Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

Conformance test report of an

AIS system

Equipment under test:	**AMEC**
Type:	**Camino-108 / Camino-108W**

Applying test standards: IEC 62287-1 Sections 12, Annex C.3

Test Report No.: BSH/4542/001/4322516/13

Applicant: Alltek Marine Electronics Corp.
7F, NO.605 Ruei-Guang Rd., Neihu District
Taipei 11492
Taiwan

Hamburg, 01 October 2013
For the Federal Maritime and Hydrographic Agency

Heinrich Bartels
Test engineer

Hans-Karl von Arnim
Head of section

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

20359 Hamburg
Germany

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12084-01-01

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

Bundesamt für Seeschifffahrt und Hydrographie
Bundesoberbehörde im Geschäftsbereich
des BMVBS
Bernhard-Nocht-Straße 78
20359 Hamburg

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Schiffsausrüstung (Navigationsausrüstung, Funkausrüstung, Rettungsmittel)

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 08.03.2013 mit der Akkreditierungsnummer D-PL-12084-01 und ist gültig bis 07.03.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 9 Seiten.

Registrierungsnummer der Urkunde: **D-PL-12084-01-01**

Frankfurt am Main, 08.03.2013

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Leiter Abteilung 2

Siehe Hinweise auf der Rückseite

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

General

Applicant:

Alltek Marine Electronics Corp.
7F, NO.605 Ruei-Guang Rd., Neihu District, Taipei 11492, Taiwan

<u>Equipment under test:</u>

Type:	Camino-108 / Camino-108W
Manufacturer:	Alltek Marine Electronics Corp.
	7F, NO.605 Ruei-Guang Rd., Neihu District,
	Taipei 11492, Taiwan
Place of test:	BSH test laboratory Hamburg, Room 916
Start of test:	2013-07-08
End of test:	2013-08-15

Test standards[1]:

IEC 62287-1 Ed.2 (2010)
Maritime navigation and radiocommunication equipment and systems-
Automatic Identification Systems
Class B shipborne equipment of the Universal Automatic Identification System (AIS) using CSTMA techniques

IEC 62287-1-am1 ed2.0 (2013)
Amendment 1 to IEC 62287-1 Ed.2: Maritime navigation and radiocommunication equipment and systems - Class B shipborne equipment of the automatic identification system (AIS) -
Part 1: Carrier-sense time division multiple access (CSTDMA) techniques

Summary

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
2	IEC 62287	10 Operational tests	Not tested
3	IEC 62287	11 Physical tests	Not tested
4	IEC 62287	12 Specific tests of link layer	Passed
5	IEC 62287	13 Specific tests of network layer	Not tested
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 62287-1 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	Camino-108	Part No.:		---
Delivery date	2013-07-05	Serial number		---
HW Version:	Delivery date	2013-07-05	Version no	
	Installation date	2013-07-05		
SW Version:	Delivery date	2013-07-05	Version no	1.2.5.8
	Installation date	2013-07-05		
SW Version:	Delivery date	2013-07-10	Version no	1.2.5.9
	Installation date	2013-07-10		
SW Version:	Delivery date	2013-07-17	Version no	1.2.5.10
	Installation date	2013-07-17		
SW Version:	Delivery date	2013-07-18	Version no	1.2.5.11
	Installation date	2013-07-18		
SW Version:	Delivery date	2013-07-19	Version no	1.2.5.12
	Installation date	2013-07-19		
SW Version:	Delivery date	2013-07-29	Version no	1.2.5.13
	Installation date	2013-07-29		
SW Version:	Delivery date	2013-07-30	Version no	1.2.5.14
	Installation date	2013-07-30		
SW Version:	Delivery date	2013-08-05	Version no	1.2.5.15
	Installation date	2013-08-05		
SW Version:	Delivery date	2013-08-13	Version no	1.2.5.17
	Installation date	2013-08-13		
SW Version:	Delivery date	2013-08-15	Version no	1.2.5.18
	Installation date	2013-08-15		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna			
Type	No GPS antenna used for the test	Part No.:	
Delivery date		Serial number	
HW Version:	Delivery date	Version no	---
	Installation date		

