitored for 10 min (or at least 20 reporting attempts) to confirm if transmission has ceased.

12.2.1.3 Required results

Table 24 – Required threshold test results

Step	Description	Signal A (dBm)	Signal B (dBm)	EUT transmission
1	Time period free	OFF	OFF	Yes
2	Time period used	–104	OFF	Ceased
3	Recovery	OFF	OFF	Yes
4	Raised background	OFF	–87	Yes
5	Time period used	–74	–87	Ceased
6	Recovery	OFF	–87	Yes

2010-02-12	Test details - Threshold level		
Test item	Check	Remark	Result
Run the test automatically with all steps, using the automatic test adapter. Record the transmissions of the EUT and the step information output of the test adapter			
Step 1	Check that the EUT has transmitted		Passed
Step 2	Check that the EUT has not transmitted		Passed
Step 3	Check that the EUT has transmitted		Passed
Step 4	Check that the EUT has transmitted	2010-02-10: Test of step 4 to 6	Passed
Step 5	Check that the EUT has not transmitted		Passed
Step 6	Check that the EUT has transmitted		Passed

5.2.2 12.2.2 Carrier sense timing

12.2.2.1 Definition

This test is to verify that signals that are received before the CS detection window starts are not used for the detection of used time periods.

12.2.2.2 Method of measurement

Use the test configuration and signals of test 12.2.1.

Signal B is switched off, signal A can be manually set to -74 dBm, -104 dBm and OFF.

The SYNC signal of the EUT indicating the start of each time period that it intends to transmit into is used to trigger the pulse generator to generate a 0,7 ms (7 bits) pulse for switch 2 starting at the SYNC signal (this pulse ends 1 bit before start of the CS detection window of the EUT)

f) Levels shall be adjusted as per the steps given in Table 25 and the EUT monitored for 10 min (or at least 20 reporting attempts) to confirm if EUT transmits.

12.2.2.3 Required results

Table 25 Required carrier sense timing results

Step	Description	Signal A (dBm)	Signal B (dBm)	EUT transmission
1	Time period free	OFF	OFF	Yes
2	Time period free	-104	OFF	Yes
3	Time period free	-74	OFF	Yes

2010-02-12 Ba	Test details - Carrier sense timing		
Test item	Check	Remark	Result
Run the test automatically with all steps, using the automatic test adapter. Record the transmissions of the EUT and the step information output of the test adapter			
Step 1	Check that the EUT has transmitted		Passed
Step 2	Check that the EUT has transmitted		Passed
Step 3	Check that the EUT has transmitted		Passed

5.3 12.3 VDL state/reservations

12.3.1 Method of measurement

Set up standard test environment and operate EUT with assigned reporting interval of 10 s. Record transmitted scheduled position reports Message 18 and check time periods used for transmission.

a) Transmit a Message 20 to the EUT reserving a block of time periods including timeout.

b) Transmit a Message 20 to the EUT reserving a block of time periods without timeout.

12.3.2 Required results

a) Verify that the reserved block is not used and used again after the timeout specified in Message 20.

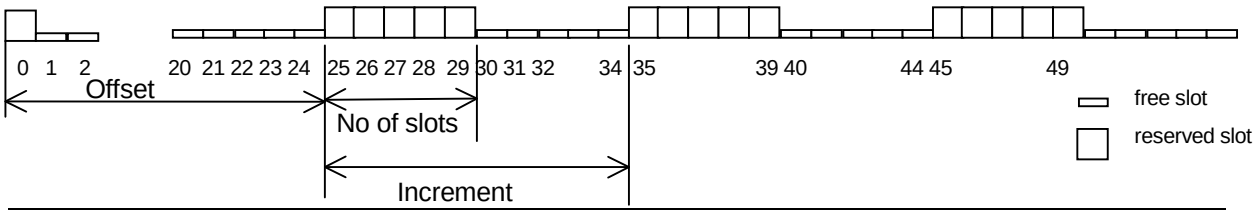
b) Verify that the reserved block is not used and used again after a timeout of 3 min.

2010-06-03 Ba	Test details – VDL state/ reservations		
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. Set time-out according to the test item. Set assigned reporting interval of 10 s.			
a) Timeout = 6 Msg "B Msg 20 Test 12.3 a" Msg "B Msg 23 Test 12.3"	Check that the reserved slots are not used by the EUT within the time-out	• Basically reserved slots are not used for transmission. • One transmission used a reserved slot (UTC 14:05:38, slot 1458) Retest 2010-07-26 Ba: No reserved slots are used	Passed Passed
	Check that after end of reservation all slots are used again.		Passed
b) Timeout = 0 (not available) Msg "B Msg 20 Test 12.3 b" Msg "B Msg 23 Test 12.3"	Check that the reserved slots are not used by the EUT within 3 min		Passed
	Check that after end of reservation all slots are used again.		Passed

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

- Msg 20 is transmitted in slot 0 in each frame
- Offset number 1: 25
- Number of slots: 5
- Time out 1: 6 / 0 depending on test item
- Increment: 10

FATDMA reservation



5.4 12.4 Data encoding (bit stuffing)

12.4.1 Method of measurement

Set up standard test environment.

Set ships name to a value that requires bit-stuffing for example "wwwww" and check the VDL (note that this might require that the manufacturer provides means to input this data).

12.4.2 Required results

Confirm that transmitted VDL Message 24 conforms to data input.

2010-02-11 Ba	Test details - Data encoding (bit stuffing)		
Test item	Check	Remark	Result
Set ships name to a value requiring bit stuffing			
Msg 24 content	Check that the ships name in msg 24 on VDL is correct	The name "??????????????????", coded as wwwwww... is correctly transmitted	Passed

5.5 12.5 Frame check sequence

12.5.1 Method of measurement

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

a) Check test output; if a display interface is provided, check this.

b) Repeat test 12.1.1 and check that a station transmitting messages with wrong CRC are not used for synchronisation.

12.5.2 Required results

Confirm that messages with invalid CRC are not accepted by the EUT in cases a) and b).

2010-02-11 Ba	Test details - Frame check sequence		
Test item	Check	Remark	Result
Transmit position report message from VDL generator			
Set CRC bit sequence to ok Msg "B Msg 1"	Check that position report is received from EUT (VDO output)		Passed
a) Set CRC bit sequence to false	Check that position report is not received from EUT (VDO output)		Passed
	Check that the target is not displayed on the display	If implemented Display is implemented	Passed
b) Disable GPS, apply external position. Transmit position report with wrong CRC	Check that the EUT does not synchronise to the incorrect message	Test 2010-06-07 Ba: There is no VDM output, and the EUT does not synchronize to the messages	Passed

5.6 12.6 Slot allocation (channel access protocol)

5.6.1 12.6.1 Autonomous mode allocation

12.6.1.1 Method of measurement

Set up standard test environment and operate EUT with assigned reporting interval of 10 s. Record transmitted scheduled position reports Message 18 and check time periods used for transmission. Check the Communication State of transmitted messages.

Repeat the test with additional simulated channel load of 80 % (4 time periods used, 1 time period unused).

12.6.1.2 Required results

The time periods used for transmission shall in both tests

- *not exceed the transmission interval TI;*
- *not always use the same time period;*
- *not always use the first unused time period.*

Check that the Communication state of Message 18 is the default value as defined in 7.3.3.5.

2010-02-10 Ba	Test details - Autonomous mode allocation		
Test item	Check	Remark	Result
Set assigned reporting rate of 10 s (Msg "B Msg 23 Test 12.3") Record the transmission slots for at least 30 min and evaluate the used slots			
Test 1: No channel load	Check that the slots do not exceed the TI	Remark: Test has been performed with 30s autonomous reporting interval	Passed
	Check that the EUT does not always use the same time period	The EUT uses always the same slot See note) Retest 2010-06-07 Ba: The EUT does not use always the same time period	Passed
	Check that the EUT not always uses the first unused time period	It seems that the EUT always uses the first unused time period Retest 2010-06-07 Ba: The EUT does not use always the first unused time period	Passed
Test 1: 80% channel load	Check that the slots do not exceed the TI		Passed
	Check that the EUT does not always use the same time period		Passed
	Check that the EUT does not always use the first unused time period		Passed
	Check that the EUT does not use slot used by the received targets		Passed
Communication state	Check that the com state of msg 18 is always as defined in 7.3.3.5		Passed

Note:
(IED 62287-1, §7.3.3.1) For each transmission interval the EUT shall randomly define 10 Candidate Periods (CP). Therefore it is expected that for each transmission different slots are used, even if always the transmission in the first CP is successful.

5.6.2 12.6.2 DSC listening periods

12.6.2.1 Method of measurement

This test is applicable only if DSC functionality is implemented.

Set up standard test environment and operate EUT with assigned reporting interval of 10 s. Enable DSC functionality. Record transmitted scheduled position reports Message 18 and check time periods used for transmission.

12.6.2.2 Required results

During the DSC monitoring times, scheduled transmissions of Message 18 shall continue.

2010-06-09 Ba	Test details - DSC listening periods		
Test item	Check	Remark	Result
Set assigned reporting rate of 10 s Enable DSC functionality			
Tx of msg 18	Check that the scheduled Tx of msg 18 continues		Passed

5.7 12.7 Assigned operation

5.7.1 12.7.1 Assignment priority

12.7.1.2 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command (Message 23) to the EUT with TX/RX mode 1.

a) Transmit a Message 22 defining a region with the EUT inside that region. Transmit a Message 22 to the EUT individually addressed and specifying Tx/Rx mode 2.

b) Repeat the test, clear the region defined by Message 22 under a) [3]. Transmit Message 22 to the EUT with regional settings specifying Tx/Rx mode 2.

Record transmitted messages.

12.7.1.2 Required results

a) The Tx/Rx mode field setting of Message 22 shall take precedence over the Tx/Rx mode field setting of Message 23.

b) The Tx/Rx mode field setting of Message 23 shall take precedence over the Tx/Rx mode field setting of Message 22. The receiving station shall revert to its previous Tx/Rx mode after a timeout value randomly chosen between 240 s and 480 s.

Remark for b)
In my opinion the time to revert to its previous (by msg 22 defined) Tx/Rx mode is defined by the time-out of msg 23, not by a random value of 240 to 480 s.

[3] This can be carried out using the method used in 13.3.1 b) step 2 or by assigning a new simulated position to the EUT.

2010-02-11 Ba	Test details - Autonomous mode allocation		
Test item	Check	Remark	Result
Send a msg 23 with Tx/Rx mode = 1 Msg "B Msg 23 Test 10.2.2.1 T4"			
a) Send a msg 22 defining a region with EUT inside (Tx/Rx mode = 2) Msg "B Msg 22 Test 12.7.1 a1"	Check that the EUT uses Tx/Rx mode 1 as defined by msg 23 (Tx on channel A)	UTC 14:49 Msg 23 UTC 14:51 Msg 22	Passed
Send an addressed msg 22 to EUT with Tx/Rx mode = 2 Msg "B Msg 22 Test 12.7.1 a2"	Check that the EUT uses Tx/Rx mode 2 as defined by msg 22 (Tx on channel B)	UTC 14:52	Passed
Clear the region defined in test a)			
b) Send a msg 22 defining a *region with EUT inside, Tx/Rx mode = 2 Msg "B Msg 22 Test 12.7.1 b1"	Check that the EUT uses Tx/Rx mode 2 (Tx on channel B)	The area cannot be deleted. It seems the areas are not deleted if the distance is more than 500 NM <u>Retest 2010-06-07 Ba:</u> The EUT uses Tx/Rx mode 2	Passed
Send one msg 23 to the EUT with Tx/Rx mode = 1 Msg "B Msg 23 Test 10.2.2.1 T4"	Check that the EUT uses Tx/Rx mode 1 as defined by msg 23 (Tx on channel A)		Passed
	Check that the EUT reverts to Tx/Rx mode 2 after 4...8 min (time-out of msg 23)		Passed

5.7.2 12.7.2 Entering rate assignment

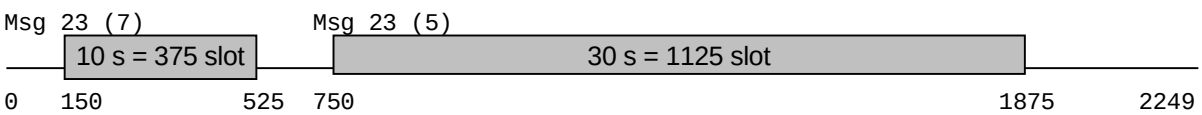
12.7.2.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a Group Assignment command (Message 23) to the EUT with a reporting interval of 10 s assigned, monitor the VDL, reset by assigning 30 s rate; repeat 10 times.

12.7.2.2 Required result

Verify that the first transmission after receiving the Message 23 is within a time randomly selected between the time the Message 23 has been received and the assigned interval.

2010-02-11 Ba	Test details - Entering rate assignment		
Test item	Check	Remark	Result
Send 10 times: Msg 23 with 10 s reporting interval (Msg "B Msg 23 Test 12.7.2 10s") After 20 s: Msg 23 with 30 s reporting interval. (Msg "B Msg 23 Test 12.7.2 30s") Repeat after 45 s			
10 s reporting interval	Check that the first Tx is randomly selected in 0 ...10 s after msg 23	The first Tx is always in slot 153, 3 slots after msg 23. Retest 2010-06-07 Ba: The first Tx is always in slot 154, 4 slots after msg 23. Retest 2010-07-26 Ba: The first Tx is randomly selected in 0... 10 after msg 23	Passed
30 s reporting interval	Check that the first Tx is randomly selected in 0 ...30 s after msg 23	The first Tx is always in slot 1653, 903 slots (24s) after msg 23. Retest 2010-06-07 Ba: The first Tx is in the range of slot 1468...1495 (27 slots). This is only a very small part of the random range of 1125 slots Retest 2010-07-26 Ba: The first Tx is randomly selected in 0... 30 after msg 23	Passed



5.7.3 12.7.3 Reverting from rate assignment

12.7.3.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a Group Assignment command (Message 23) to the EUT with a reporting interval of 10 s assigned, monitor the VDL until at least 1 min after timeout occurred; repeat 10 times (transmissions of Message 23 shall not be synchronised to the initial transmission schedule of the EUT).

Measure the time T_{rev} between the reception of Message 23 and first transmission after timeout.

12.7.3.2 Required result

T_{rev} shall be randomly distributed between 240 s and 480 s.

2010-02-11 Ba	Test details - Reverting from rate assignment		
Test item	Check	Remark	Result
Send 10 times: Msg 23 with 10 s reporting interval, Msg "B Msg 23 Test 10.2.2.1 T3" Wait until time-out + 1 min.			
Measure time T_{rev}	Check that T_{rev} is randomly distributed between 4 and 8 min		Passed

5.7.4 12.7.4 Reverting from quiet mode

12.7.4.1 Method of measurement

Set up standard test environment and operate EUT with a reporting interval of 10 s assigned. Transmit a Group Assignment command (Message 23) to the EUT with quiet time = 1 min.

12.7.4.2 Required results

Verify that the first transmission after the quiet period is within the schedule that was in place before the quiet period.

2010-02-11 Ba	Test details - Reverting from mode		
Test item	Check	Remark	Result
Send Msg 23 with 10 s reporting interval Msg "B Msg 23 Test 10.2.2.1 T3"			
Reporting rate	Check reporting interval = 10 s	UTC 13:54	Passed
Send msg 23 with quiet time = 1 min	Check that EUT does not transmit during quiet time	UTC 13:54:28 UTC 14:10:08	Passed
	Check that the transmissions after end of quiet time matches the previous schedule.	Tx schedule: 10:03, 10:13: 10:23 After quiet time: 10:08, 10:18: 10.28 The EUT starts at the end of the 1 min quiet time immedately with a new Tx schedule. It should continue the old schedule Retest 2010-06-02 Ba: UTC 10:45 see test 10.2.2.1 The EUT continues Tx after quiet time wit the same schedule as before the quiet time	Passed

5.7.5 12.7.5 Retry of interrogation response

12.7.5.1 Method of measurement

Set up standard test environment. Interrogate the EUT by Message 15 for a response with Message 18.

a) Simulate full VDL load for the following 30 s.

b) Simulate full VDL load for the following 60 s

12.7.5.2 Required result

a) Verify that a response is transmitted between 30 s and 60 s after the transmission of Message 15.

b) Verify that no response is transmitted.

2010-06-08 Ba	Test details - Retry of interrogation response		
Test item	Check	Remark	Result
Send an interrogation for msg 18			
Apply full channel load for 30s Target simulation: "50_slotsVer2"	Check that a response is transmitted within 30 ... 60 s after msg 15	UTC 09:01, 09:03, 09:04	Passed
Send an interrogation for msg 18			
Apply full channel load for 60s Target simulation: "50_slotsVer2"	Check that no response is transmitted (because retry is inhibited)	UTC 09:06	Passed

5.8 12.8 Message formats

5.8.1 12.8.1 Received messages

12.8.1.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply messages according to Table 11 to the VDL. Record messages output by the PI of EUT where provided.

12.8.1.2 Required results

Confirm that EUT responds as appropriate. Check that EUT outputs the corresponding sentences with correct field contents and format via the PI where provided.

Verify that the EUT does not process addressed messages.

2010-06-08 Ba	Test details - Received messages		
Test item	Check	Remark	Result
Send all message to the EUT and check PI output			
Msg 1,2,3 Position report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 4 base station report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 5 Static and voyage related data	Check that message is output	Optional	Passed
	Check format and content Fill bits: ,2		Passed
Msg 6 Addressed binary message	Check that message is not output		Passed
Msg 7 Binary acknowledgement	Check that message is not output		Passed
Msg 8 Binary broadcast message	Check that message is output	Optional	Passed
	Check format and content Fill bits: ,4		Passed
Msg 9 SAR Aircraft position report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 10 UTC and date inquiry	Check that message is not output		Passed
Msg 11 UTC/Date response	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 12 Safety related addressed message, addressed to EUT	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 12 Safety related addressed message, not addressed to EUT	Check that message is not output		Passed
Msg 13 Safety related acknowledge	Check that message is not output		Passed
Msg 14 Safety related broadcast message	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 15 Interrogation	Check that message is output	required	Passed
	Check format and content Fill bits: 2		Passed
Msg 16 Assigned mode command	Check that message is not output		Passed
Msg 17 DGNSS broadcast binary message	Check that message is output	Optional No output	Passed
	Check format and content		N/A
Msg 18 Class B equipment position report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 19 Extended Class B equipment position report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 20 Data link management message	Check that message is output	Required	Passed
	Check format and content		Passed

Msg 21 Aids to navigation report	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 22 Channel management message	Check that message is output	Required	Passed
	Check format and content		Passed
Msg 23 Group assignment	Check that message is output	Required	Passed
	Check format and content		Passed
Msg 24 Class B “CS” static data, Part A	Check that message is output	Optional	Passed
	Check format and content		Passed
Msg 24 Class B “CS” static data, Part B	Check that message is output	Optional	Passed
	Check format and content		Passed

5.8.2 12.8.2 Transmitted messages

12.8.2.1 Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Initiate the transmission of messages relevant for a Class B mobile station according to Table 11 by the EUT. Record transmitted messages.

12.8.2.2 Required results

Confirm that only messages as allowed by Table 11 are transmitted by the EUT.

2010-06-08 Ba	Test details - Transmitted messages		
Test item	Check	Remark	Result
Initiate transmission of the messages according to table 11 by interrogation with msg 15			
Msg 1,2,3 Position report	Check that message is not transmitted		Passed
Msg 4 base station report	Check that message is not transmitted		Passed
Msg 5 Static and voyage related data	Check that message is not transmitted		Passed
Msg 6 Addressed binary message	Check that message is not transmitted		Passed
Msg 7 Binary acknowledgement	Check that message is not transmitted		Passed
Msg 8 Binary broadcast message	Check that message is not transmitted		Passed
Msg 9 SAR Aircraft position report	Check that message is not transmitted		Passed
Msg 10 UTC and date inquiry	Check that message is not transmitted		Passed
Msg 11 UTC/Date response	Check that message is not transmitted		Passed
Msg 12 Safety related addressed message, addressed to EUT	Check that message is not transmitted		Passed
Msg 12 Safety related addressed message, not addressed to EUT	Check that message is not transmitted		Passed
Msg 13 Safety related acknowledge	Check that message is transmitted when msg 12 is processed (Response on msg 12)	Optional	Passed
Msg 14 Safety related broadcast message	Check that message is not transmitted (Manually initiated)	Optional	Passed
Msg 15 Interrogation	Check that message is not transmitted		Passed
Msg 16 Assigned mode command	Check that message is not transmitted		Passed
Msg 17 DGNSS broadcast binary message	Check that message is not transmitted		Passed
Msg 18 Class B equipment position report	Check that message is transmitted (Interrogation and automatically)		Passed
Msg 19 Extended Class B equipment position report	Check that message is transmitted (Interrogation with offset)		Passed
Msg 20 Data link management message	Check that message is not transmitted		Passed
Msg 21 Aids to navigation report	Check that message is not transmitted		Passed
Msg 22 Channel management message	Check that message is not transmitted		Passed
Msg 23 Group assignment	Check that message is not transmitted		Passed
Msg 24 Class B “CS” static data, Part A	Check that message is transmitted (Interrogation and automatically)		Passed
Msg 24 Class B “CS” static data, Part B	Check that message is transmitted (Interrogation and automatically)		Passed

5.8.3 12.8.3 Use of safety related Message 14

This test is only applicable if Message 14 is implemented.

12.8.3.1 Method of measurement

Check manufacturer's documentation.

a) Initiate transmission of Message 14 as specified by the manufacturer.

b) Repeat initiation twice a minute

12.8.3.2 Required results

a) Verify that the data content of Message 14 is predefined and the transmission cannot exceed one time period (see Table 12).

b) Verify that the EUT only accepts the initiation of a Message 14 once a minute without automatic repetition.

2010-02-12 Ba	Test details - Use of safety related message 14		
Test item	Check	Remark	Result
Check manufacturers documentation			
a) Send msg 14	Check that the content of msg 14 is predefined	The content is not predefined but can be entered freely Retest 2010-06-08 Ba: Transmission of safety related message 14 has been removed	Passed
	Check that msg 14 cannot exceed one time period	The input is limited to max. 16 characters	Passed
	Check content of msg 14 on VDL		Passed
b) Repeat initiation of msg 14 twice a minute	Check that msg 14 is transmitted only once	When trying to send again within 1 min there is a popup window with a count down counter until the next Tx. It is not possible to send within 1 minute	Passed

6 13 Specific tests of network layer

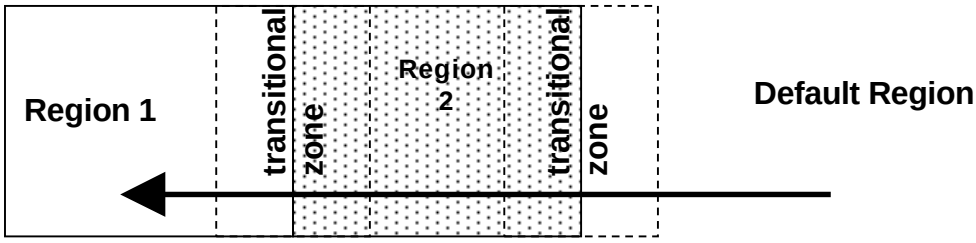
(see 7.4)

6.1 13.1 Regional area designation by VDL message

13.1.1 Method of measurement

Set up standard test environment. Apply channel management messages (Message 22) to the VDL defining two adjacent regional areas 1 and 2 with different channel assignments for both regions and a transitional zone extending 4 NM either side of the regional boundary

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. This can be accomplished by either using a dedicated test input for simulated position information or a GNSS simulator.



	Primary channel	Secondary channel
Region 1	CH A 1	CH B 1
Region 2	CH A 2	CH B 2
Default region	AIS 1	AIS 2

Figure 2 – Regional area scenario

13.1.2 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 (see Table 26). EUT shall revert to default autonomous operation on the regional channels after leaving the transitional zones.

Table 26 – Required channels in use

	Area	Channels in use
1	Default region	AIS 1, AIS 2
2	First transitional zone	AIS 1, 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

2010-06-08 Ba	Test details part 1 – Channel management by VDL msg 22		
Test item	Check	Remark	Result
Set-up EUT in autonomous mode transmitting on channel AIS 1/AIS 2, send 2 Msg 22 by VDL generator, defining 2 adjacent areas with channels A1, B1 and A2, B2. Use external sensor input to simulate a voyage through both areas. Set transitional zone to 4nm. Set the position outside the areas. "TZ" is used for "transitional zone" Set the positions near the limits of the transitional zones to check the dimensions Msg: "B Msg 22 Test 13.1 Area1" and " B Msg 22 Test 13.1 Area2"			
Area 1: In high sea area	Check that channels AIS 1 and AIS 2 are in use	UTC 11:40	Passed
Area 2: Move position into outer TZ of region 2	Check the limit of the TZ (5 NM = 8.8 minutes)		Passed
	Check that channel AIS 1 and A2 are used		Passed
	Check that reporting rate is doubled		Passed
Crossing the area border	Check the border of area	ACA output of area 2	Passed
Area 3: Move position into region 2 (out of TZ)	Check the limit of the TZ (4 NM = 7 minutes)		Passed
	Check that channel A2 and B2 are used		Passed
	Check that reporting rate is changed back to normal reporting rate		Passed
Area 4: Move position into TZ between region 1 and 2, inside area 2	Check that channels A2 and A1 are used		Passed
	Check that reporting rate is doubled		Passed
crossing the area border	Check the border of area	ACA output of area 1	Passed
Area 5: Move position into region 1 (out of TZ)	Check that channels A1 and B1 are used		Passed
	Check the limit of the TZ (4 NM = 7 minutes)		Passed
	Check that reporting rate is changed back to normal reporting rate		Passed
Item 6: Move position into TZ of region 1 to high sea	Check that channels A1 and AIS 1 are used		Passed
	Check that reporting rate is doubled		Passed
Area 7: Move position out of the TZ of region 1, into high sea	Check that channels AIS 1 and AIS 2 are used		Passed
	Check that reporting rate is changed back to normal reporting rate		Passed

6.2 13.2 Regional area designation by serial message or manually

13.2.1 Method of measurement

Check documentation.

13.1.2 Required result

Verify that the user cannot allocate channels (directly or by ACA sentence).