1.2   Test environment

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

1.2.1   Test environment no 1

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

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

Equipment no	Start of test	End of test	Test engineer
1	2013-07-08	2013-07-08	Bartels
1	2013-07-10	2013-07-10	Bartels
1	2013-07-18	2013-07-19	Bartels
1	2013-07-29	2013-07-29	Bartels
1	2013-07-30	2013-07-31	Bartels
1	2013-08-07	2013-08-07	Bartels
1	2013-08-13	2013-08-13	Bartels
1	2013-08-15	2013-08-15	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:	NMEA-0183

If not available, a serial test interface is required

Sync signal for Carrier sense test

Required for testing

Parameters	
Polarity:	Active positive
Level	TTL level

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	Sign	Result	Status

Issue of this template: 2013-07-12

---

[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
2013-07-08	Channel management	The receiver channels are re-set to AIS1 and AIS2 after DSC monitoring times when the unit is operating with channel management settigns. Retest 2013-07-10: The receiver channels stay on the frequencies as defined by the channel management setting	Passed
2013-07-29 UTC 11:40	Overlapping areas	The EUT has stored two overlapping areas, one applied by DSC and one by message 22. If a new area overlaps an existing one the existing area has to be deleted and the new one has to be stored Retest 2013-07-30 Ba: UTC 12:14 There were again two overlapping areas. The reason seems to be that – because of the fixed timing in DSC test mode – the second area (by DSC) has an older time stamp than the already existing area (applied by message 22 at real time). Nevertheless- there should never be two overlapping areas stored. If there is irreglular timing either the new area has to be ignored (because of older time stamp) or the previous area has to be removed) but never two overlapping areas should be stored at the same time. Retest 2013-08-07 Ba: It is still possible to apply 2 overlapping areas. Retest 2013-08-13 Ba: The new area overwrites the existing one	Passed
2013-07-31 UTC 12:25, 12:30, 12:33	Areas are deleted	All areas have been deleted. Reason seems to be that the external position input has stopped for about 10 s. The standard provides only 3 reasons to delete areas: - an existing area is overlapped by a new one - an area is older than 5 weeks (latest update) - an area is more than 500 NM away from the current <u>valid</u> position of the EUT. An invalid position or missing position input is definitely not a reason to delete area settings. This is again a problem which may be caused by the special test mode using external position. But it has to be clarified to be sure that it does not happen in normal operation (using internal GPS).	

		Retest 2013-08-07 Ba: Areas are not deleted at time-out of external position.	Passed
2013-08-07	Message 4 required	The EUT does accept area setting calls only if it has received a message 4 from the base station before. For DSC this requirement for message 4 is not appropriate because of the following reasons: - The DSC call includes already an addressing area - different to message 22. So a check of the distance to the base station is not necessary. DSC channel management has mainly been introduced to be able to apply channel management areas to mobile stations which cannot be reached on AIS channels because they are using other, unknown channels (e.g. because of incorrect area settings). This would not be possible if the mobile stations require a message 4 on AIS channels to accept the DSC area setting commands. Retest 2013-08-13 Ba: The EUT accepts DSC calls with area setting also when no message 4 from the same base station has been received.	Passed