2010-06-08 Ba	Test details - Regional area designation		
Test item	Check	Remark	Result
Check documentation			
Serial message or manual input	Check that the user cannot enter area settings		Passed
	Check that the user cannot change the channels on another way	ACA input is not accepted	Passed

6.3 13.3 Management of received regional operating settings

6.3.1 13.3.1 Replacement or erasure of dated or remote regional operating settings

13.3.1.1 Method of measurement

Set up standard test environment. Send a valid regional operating setting to the EUT by Message 22 with the regional operating area including the own position of the EUT. Consecutively send a total of seven valid regional operating settings to EUT, using Message 22, with regional operating areas not overlapping to the first and to each other. Perform the following in the order shown:

a) send a ninth Message 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 Message 22 sent to the EUT previously;

Step 2: send a tenth Message 22 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 Message 22.

This test can be accomplished by either using the test input for simulated position information or a GNSS simulator (see also Annex D).

13.3.2 Required results

After the initialisation, the EUT shall operate according to the regional operating settings defined by the first Message 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 are erased due to Step 2, and since there is no other regional operating setting due to their non-overlapping definition, the EUT returns 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.

2010-06-08 Ba	Test details – Test of replacement or erasure of dated or remote regional operating settings		
Test item	Check	Remark	Result
Send by msg 22 • 1 area including own position • 7 areas not overlapping, not including own position Msg: "B Msg 22 Test 13.3.1 Area1... Area8"			
Check active area	Check that EUT uses the channels of area 1		Passed
a) Send a 9. msg 22 to the EUT not overlapping the previous areas Msg: "B Msg 22 Test 13.3.1 Area9"	Check that the EUT returns to the default operating settings (the area is deleted)		Passed
b) step 1: Set own position to any of the 7 areas	Check channels of area 2		Passed
	Check channels of area 3		Passed
	Check channels of area 4		Passed
	Check channels of area 5		Passed
	Check channels of area 6		Passed
	Check channels of area 7		Passed
	Check channels of area 8		Passed
	Check channels of area 9		Passed
b) step 2: Send an area 10, overlapping the area of step 1 not including own position Msg: "B Msg 22 Test 13.3.1 Area10"	Check that the EUT returns to the default operating settings (the area is deleted)		Passed
c) Step 1: 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 the EUT operates with the default settings		Passed
Step 2: Check of erasure: Set own position of EUT to within all regions defined by the previous telecommands. b) step 1: Set own position to any of the 7 areas	Check area 2 = default		Passed
	Check area 3 = default		Passed
	Check area 4 = default		Passed
	Check area 5 = default		Passed
	Check area 6 = default		Passed
	Check area 7 = default		Passed
	Check area 8 = default		Passed
	Check area 10 = default		Passed

6.3.2 13.3.2 Channel management by addressed Message 22

13.3.2.1 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 Message 22 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 Message 22 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 command into an area without regional operating settings.

13.3.2.2 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.

2010-06-08 Ba	Test details – Test of addressed message 22		
Test item	Check	Remark	Result
All areas are erased by the previous test			
a) Send msg 22 with a new area, position inside Msg: "B Msg 22 Test 10.4.1"	Check, that the EUT uses the regional operating settings		Passed
b) Send an addressed msg 22 to the EUT with different regional operating settings Msg: "B Msg 22 Test 13.3.2 b"	Check, that the EUT uses the settings of the new message	UTC 13:11	Passed
c) Move the position out of the area	Check, that the EUT uses the default channels		Passed

6.3.3 13.3.3 Invalid regional operating areas

This test is to check the rejection of invalid regional operating areas (three regional operating areas with same corner).

13.3.3.1 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 Message 22. The current own position of the EUT shall be within the regional operating area of the third regional operating setting;

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

13.3.3.2 Required test results

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

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

2010-06-08 Ba	Test details – Test for invalid regional operating areas		
Test item	Check	Remark	Result
a) Send three different valid regional with adjacent corners by msg 22, Position inside 3rd area. Msg: "B Msg 22 Test 13.3.1 Area6" Msg: "B Msg 22 Test 13.3.1 Area7" Msg: "B Msg 22 Test 13.3.3"	Check, that the default channels are used		Passed
b) Move own position to the first area	Check, that the EUT uses the operational settings of the first area		Passed
Move own position to the second area	Check, that the EUT uses the operational settings of the second area		Passed

6.3.4 13.3.4 Continuation of autonomous mode reporting rate

13.3.4.1 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 interval.

13.3.4.2 Required result

Ensure that the autonomous reporting interval is maintained.

2010-06-08 Ba	Test details – Continuation of autonomous mode reporting rate		
Test item	Check	Remark	Result
Set the EUT into a transitional zone Send an assignment command using msg 23 to the EUT with a different reporting interval Area setting msg Msg: "B Msg 22 Test 10.4.1" Reporting interval: Msg: "B Msg 23 Test 10.2.2.1 T1"			
Assignment command in a transitional zone	Check that an rate assignment command is ignored in a transitional zone	UTC 13:32 Reporting interval = 15s	Passed

6.3.5 13.3.5 Other conditions

The fulfilment of all other conditions of 7.4.2 shall be self-certified by the manufacturer.

Date	**Result**	**Status**
2010-06-08 Ba	No selfcertification required	Passed

7 C.3 DSC functionality tests

7.1 C.3.1 General

For the tests in this clause (see also IEC 61993-1), set the EUT into assigned mode using channels AIS 1 and AIS 2 with a reporting interval of 10 s.

Check with a sequence of valid calls consisting of a DSC channel management 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's AIS operation is not affected by the interleaved calls.

2010-06-09 Ba	Test details– Sequence of 5 calls		
Test item	Check	Remark	Result
Activate DSC function Set reporting interval to 10 s and record VDL			
Start DSC transmission of test sentence File: sequence_C3_1.sst" Delay between the calls is 5 s	Check that the schedule of the AIS position reports is not affected by the transmission of the DSC calls		Passed

7.2 C.3.2 Regional area designation

Perform the following tests using the DSC channel management test signal number 1.

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 5 NM in this test.

2010-06-09 Ba	Test details - Regional area designation		
Test item	Check	Remark	Result
Activate DSC function			
Start DSC transmission of test sentence	Check that the area setting of the DSC command is correctly stored		Passed
File: area_set_region_2084_2086.sst"	Check that the transitional zone size is 5 NM		Passed

7.3 C.3.3 Scheduling

Check that the EUT's AIS reporting is not affected during the DSC monitoring times.

Send a valid geographical call to the EUT. Check that a response is not transmitted.

2010-06-09 Ba	Test details (b) – Sequence of 5 calls		
Test item	Check	Remark	Result
Set reporting interval to 10 s and record VDL Msg: B Msg 23 Test 10.2.2.1 T3			
DSC monitoring times	Check that the AIS reporting is not affected during the DSC monitoring times		Passed
File: area_set_region_2084_2086.sst"	Check that not response is transmitted		Passed

7.4 C.3.4 DSC flag in Message 18

Check that the DSC flag is set properly when DSC functionality is available.

2010-06-08 Ba	Test details – DSC flag		
Test item	Check	Remark	Result
Record VDL			
DSC activated	Check that the DSC flag is set		Passed
DSC inactivated	Check that the DSC flag is not set	Information required how to activate and inactivate DSC Retest 2010-07-26 Ba: DSC flag = 0	Passed

Note:
The standard is not very clear regarding the DSC flag. It only says: "(not) equipped with DSC function.

I think the main purpose of the DSC flag is to indicate mainly to the base station if it can be controlled by DSC channel management. Therefore I think if the DSC function is disabled by configuration for the other stations it is identical to "not equipped with DSC function", and the DSC flag should not be set.

7.5 C.3.5 DSC monitoring time plan

Check that DSC commands are received during DSC monitoring times and, if time-sharing is used, are not received outside those times.

2010-06-09 Ba	Test details (b) – DSC monitoring time plan		
Test item	Check	Remark	Result
Delete all area settings			
Send a DSC area setting outside the monitoring time	If time-sharing is used: Check that the channels are not changed		Passed
	If time-sharing is **not** used: Check that the channels are changed according to the area setting	Time sharing is used	N/A
Send a DSC area setting inside the monitoring time	Check that the channels are changed according to the area setting		Passed

7.6 C.3.6 Replacement or erasure of dated or remote regional operating settings

Method of measurement

Set up standard test environment. Send a valid regional operating setting to the EUT by Message 22 with the regional operating area including the own position of the EUT. Consecutively send a further seven (7) valid regional operating settings to EUT, using both Message 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 Message 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 NM 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 initialisation, the EUT shall operate according to the regional operating settings defined by the first Message 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 are erased due to Step 2, and since there is no other regional operating setting due to their non-overlapping definition, the EUT returns 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.

2010-06-09 Ba	Test details – Test of replacement or erasure of dated or remote regional operating settings		
Test item	Check	Remark	Result
Send by DSC and msg 22 • 1 area including own position by MSG 22 (Msg: B Msg 22 Test 13.3.1 Area 1...4) • 7 areas not overlapping, not including own position, first 3 by msg 22, last 4 by DSC			
Check active area	Check that EUT uses the channels of area 1		Passed
a) Send a 9. msg 22 to the EUT not overlapping the previous areas	Check that the EUT returns to the default operating settings (the area is deleted)		Passed
b) step 1: Set own position to any of the 7 areas	Check channels of area 2	UTC 07:06	Passed
	Check channels of area 3		Passed
	Check channels of area 4		Passed
	Check channels of area 5		Passed
	Check channels of area 6		Passed
	Check channels of area 7		Passed
	Check channels of area 8		Passed
	Check channels of area 9		Passed
b) step 2: Send an area 10 by DSC, overlapping the area 2 of step 1 not including own position	Check that the EUT returns to the default operating settings (the area is deleted)		Passed
c) Step 1: 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 the EUT operates with the default settings		Passed
Step 2: Check of erasure: Set own position of EUT to within all regions defined by the previous telecommands. b) step 1: Set own position to any of the 7 areas	Check area 2 = default		Passed
	Check area 3 = default		Passed
	Check area 4 = default		Passed
	Check area 5 = default		Passed
	Check area 6 = default		Passed
	Check area 7 = default		Passed
	Check area 8 = default		Passed
	Check area 10 = default		Passed

7.7 C.3.7 Test of addressed telecommand

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 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 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.

2010-06-08 Ba	Test details – Test of addressed telecommand		
Test item	Check	Remark	Result
All areas are erased by the previous test			
a) Send a DSC call with a new area, position inside	Check, that the EUT uses the regional operating settings		Passed
b) Send an addressed DSC call to the EUT with different regional operating settings	Check, that the EUT uses the settings of the new message		Passed
c) Move the position out of the area	Check, that the EUT uses the default channels		Passed

7.8 C.3.8 Invalid regional operating areas

Test for invalid regional operating areas (three regional operating areas with same corner).

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 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 setting;

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

This test can be accomplished by either using a dedicated test input for simulated position information or a GNSS simulator.

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.

2010-10-01 Ba	Test details – Test for invalid regional operating areas		
Test item	Check	Remark	Result
a) Send three different valid regional with adjacent corners by DSC area call, Position inside 3rd area.	Check, that the default channels are used		Passed
b) Move own position to the first area	Check, that the EUT uses the operational settings of the first area		Passed
Move own position to the second area	Check, that the EUT uses the operational settings of the second area		Passed

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 5508 SW NewMoni V2.1
4	DSC Test box	DEBEG 3817 DEBEG 6348	S/N 475533
	Auxiliaries:		
5	Digital Multimeter	Voltcraft	S/N 1010365036
6	Oscilloscope	Le Croy Wavesurver 422	BSH 106106/2005
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 Test box

The DSC test box includes:

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

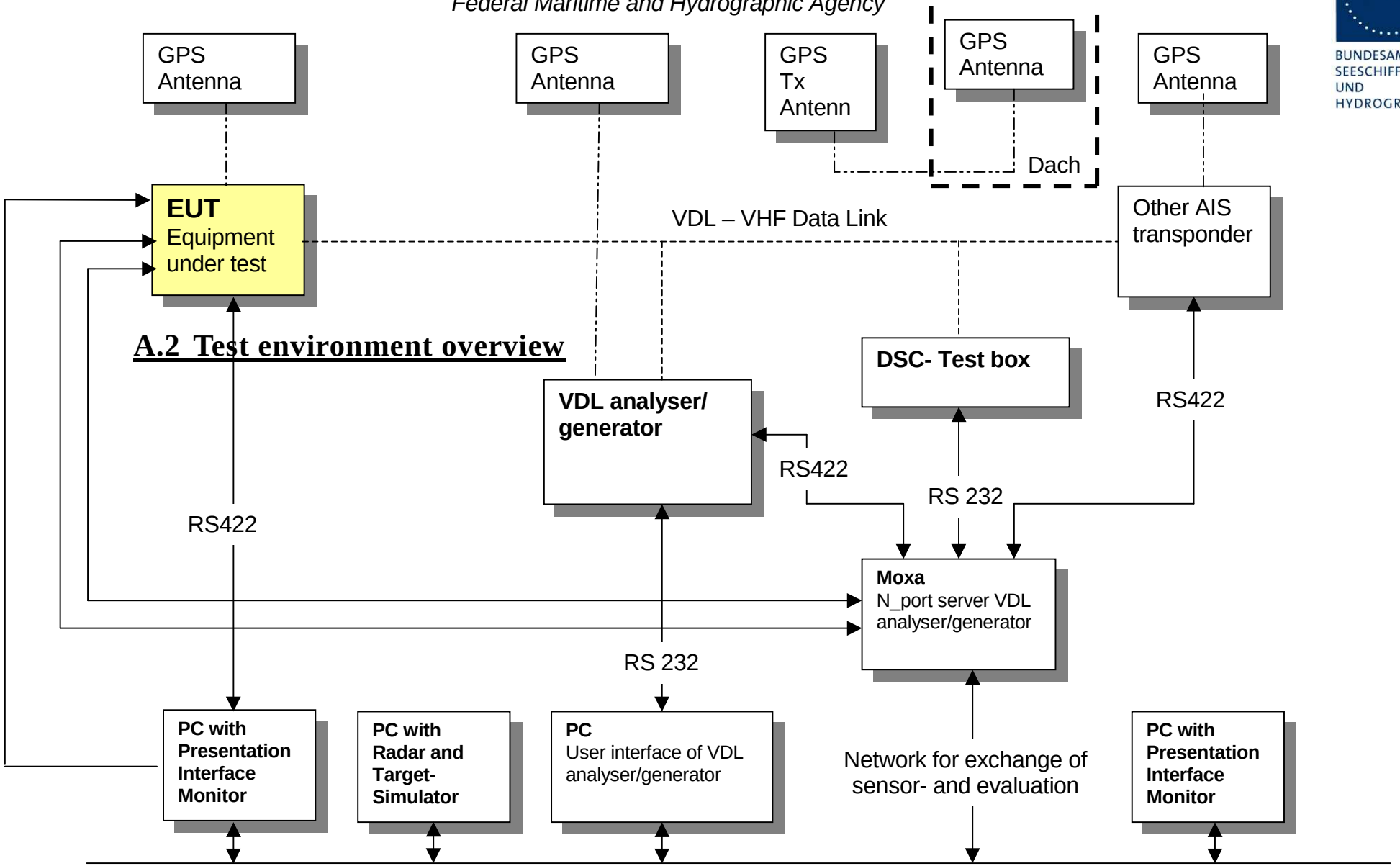
The software modification of the DSC controller comprises a remote control input/output facility

- 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`	

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 specifier which included only ones. The DSC coding and addition of redundancy (3 bit symbol redundancy 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

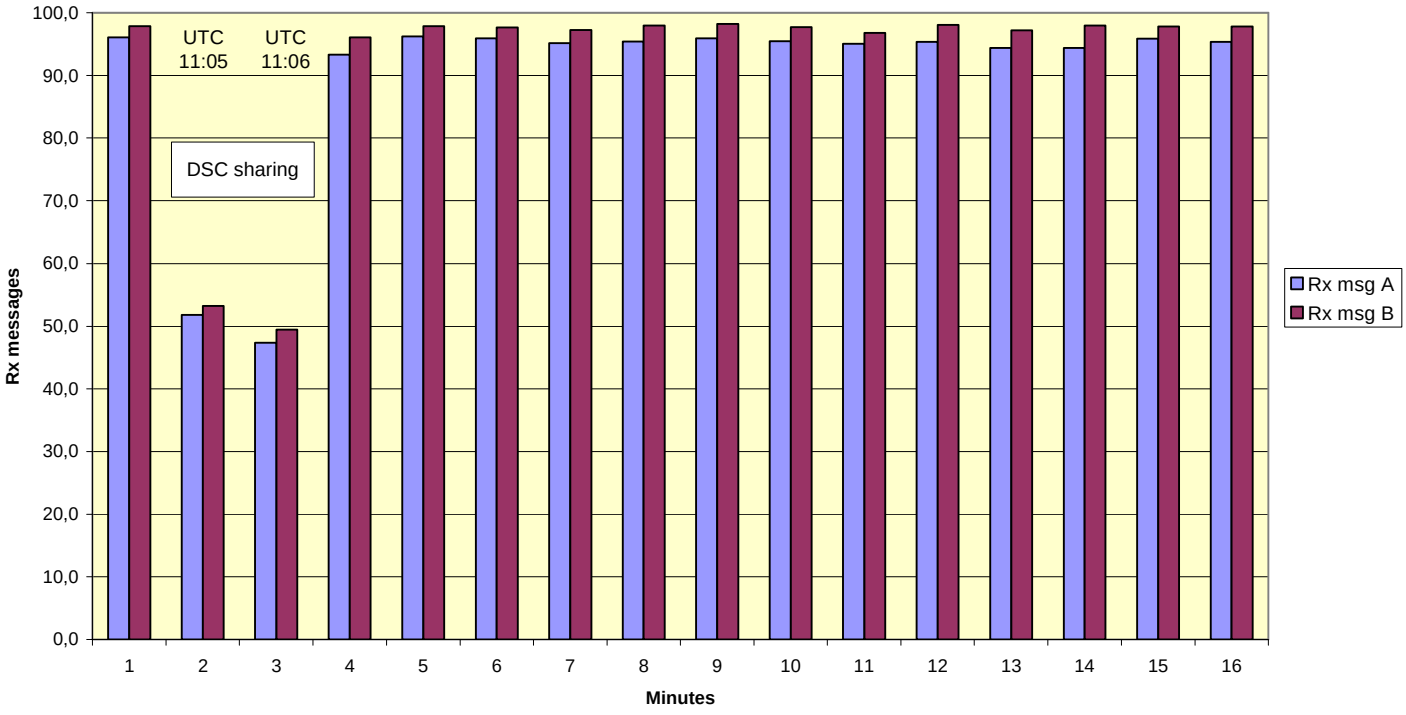
DSC Sentences	
File name	Description
Sentences	
sel_set_region.sst	Selective regional setting by DSC, standard pos. outside, channel 61
$PDEBT,CCDSC,T,000146007800000010050671 50A27271E68090A3D00680A143D00680C053C00011400680D053200010A0075FF	
sel_set_region_in.sst	Selective regional setting, standard position inside, channel 72, 73, 12.5 kHz
$PDEBT,CCDSC,T,000146007800000010050671 50A27271E680900480A680A00490A680C05280001030068 0D051E00005D0075FF	
sel_set_ais_channel_ch65.sst	Setting AIS channel to 65
$PDEBT,CCDSC,T,000146007800000010050671 50A27271E68090A4100680A14410075FF	
sel_check_channel.sst	Test of channel use in 20.4
$PDEBT,CCDSC,T,000146007800000010100671 50A27271E654875FF $PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E676F75FF	
area_set_region.sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146006705280000091E003C003C0067150A27271E68090A3C00680A143C00680C05 1400005A00680D050A0000500075FF	
area_set_region_20_2.sst	Area addressed regional setting for test 20.2
$PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145200680A0A5200680C0F 1E00011E00680D0F140001280075FF $PDEBT,CCDSC,T,00014600670F3200000E00005A005A0067150A27271E6809145100680A0A5100680C0F 1400011E00680D0F0A0001280075FF	
Sequence_20_1sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,000146007800000010100671 50A27271E676F75FF $PDEBT,CCDSC,T,000146006606000 50A0A64150A27271E646E5A00487E7E7E7FFF $PDEBT,CCDSC,T,000146007800000010100671 50A27271E676F75FF $PDEBT,CCDSC,T,000146007800000010100671 50A27271E646E5A00487E7E7E75FF $PDEBT,CCDSC,T,000146007800000010100671 50A27271E676F75FF	
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,000846007800000000 10167150A27271E676F75FF	

Annex C Test diagrams

C.1 10.2.5.1 Rx performance test

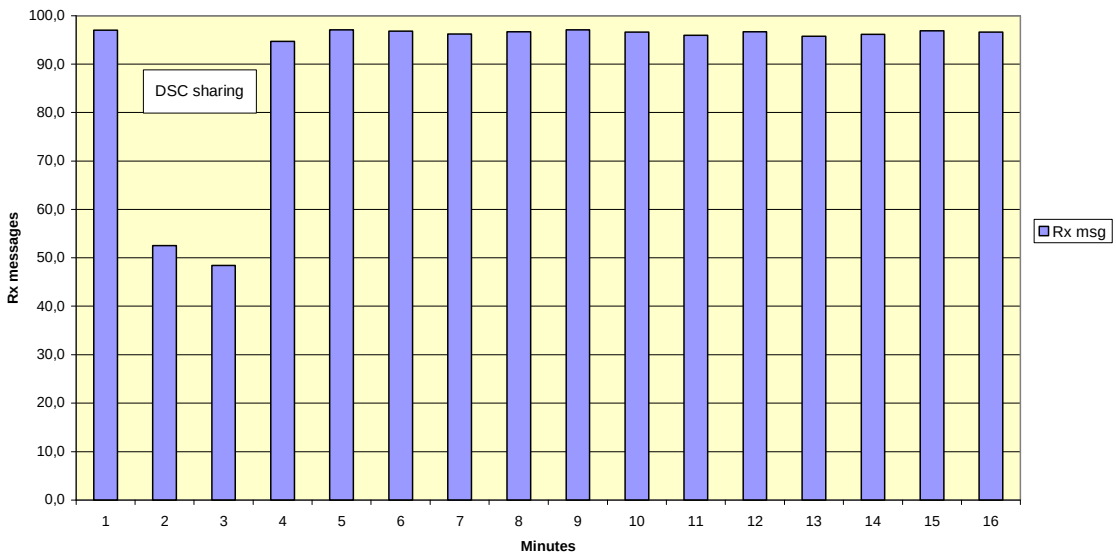
2010-06-07 Ba - ICOM MA-500TR - 10.2.1.5 PI output performance, RS422 output

Result: Average = A= 96,2 %, B=97.6 % (outside DSC sharing) Ch A: 2084 Ch B: 2086