1.5   12.2   Carrier-Sense tests

1.5.1   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).
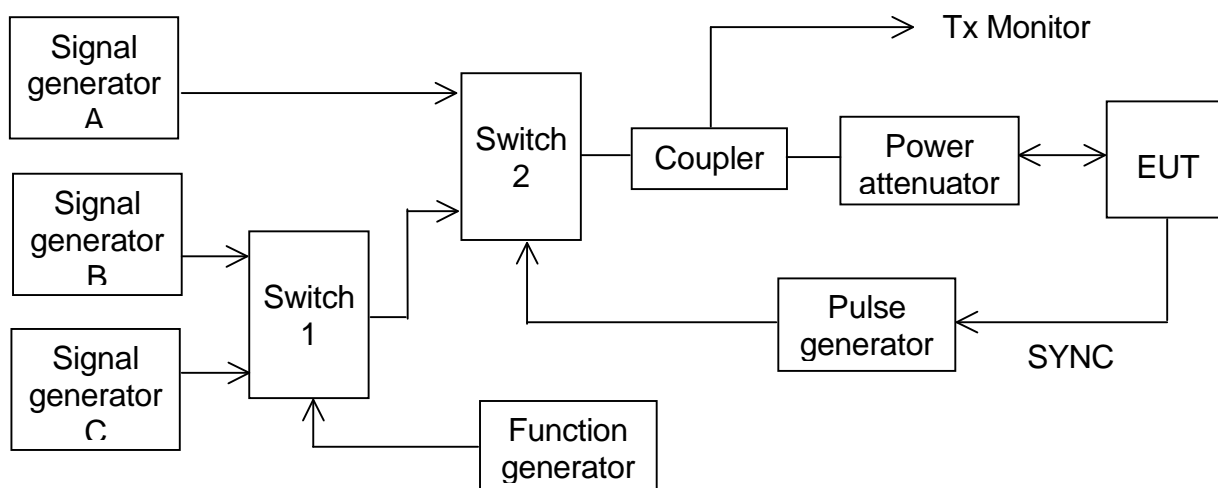
Figure 1 – Configuration for Carrier-Sense threshold test

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

2013-07-10 Ba	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		Passed
Step 5	Check that the EUT has not transmitted		Passed
Step 6	Check that the EUT has transmitted		Passed

1.5.2 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

2013-07-10	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

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

2   C.3   DSC functionality tests

2.1   C.3.1   General

For the tests in this subclause   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 call, a geographic call from ITU-R M.493-13, a test call, an individual call from ITU-R M.493-13 and a test call that the EUT's AIS operation is not affected by the interleaved calls.

2013-07-31 Ba	Test details– Sequence of 5 calls		
Test item	Check	Remark	Result

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE

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	Some Tx messages on the DSC listening channel are missing Remark: It seems that with 10 s reporting interval some messages are also missing during the DSC listening intervals when there are no DSC calls. This was not observed with 30s reporting interval <u>Retest 2013-08-07 Ba:</u> Similar result, in 2 cases some messages were not transmitted after DSC receiving interval. In some other intervals there was no problem <u>Retest 2013-08-13 Ba:</u> Similar result. For the missing messages the EUT outputs "Tx fail, Carrier sensing". So it seems that the DSC receiving influences somehow the carrier sensing. <u>Retest 2013-08-15 Ba:</u> There are still some phases with Tx fail but there is no correlation with the DSC receiving times. It may be a problem of distortion signal levels in the test lab. We accept this test item as passed.	Passed

2.2 C.3.2 Regional area designation

Perform the following tests using the DSC channel management test call.

Send to the EUT a standard call 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.

2013-07-18 Ba	Test details - Regional area designation		
Test item	Check	Remark	Result
Activate DSC function			
Start DSC transmission of test sentence File: area_set_region_2084_2086.sst"	Check that the area setting of the DSC command is correctly stored	According to PI test output the DSC calls are received but the area settings are not stored. Retest 2013-07-19 Ba: - The area settings are stored There are still phase where no DSC calls are received Retests 2013-07-30 Ba: UTC 13:18 There was again a phase where DSC was not received. Even with normal timing the EUT did not receive DSC calls during the DSC rx phases. After a restart of the unit DSC reception was ok. Retest 2013-08-07 Ba: UTC 12:04 There was still a phase without receiving DSC calls. After restart DSC calls were received again. The same happened with regular DSC timing intervals every 15 minutes (UTC 13:50 to 14:45). After restart DSC rx was ok Retest 2013-08-13 Ba: UTC 11:40 There was again a phase with no DSC rx. Retest 2013-08-15 Ba: During the current test phase there was no DSC Rx fail	Passed
	Check that the transitional zone size is 5 NM	The transitional zone size is 4 NM Retest 2013-07-29 Ba: The transitional zone size is still 4 NM, but should be 5 NM Retest 2013-07-30 Ba: The transitional zone size is 5 NM.	Passed

Bundesamt für Seeschifffahrt und Hydrographie

Federal Maritime and Hydrographic Agency

2.3   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.

2013-07-31 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

2.4   C.3.4   DSC flag in Message 18

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

2013-07-19 Ba	Test details – DSC flag		
Test item	Check	Remark	Result
Record VDL			
DSC activated	Check that the DSC flag is set	The DSC function is activated and deactivated with the AMEC AIS Class B Configuration utility	Passed
DSC inactivated	Check that the DSC flag is not set		Passed

Test Report No. BSH/4542/001/4322516/13   Date: 2013-10-01   page 17 of 33

2.5   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.

2013-07-30 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	Not applicable because 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	The DSC monitoring time plan is also checked by a record of AIS receiving.	Passed

2.6 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.

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

2013-07-29 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)	UTC 11:53	Passed
b) step 1: Set own position to any of the 7 areas	Check channels of area 2	Verified by ACA output	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	Retest 2013-07-29 Ba: UTC 12:05 Area 9 was received but not accepted It seems that no further areas are accepted when the required maximum of 8 area settings are stored. If a new area is received the oldest area has to be removed. Retest 2013-07-30 Ba: UTC 13:45 Area 1 has been deleted	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)	Retest 2013-07-29 Ba:	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	Retest 2013-07-29 Ba:	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	Checked by ACA output	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

2.7   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.*

2013-07-29 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	UTC 12:11 area 1	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	UTC 12:12:10 An DSC calls with new channels only (no corners) is ignored and the channels of the area in use are not changed. UTC 12:15:55 After receiving an DSC call with complete setting and the same corners as the area in use but different channels the EUT restarts automatically. The new setting is not stored. Retest 2013-07-30 Ba: Both kinds of MMSI addressed calls are accepted, with and without corner points.	Passed
c) Move the position out of the area	Check, that the EUT uses the default channels	Retest 2013-07-30 Ba:	Passed

2.8   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.

2013-07-29 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	Checked by evaluation of ACA output on request and evaluation of PI port. UTC 13:21 The area is stored, and the default channels are not used Retest 2013-07-30 Ba: The area is not stored		Passed
b) Move own position to the first area	Check, that the EUT uses the operational settings of the first area	Check by evaluation of ACA output on request		Passed
Move own position to the second area	Check, that the EUT uses the operational settings of the second area	Check by evaluation of ACA output on request		Passed

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency

Annex A Test equipment

A.1 Test equipment summary

#	description	type	identification
1	VDL Analyser / Generator	AIS Test unit MKII	S/N AA08PN Bund BSH/2012, 7200002112 BSH PC10745 SW AISterm V1.0rev47 AISmain V1.47011120R
2	Target simulator software	Furuno Navintra	BSH PC 9169
3	Presentation Interface Monitor	BSH	BSH PC 8441 BSH PC 9457 SW NewMoni V3.1
4	GMDSS-AIS-Testbox (DSC)	Futronic I/S	200 30 405
5	16 Port Serial Device Server	Moxa DE-303	06698, BSH Nr. 6084
6	Connection box for Moxa serial server With 8 converters RS 232 to RS 422	----	----
7	Active retransmitting GPS antenna	RA - 48	4800199
8	Trimble GPS reference receiver	4000RS, Part number 21000-76	S/N 3428A06700
	Auxiliaries:		
9	True RMS Multimeter DMM 916	Tektronix	S/N 138531
10	2-Kanal-Digital-Oszilloskop	Le Croy Wavesurfer 422	LCRY 0301 J 15673
11	Unbalanced Standard Attenuator	Rhode & Schwarz DPR BN 18024/50	BUND KK 11201
12	2 fixed voltage power supply (24 V/10A)	SITOP	BUND 102452, 102453
13	1 fixed voltage power supply (12 V/4,5A)	Siemens	
14	2 adjustable power supplies (30 V/5 A)	PS 405 D	S/N 2737, 2768