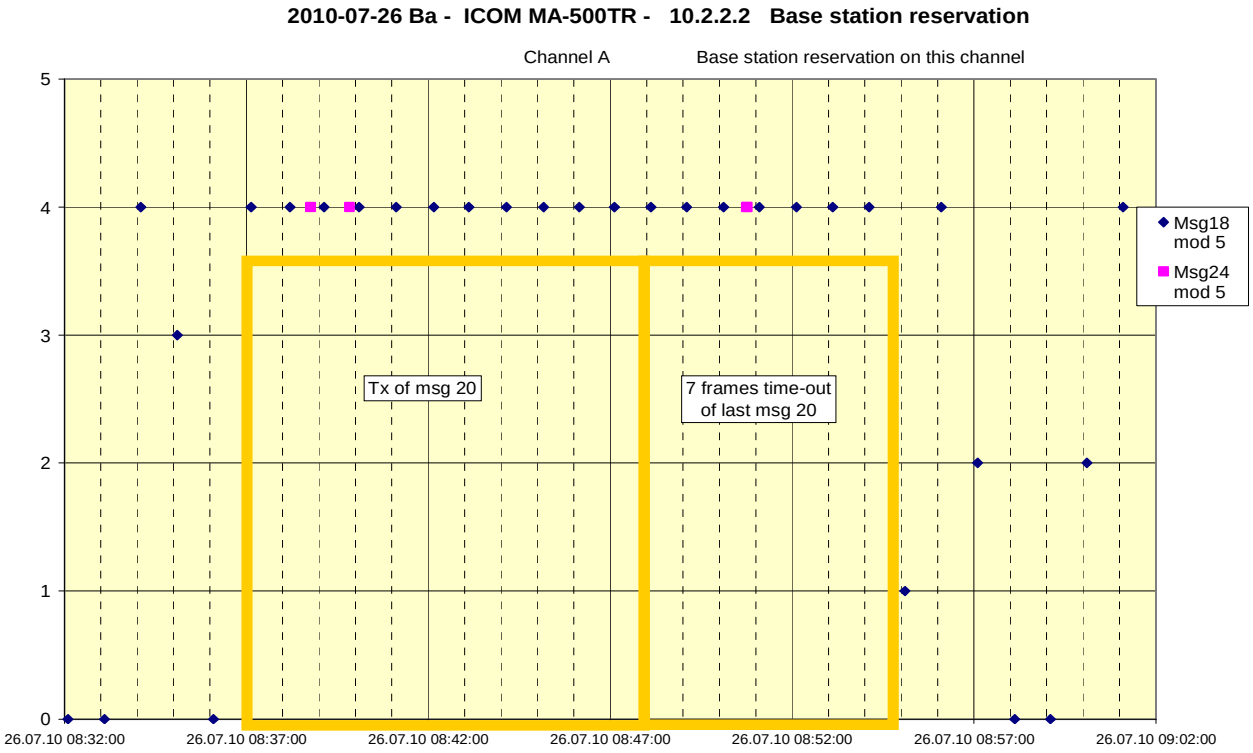


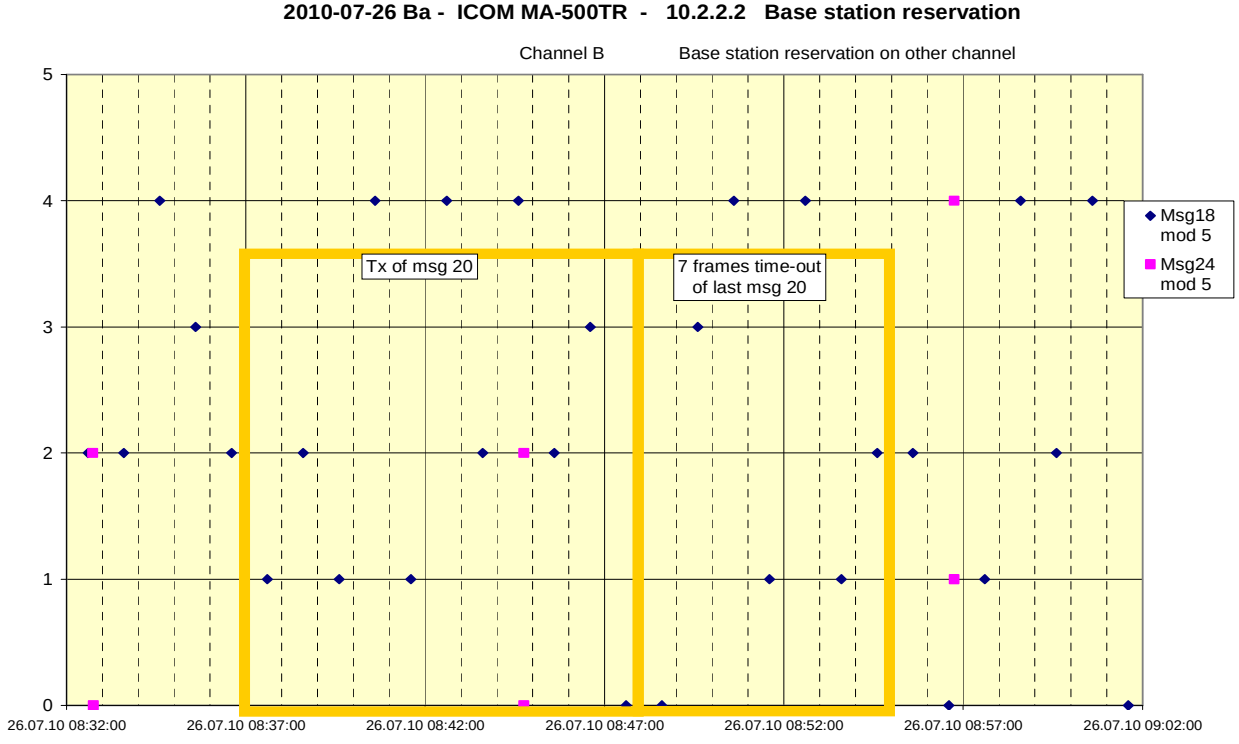
2010-06-07 Ba - ICOM MA-500TR - 10.2.1.5 PI output performance, RS422 output

Result: Average = 96.4 % (outside DSC sharing) Ch A: 2084 Ch B: 2086



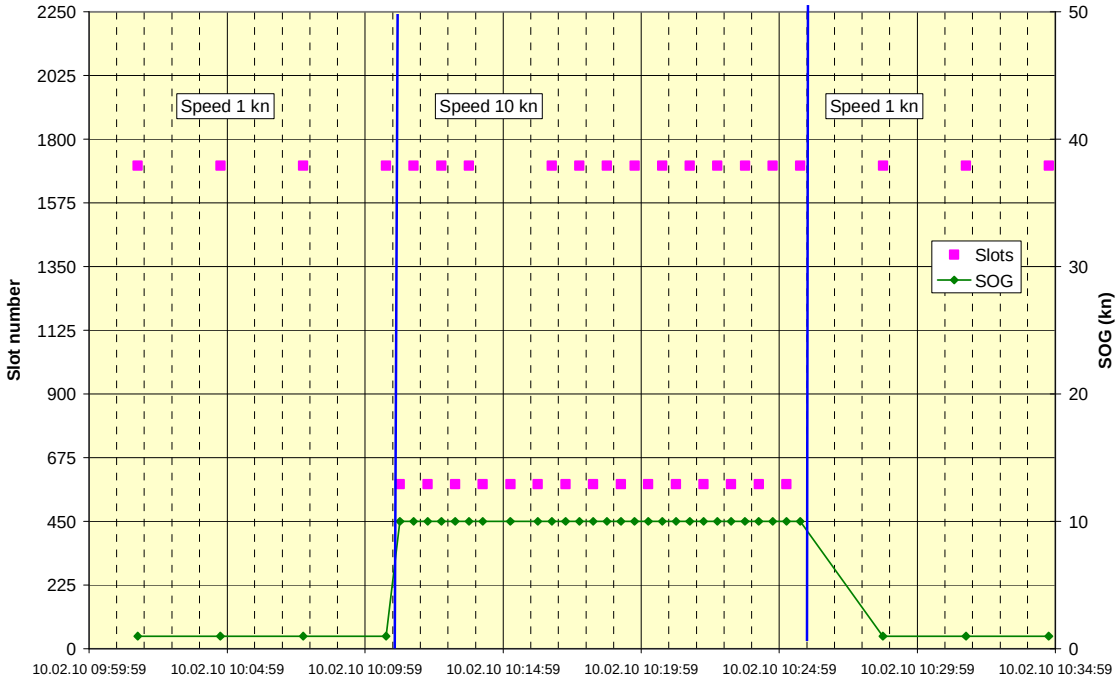
10.2.2.2 VDL state/reservations



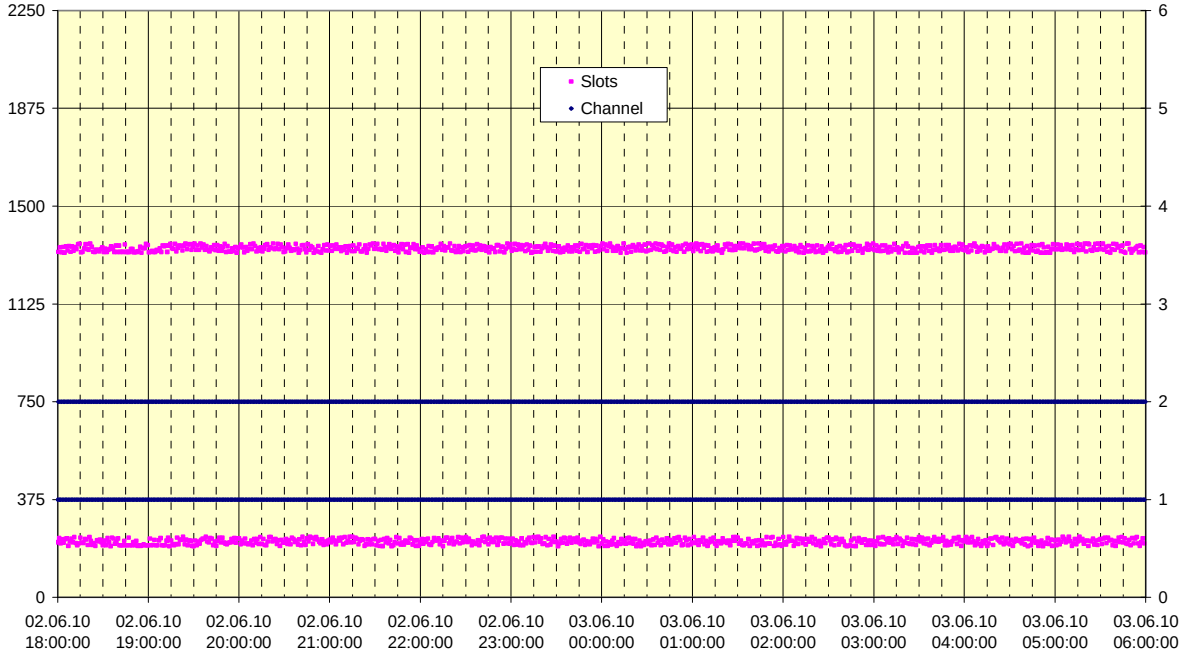


C.3 10.6.2.1 Nominal reporting interval

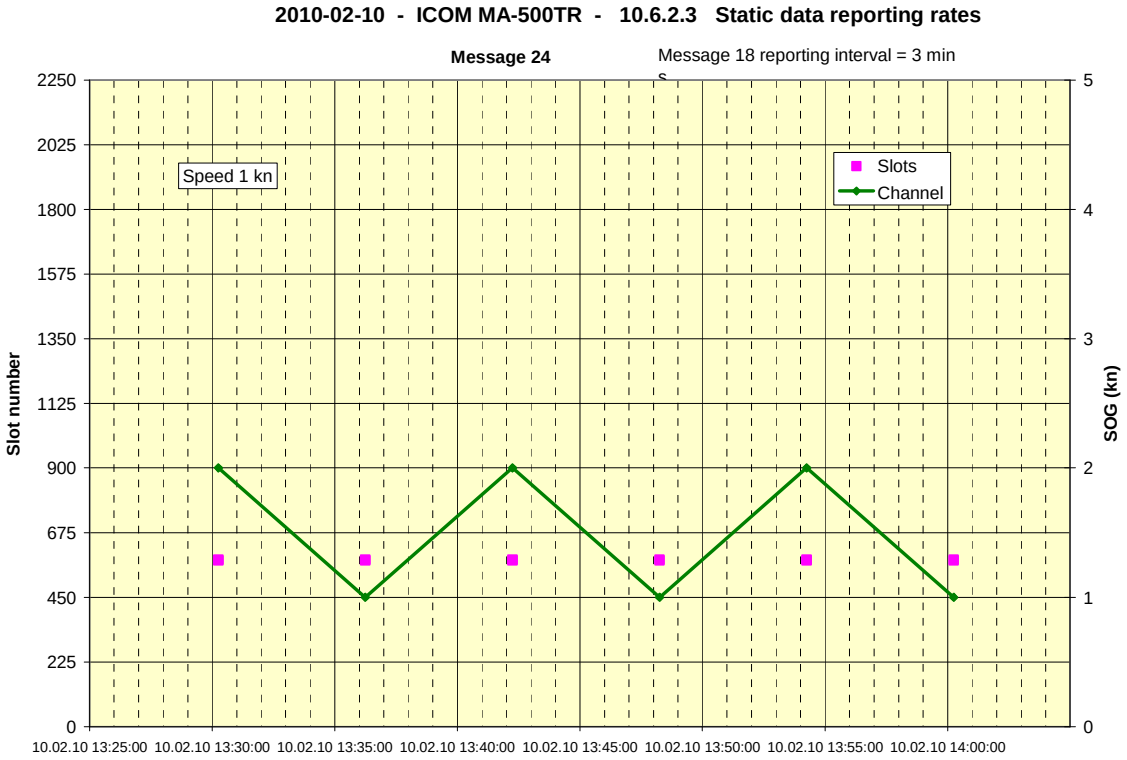
2010-02-10 Ba - ICOM MA-500TR - 10.6.2.1 Nominal reporting interval