Reserve equipment

#	description	type	identification
15	VDL Analyser / Generator	AIS equipment tester	S/N 218 Bund 102710/2002 Prüfgerät Nr. 1
16	VDL Analyser / Generator	AIS equipment tester	Prüfgerät Nr. 2

A.1.1   VDL Analyser / Generator

The VDL analyser/generator:
- <u>receives</u> 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).
- <u>transmits</u> 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.
- <u>records</u> all data contained in the received radio telegrams and radio parameters in a data base for offline evaluation and documentation purposes.
- <u>simulates</u> AIS targets by transmitting position reports of virtual targets up to the maximum channel capacity of 100% channel load on both channels (4500 messages / minute). The data are provided via serial interface to the VDL analyser/ Generator.

A.1.2   Target simulator

The target simulator consists of a standard PC with a special AIS Target Simulator software.

For tests of AIS transponders the data of up to 75 moving targets defined in text file in plain language are transferred to the „TS" input of the VDL Analyser/ Generator as VDM sentences and transmitted on the VHF data link (VDL) . Thus the AIS VHF data link is loaded with simulated AIS targets in fixed slots or in slots selected by the VDL Analyser/ Generator.

A.1.3   Presentation Interface Monitor

The Presentation Interface Monitor is a PC software running on four standard PCs.
It is used to
- 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 Sensor Data Simulator

The Sensor Data Simulator provides simulated sensor data to the serial sensor data inputs of the EUT. The sensor data are provided in text files to the Sensor Data Simulator which modifies the sensor data sentences e.g. adding the actual UTC time, modify some time-varying data and by adding a checksum.

The Sensor Data Simulator is basically the same software as the Presentation Interface Monitor using a special part of the functionality of the software.

A.1.5 DSC Testbox

The DSC test box is a standard GMDSS-AIS Test box used for the survey of ship stations.

For the DSC testing of AIS equipment in includes a software extension that provides a remote control input/output facility
- to transmit DSC calls according to ITU 825-3 generated in an external PC on DSC channel 70 and
- to output received DSC calls from the EUT to the external PC.

A special PC software is used to generate the DSC calls and to display, log and evaluate received DSC calls. It communicates via the serial remote control interface to the DSC Testbox.

A.1.6 Serial Interface Server

The Serial Interface Server provides 16 serial lines which can be connected in a flexible way to the EUT and to equipment of the test environment like the DSC Testbox.

The Serial Interface Server is connected to the controlling PCs via Ethernet Network. It includes:
- 8 serial lines according to RS-422 and IEC 61162-1/2
- 8 serial lines according to RS-232

A.1.7 Laboratory Network

A special laboratory network connect controlling PCs with equipment of the test environment (VDL Generator/ analyser) and with EUT if equipped with an ethernet interface.
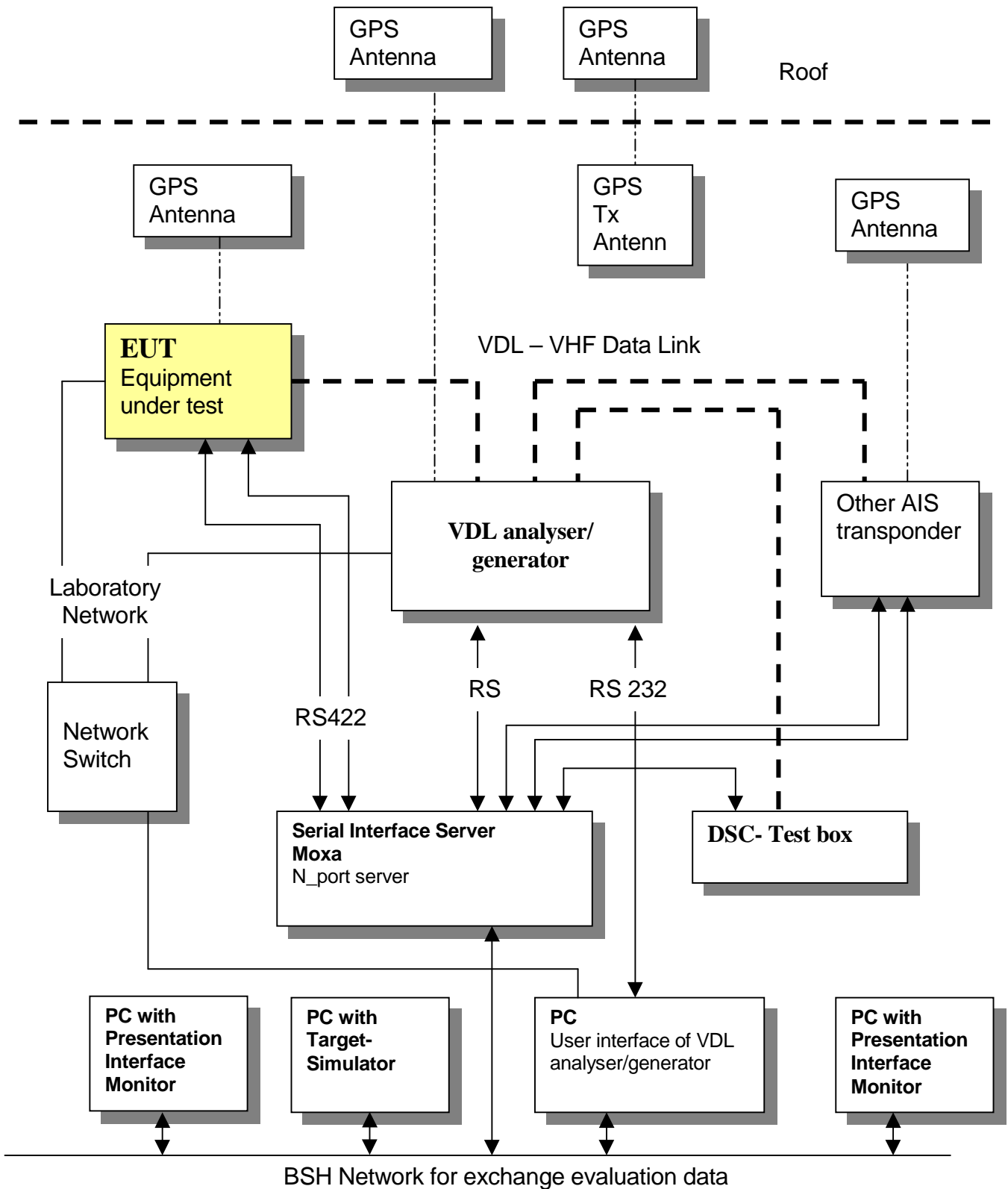
A.1.8 GPS Retransmitter

All AIS equipment includes a GPS receiver for the exact timing and for getting position and speed information.

To avoid the need to connect all AIS equipment to GPS antennas outside the laboratory a re-transmitting GPS antenna is installed in the lab. It amplifies and radiates a GPS signal in the laboratory which is received by active GPS antenna on the roof.

A.2 Test environment overview

GPS Antenna	GPS Antenna

Roof

GPS Antenna

GPS Tx Antenn

GPS Antenna

EUT Equipment under test

VDL – VHF Data Link

VDL analyser/ generator

Other AIS transponder

Laboratory Network

RS

RS 232

Network Switch

RS422

Serial Interface Server Moxa
N_port server

DSC- Test box

PC with Presentation Interface Monitor

PC with Target-Simulator

PC User interface of VDL analyser/generator

PC with Presentation Interface Monitor

BSH Network for exchange evaluation data

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 50A27271E68090A3D00680A143D00680C053C0001140068 0D053200010A0075FF	
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,0001460078000000100506715 0A27271E68090A4100680A14410075FF	
sel_check_channel.sst	Test of channel use in 20.4
$PDEBT,CCDSC,T,000146007800000010100671 50A27271E654875FF	
$PDEBT,CCDSC,T,0001460067052800000091E003C003C006715 0A27271E676F75FF	
area_set_region.sst	Area addressed regional setting, standard position inside address, but not inside area, Ch 60
$PDEBT,CCDSC,T,0001460067052800000091E003C003C0067150A27271E68090A3C00680A143C00680C05 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,00014600660600000050A0A64150A27271E646E5A00487E7E7E7FFF	
$PDEBT,CCDSC,T,000146007800000010100671 50A27271E676F75FF	
$PDEBT,CCDSC,T,00014600780000001010067150A27271E646E5A00487E7E7E75FF	
$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,0001460067053200000091E003C003C0067150A27271E676F75FF	
$PDEBT,CCDSC,T,00084600780000000010167150A27271E676F75FF	