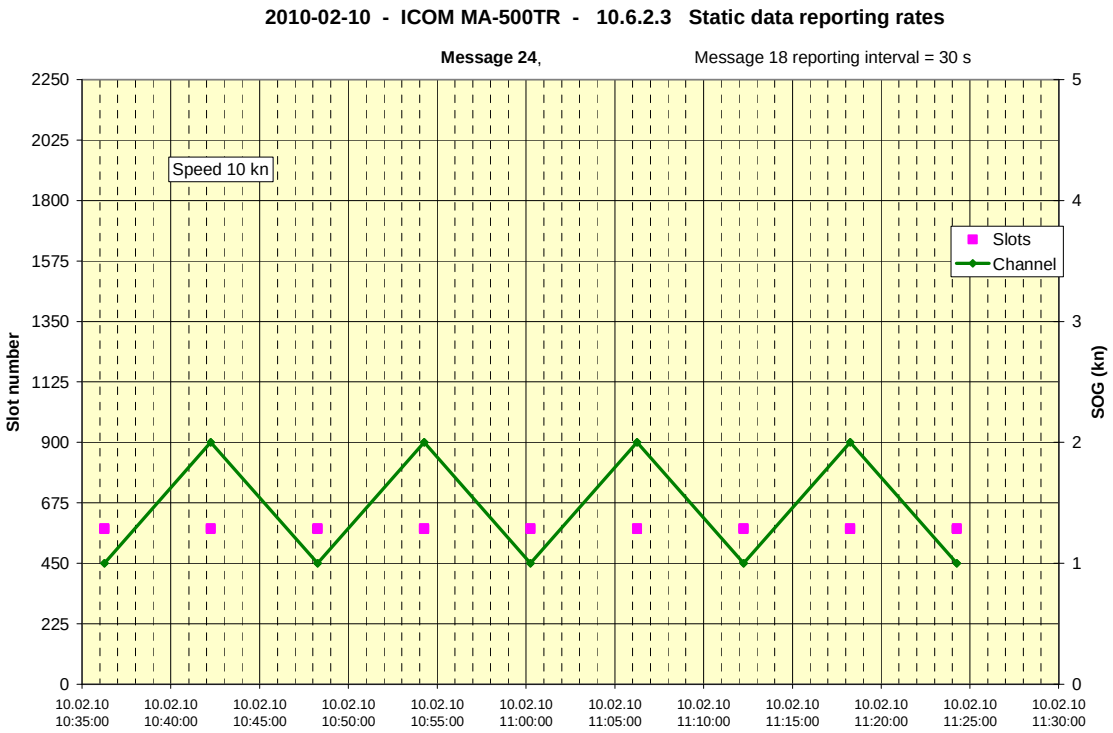


010-06-03 Ba - ICOM MA-500TR - 10.6.2.1 Nominal reporting interval

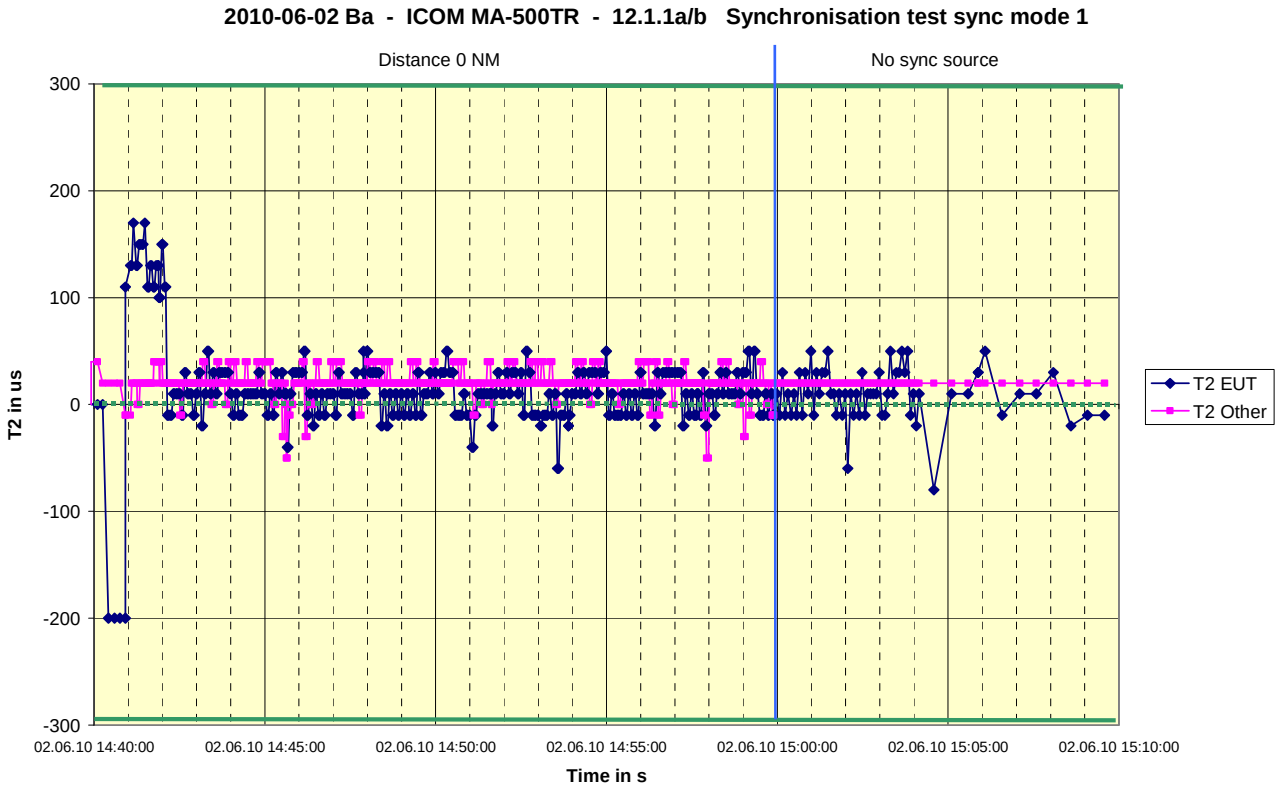


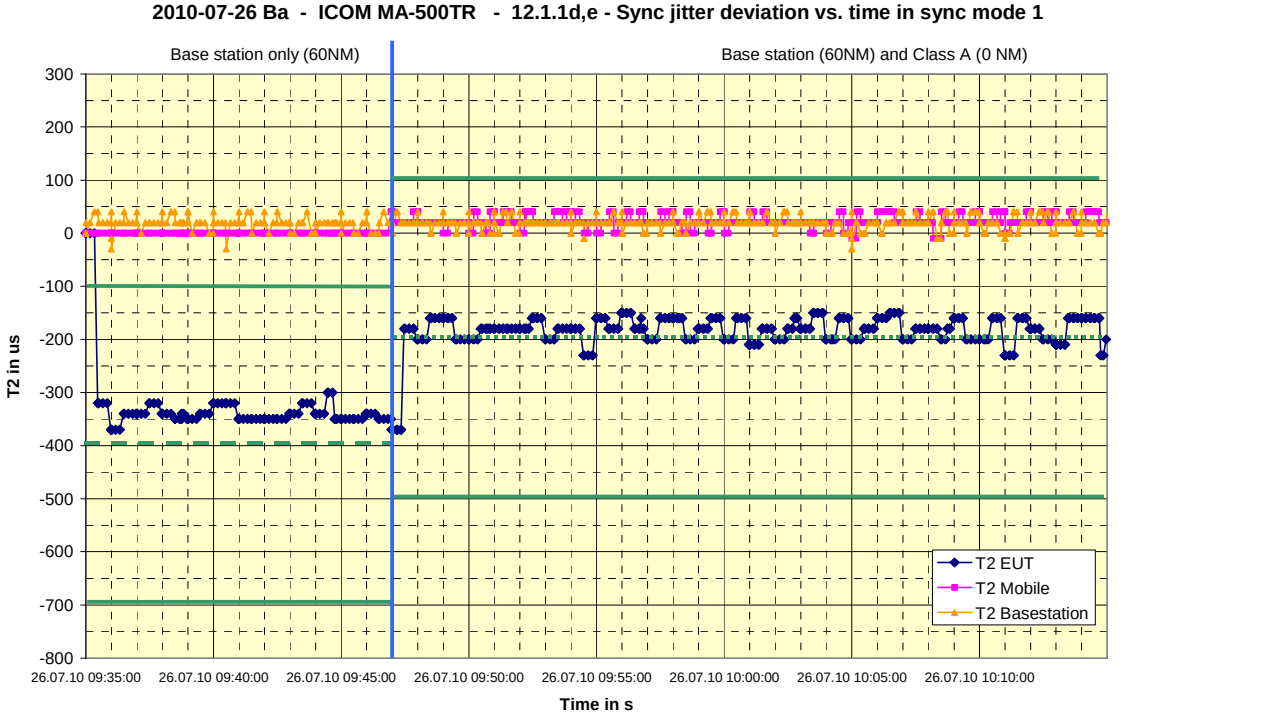
C.4 10.6.2.3 Static data reporting interval



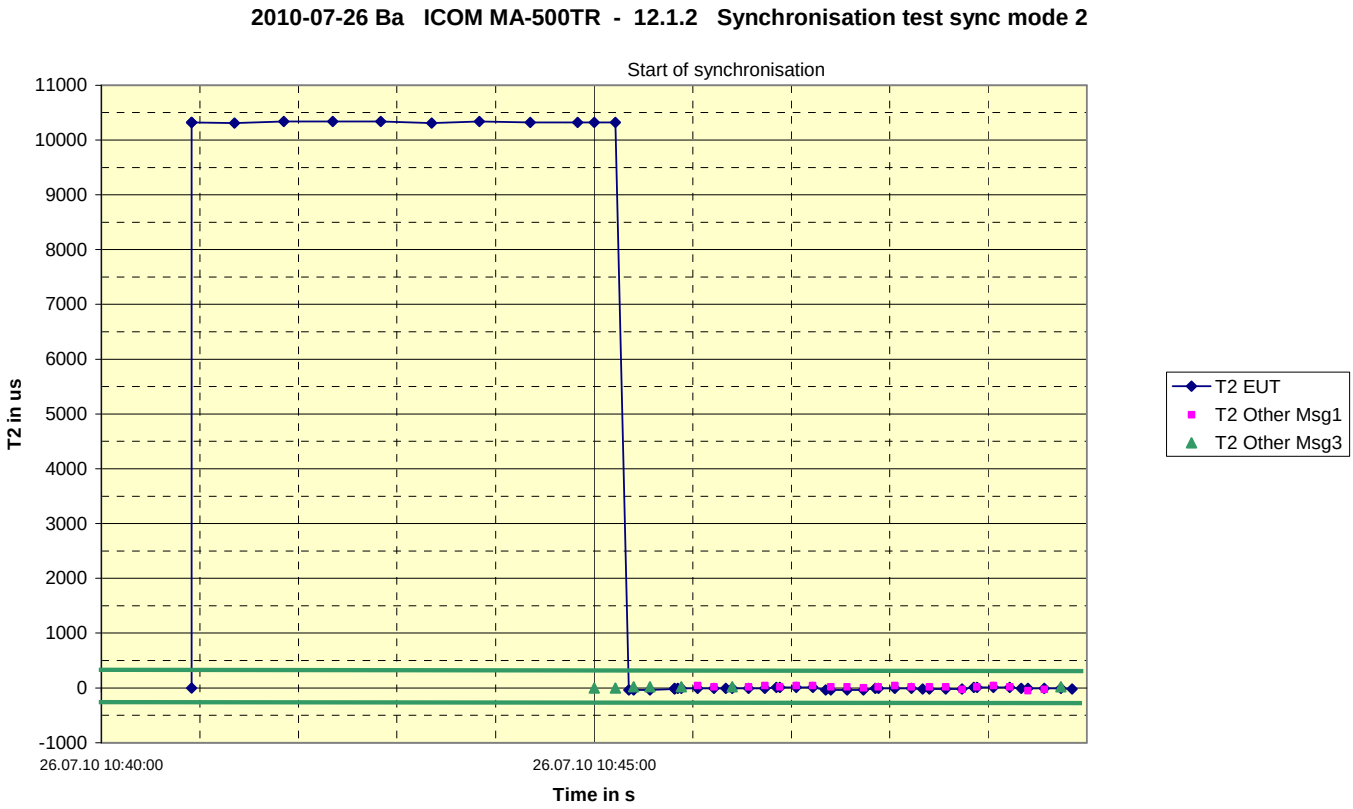


C.5 12.1.1 Synchronisation test sync mode 1





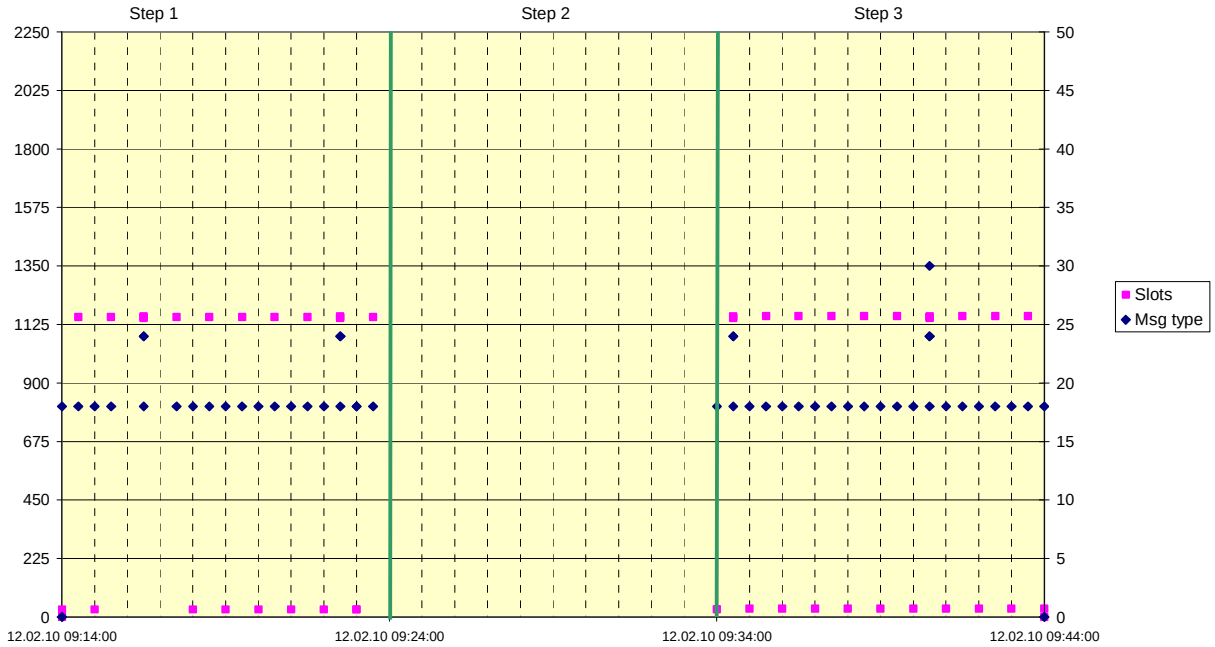
C.6 12.1.2 Synchronisation test sync mode 2