Annex C Test diagrams

C.1 12.2.1   Carrier sense tests – Threshold level

2013-07-10 Ba - AMEC Camino-108 - 12.2.1 Carrier sense tests - Threshold level
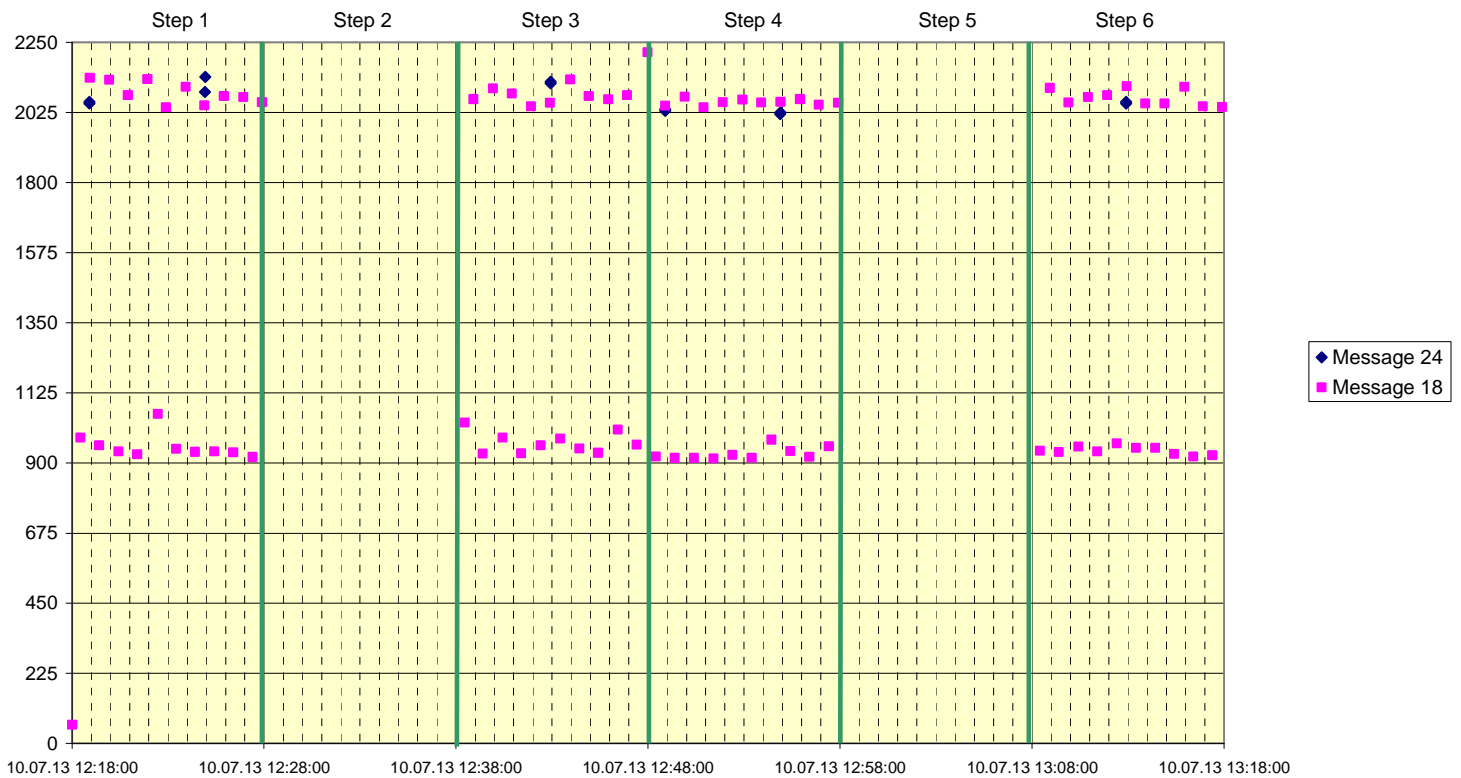
C.2   12.6.1 Carrier sense tests – Carrier sense timing