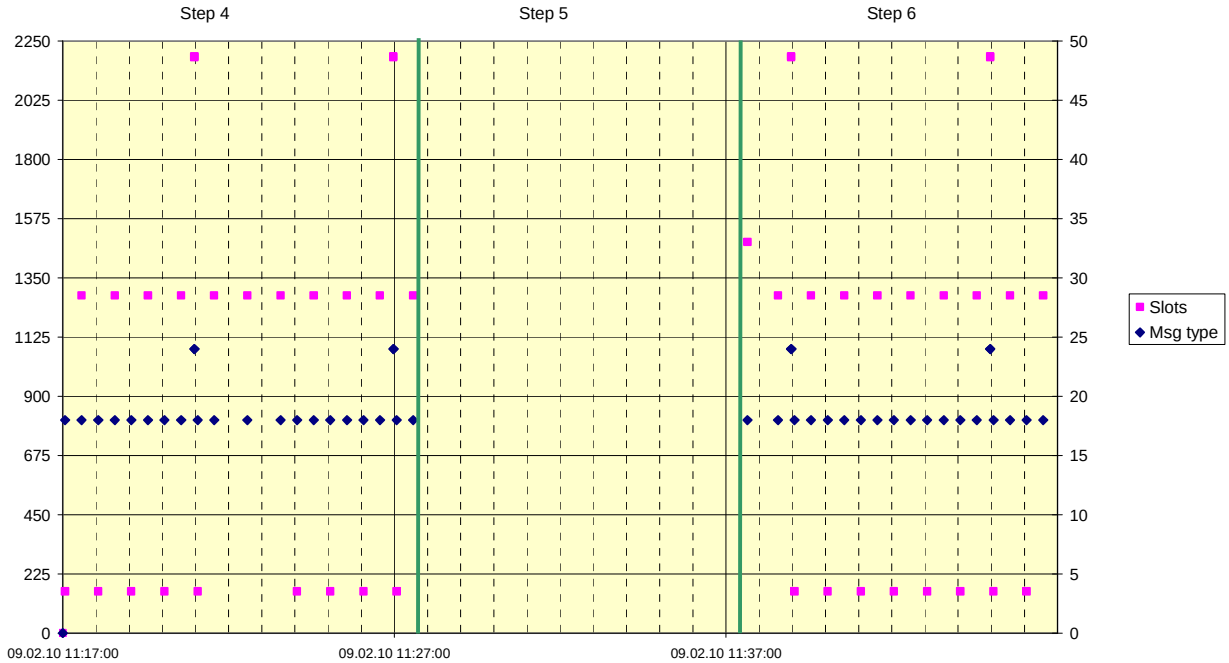
C.7 12.2.1 Carrier sense test – Threshold level

2010-02-12 Ba - ICOM MA-500TR - 12.2.1 Carrier sense tests - Threshold level

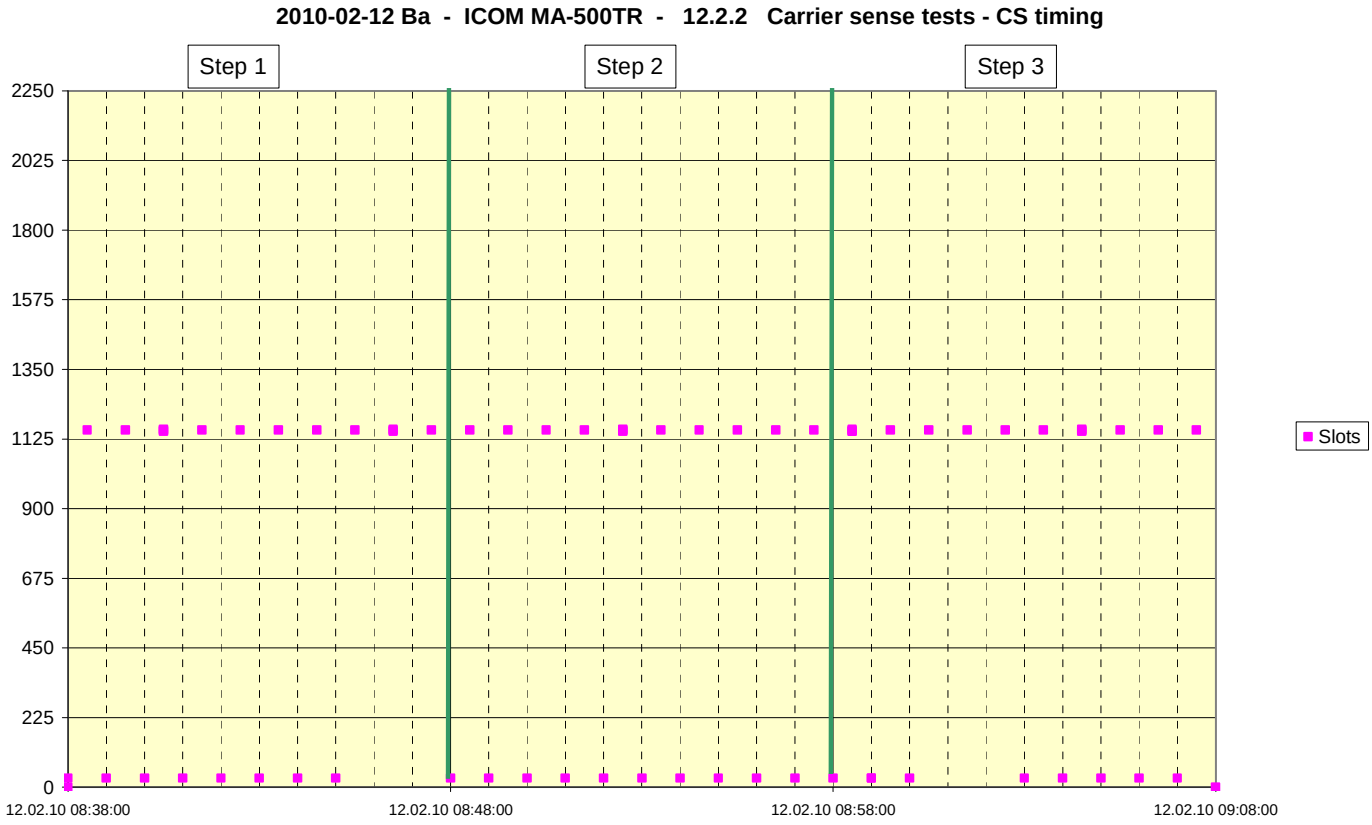
The level of signal C is -70 dBm, 10 dB lower than the level in the standard (-60 dBm), because of limitations of the test equipment



2010-02-09 Ba - ICOM MA-500TR - 12.2.1 Carrier sense tests - Threshold level

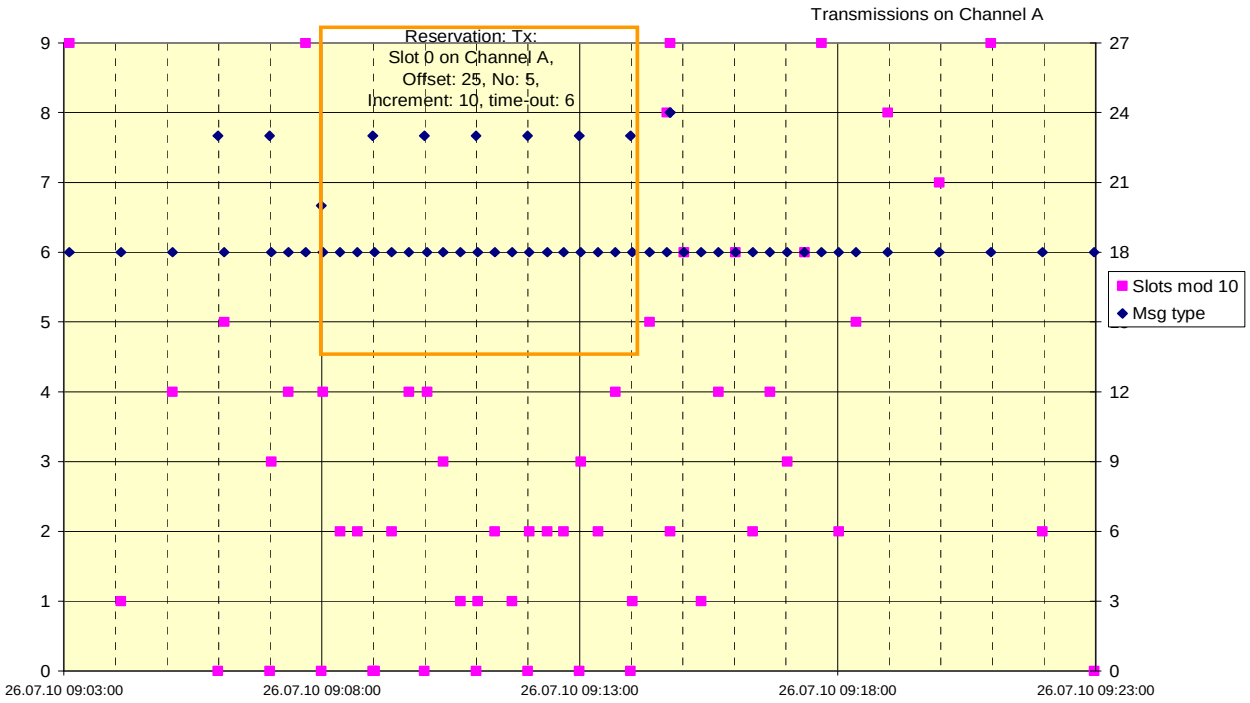


C.8 12.2.2 Carrier sense timing

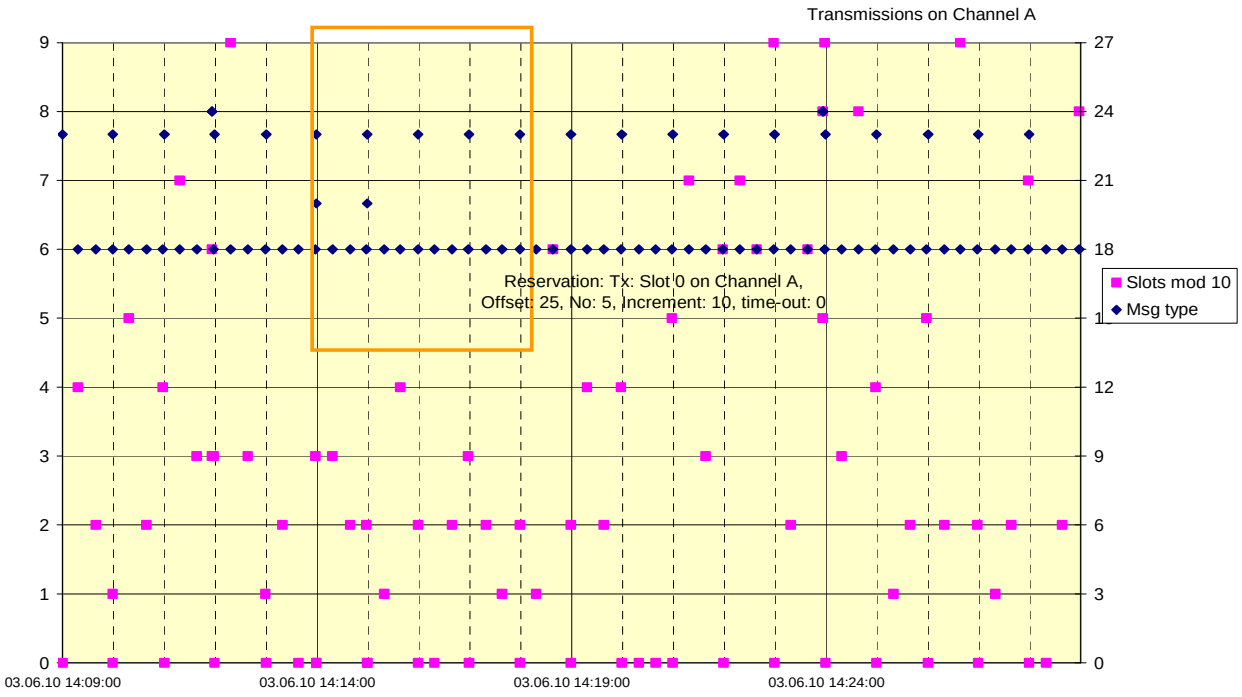


C.9 12.3 VDL state / Reservations

2010-07-26 Ba - ICOM MA-500TR - 12.3a VDL state/Reservations

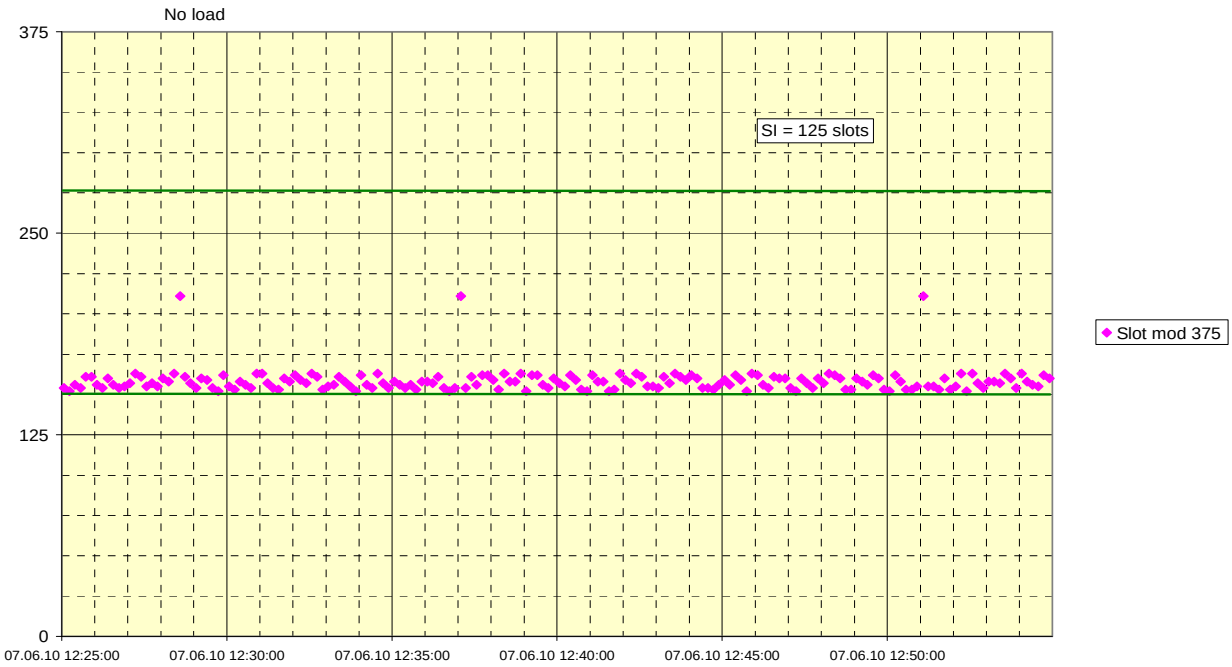


2010-06-03 Ba - ICOM MA-500TR - 12.3b VDL state/Reservations

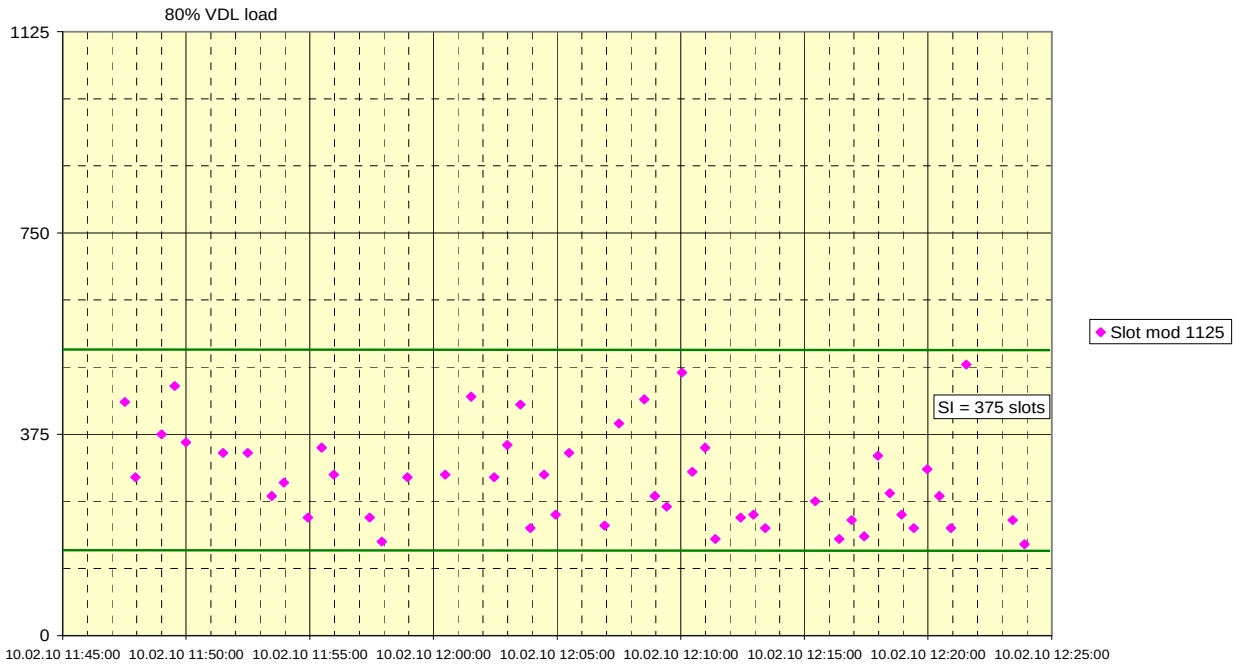


C.10 12.6.1 Autonomous mode allocation

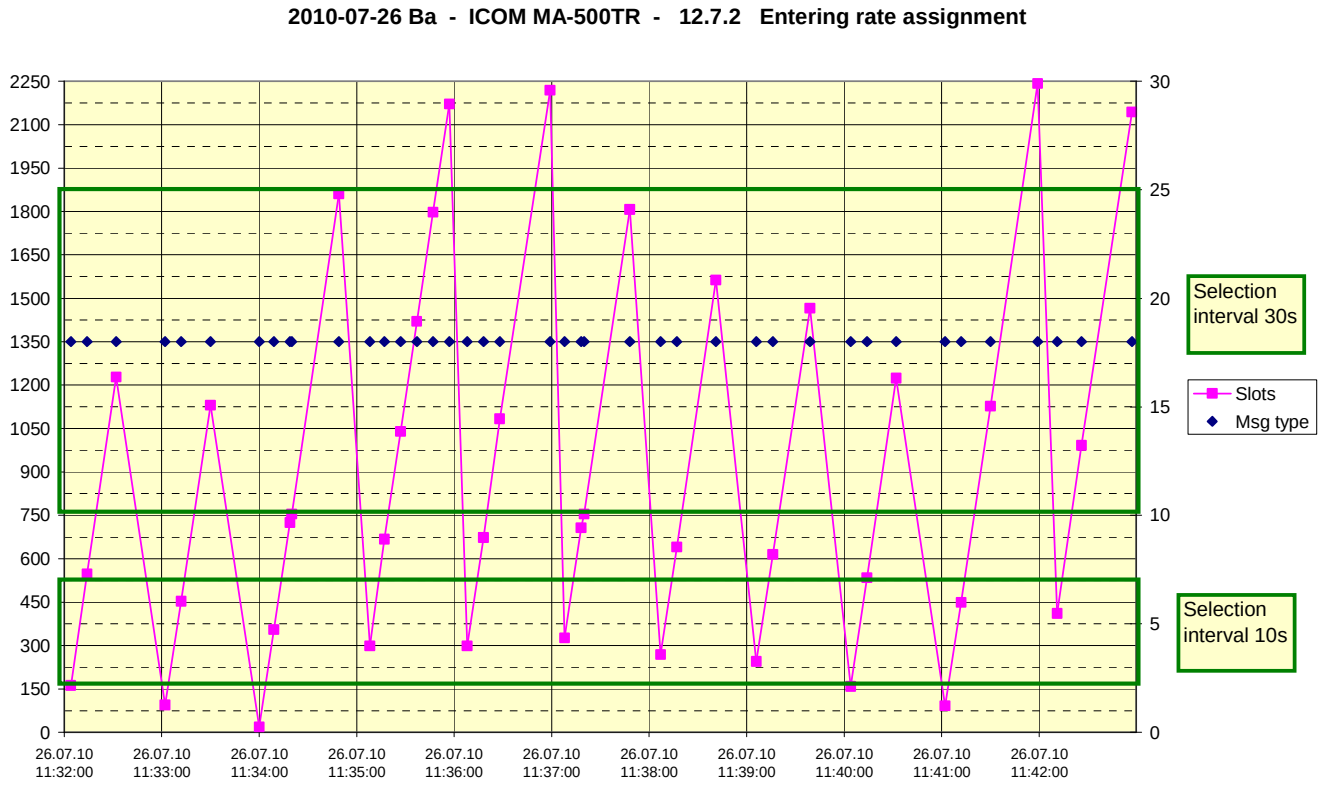
2010-06-07 - ICOM MA-500TR - 12.6.1 Autonomous mode allocation



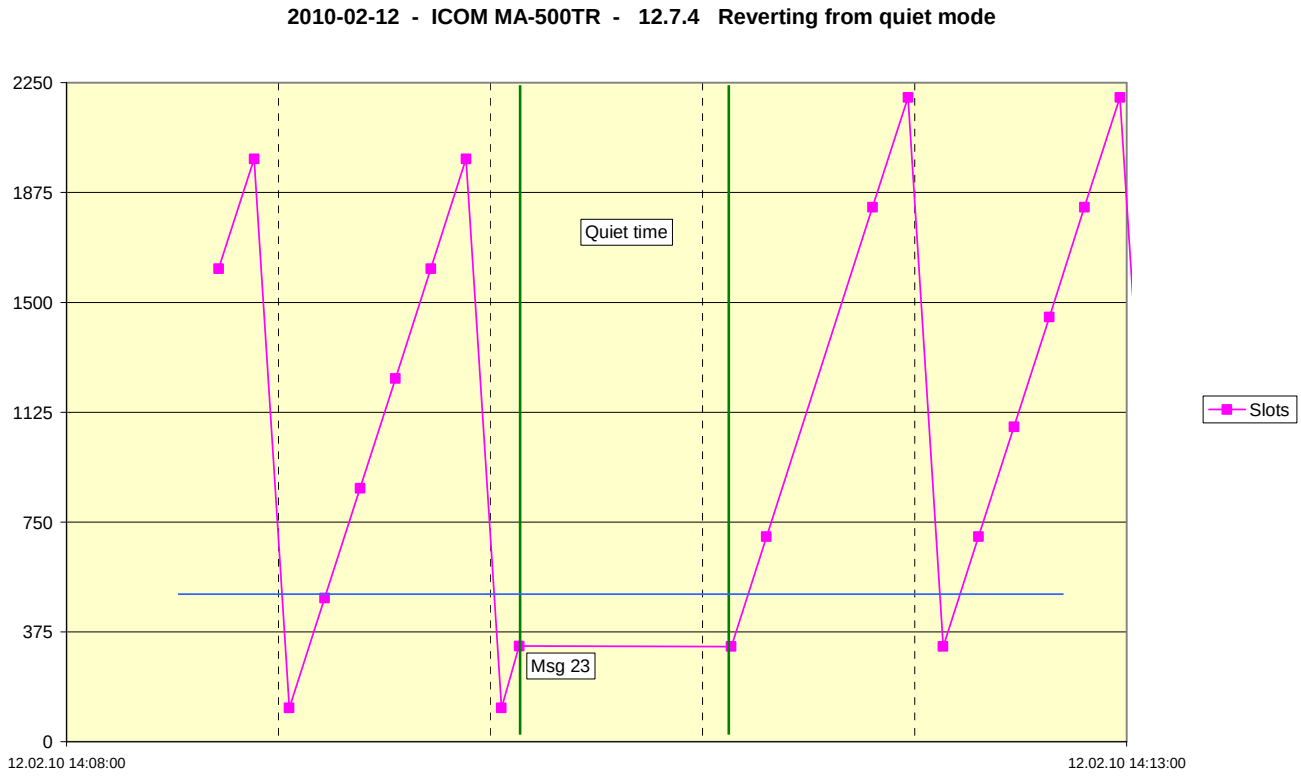
2010-02-10 - ICOM MA-500TR - 12.6.1 Autonomous mode allocation



C.11 12.7.2 Entering rate assignment



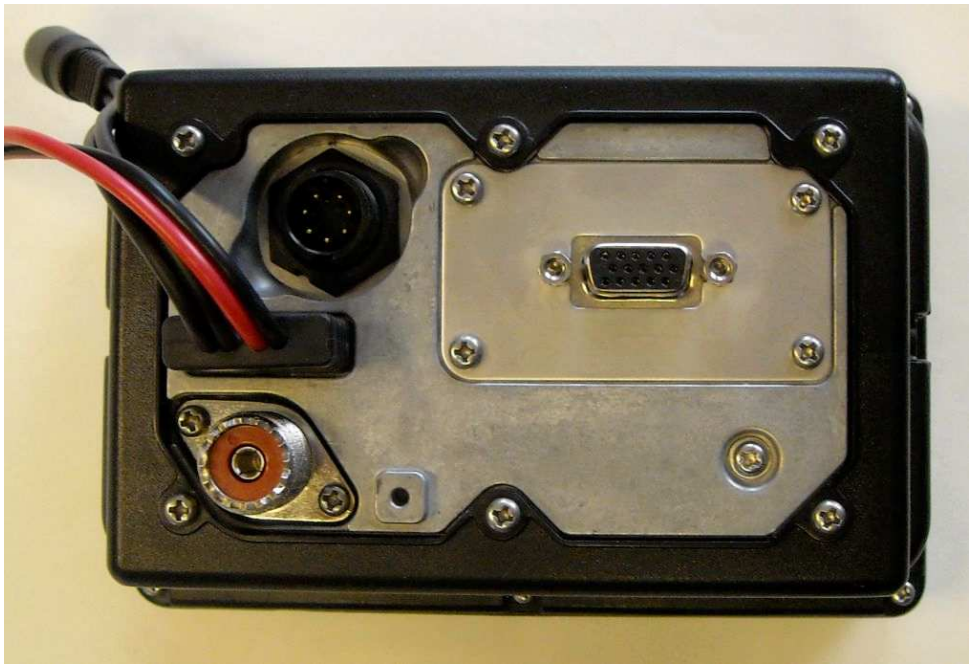
C.12 12.7.4 Reverting from quiet mode



Annex D Photos of equipment under test

D.1 Transponder Unit


GND
ANT
12V DC
NMEA I/O
GPS
BSH 1
登録票2010年7月13日
所属K番号35K-2189
ICOM
CLASS B AIS TRANSPONDER MA-500TR
ENT
DISP MODE
MENU
CLEAR
MOB
DSC
BRILL



D.2 GPS antenna