2013-07-10   Ba -   AMEC Camino-108 -   12.2.2   Carrier sense tests - Carrier sense timing
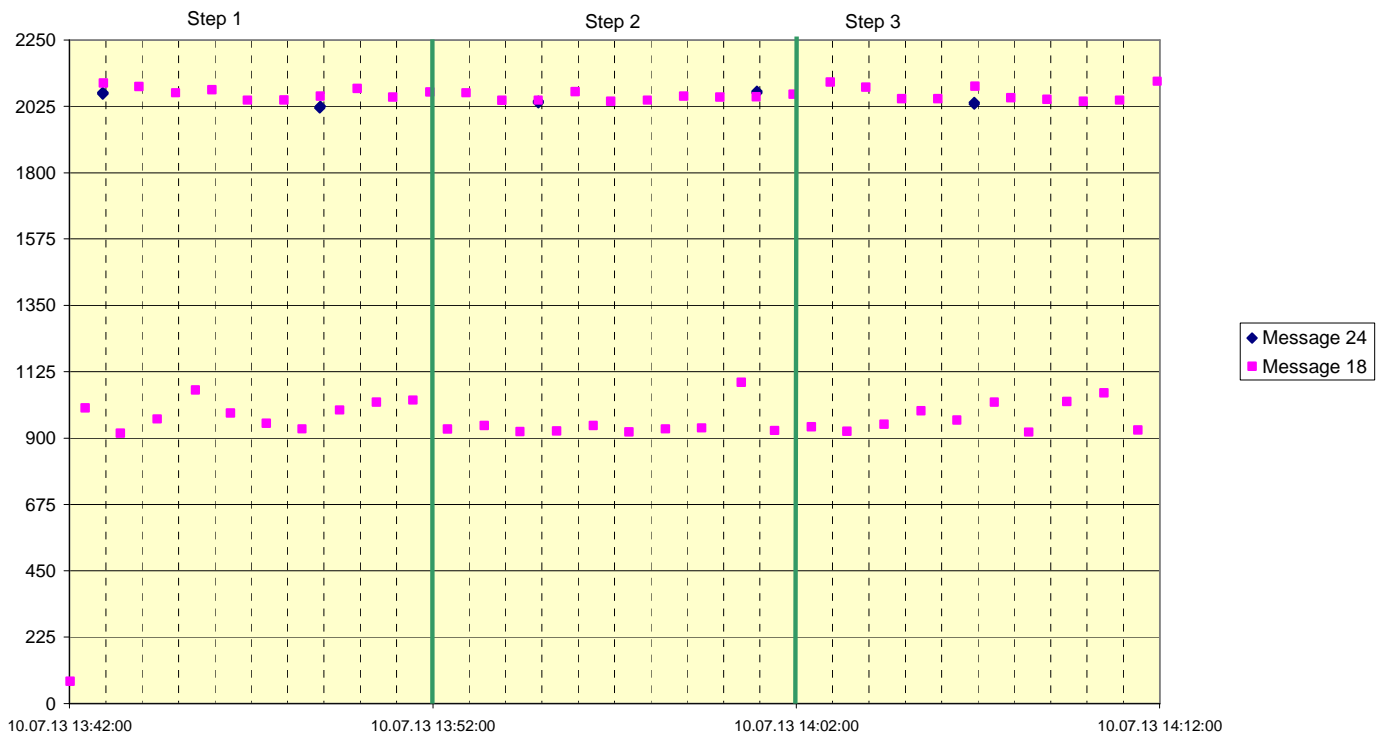
Annex D Photos of equipment under test

D.1 Transponder Unit