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 SART

Equipment under test: **McMurdo SART**

Type: **AIS SART**

Applying test standards: IEC 61097-14 Ed.1/FDIS

Test Report No.: BSH/4615/4321410/09/S3140

Applicant: McMurdo
Silver Point, Airport Service Road
PO3 5PB Portsmouth
United Kingdom

Hamburg, 25 November 2009
Federal Maritime and
Hydrographic Agency

by order

Bartels
Test engineer

by order

Preuss
Head of
laboratory

nach EN ISO/IEC 17025:2005
akkreditiertes Prüflaboratorium

Deutscher Akkreditierungs Rat
DAR

DAT-P-086/98

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

D-20359 Hamburg
Germany

DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH
Signatory of the Multilateral Agreement of EA and ILAC for the mutual recognition

represented in the

Deutschen AkkreditierungsRat

Akkreditierung

The **TGA GmbH,** represented by the **DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH**, confirms that the Testing Laboratory

Federal Maritime and Hydrographic Agency
Department Shipping
Laboratory for Type Approvals
Bernhard-Nocht-Straße 78

20359 Hamburg

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out testing in the fields of

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

according to the annexed list of standards and specifications.

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DAR-Registration No.: **DAT-PL-086/98-02**

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:	McMurdo Silver Point, Airport Service Road, PO3 5PB Portsmouth, United Kingdom
Equipment under test:	
Type:	AIS SART
Manufacturer:	McMurdo
	Silver Point, Airport Service Road, PO3 5PB Portsmouth, United Kingdom
Place of test:	BSH test laboratory Hamburg, Room 916
Start of test:	19 October 2009
End of test:	22 October 2009
Edition of the test report	1.0

Test standards[1]:

IEC 61097-14 Ed. 1/FDIS
Global maritime distress and safety system (GMDSS) –
Part 14: AIS search and rescue transmitter (AIS-SART) –
Operational and performance requirements, methods of testing and required test results

Summary

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
1	**IEC 61097-14**	6 Performance tests	Not tested
2	**IEC 61097-14**	7 Physical radio tests	Not tested
3	**IEC 61097-14**	8 Link layer tests	Passed

[1] Numbers listed in the titles of the test sections of this report refer to the respective sections of IEC 61097-14 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	AIS SART	Part No.:	Prototype without label	
Delivery date	2009-10-15	Serial number	No 2	
HW Version:	Delivery date	2009-10-15	Version no	92-102B issue 1
	Installation date	2009-10-15		
SW Version:	Delivery date	2009-10-15	Version no	Version1.1.60
	Installation date	2009-10-15		
SW Version:	Delivery date		Version no	
	Installation date			

GPS antenna			
Type	internal	Part No.:	
Delivery date		Serial number	

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	2009-10-15	2009-10-22	Bartels

1.3 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

1.4 Test notes

The test report does not cover all test items of the SART standard IEC 61097-14. The Link layer test (Section 8 of IEC 61097-14) is included only.

[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

2 6 Performance tests

The performance tests are not subject of this test report

3 7 Physical radio tests

The physical radio tests are not subject of this test report

4 8 Link layer Tests

4.1 8.1 Tests for Synchronisation accuracy

To measure the synchronisation error of the AIS-SART.

8.1.1 Method of measurement

Activate the AIS-SART with EPFS data available in active mode and record transmissions for 40 minutes.

Record VDL messages and measure the time between the transmission patterns as defined by ITU-R M.1371 and the actual transmission made by the AIS-SART. The transmission timing shall be measured and referenced to the beginning of the start of a transmission packet (start flag) according to ITU-R M.1371.

8.1.2 Required results

The synchronisation error with its additive jitter shall not exceed ± 312 µs between minutes 15 and 40.

2009-10-15 Ba	Test details: Synchronisation accuracy		
Test item	Check	Remark	Result
Evaluate the data recorded under 8.2.1			
Sync jitter	Verify that the additive jitter does not exceed ± 312 µs between minutes 15 and 40		Passed

4.2 8.2 Active mode tests

These tests require analysis of the transmissions of the AIS-SART.

4.2.1 8.2.1 Method of measurement

Activate the AIS-SART in active mode and record transmissions for 40 minutes. Inhibit EPFS data and record transmissions for a further 20 minutes.

Record the activation time of the AIS-SART.

For all transmitted messages record:

- *transmission time (UTC time)*
- *transmission slot*
- *in-slot timing*
- *transmission channel*
- *message content*

The records will be evaluated in the following test items.

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Activate the AIS-SART in active mode and record transmissions for 40 minutes			
Activation time	Record the activation time	UTC 13:25:00	Passed
Inhibit EPFS data and record transmissions for further 20 minutes			
Time of inhibit	Record the time of inhibit EPFS data	UTC 14:05:00	Passed

4.2.2 8.2.2 Initialisation period

a) The first message is transmitted within 1 min after activation.

b) The first message with a valid position is transmitted within 15 minutes.

2009-10-15 Ba	Test details: Initialisation period		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1			
a) First transmission	Verify that the first message is transmitted within 1 min after activation.	First message is transmitted within 1 min, 54 s after activation	Passed
b) Valid position	Verify that the first message with a valid position is transmitted within 15 minutes.	The first transmission includes a valid position, so a valid position is transmitted within 1 minute.	Passed

4.2.3 8.2.3 Message content of Message 1

For position reports transmitted after 15 minutes and before 40 minutes the following is required:

a) Message ID = 1.

b) Repeat indicator = 0.

c) User ID as configured in the AIS-SART.

d) Navigational status = 14.

e) Rate of turn = default.

f) SOG = actual SOG from GNSS receiver.

g) Position accuracy = according to the RAIM result if provided, otherwise 0.

h) Position = actual position from internal GNSS receiver.

i) Position is updated at least once per minute, for each burst.

j) COG = actual COG from internal GNSS receiver.

k) True heading = default.

l) Time stamp = actual UTC second (0...59).

m) Verify correct indication according to manufacturer's documentation.

2009-10-15 Ba	Test details – Message content of msg 1		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1			
a) Message ID	Check that message ID = 1		Passed
b) Repeat indicator	Check that repeat indicator = 0		Passed
c) User ID	Check that User ID as configured in the AIS-SART		Passed
d) Navigational status	Check that Navigational status = 14		Passed
e) ROT	Check that ROT = default		Passed
f) SOG	Check that SOG = SOG from internal GNSS	= 0	Passed
g) Position accuracy flag	Check that Position accuracy flag according to RAIM or 0	= 0	Passed
h) Position	Check that values of lat and lon are according to actual position		Passed
i) Position update	Check that the position is updated once per minute, for each burst		Passed
j) COG	Check that COG = COG from internal GNSS	COG = default (at SOG = 0)	Passed
k) Heading	Check that heading = default		Passed
l) Time stamp	Check time stamp = actual UTC second (0...59)		Passed
m) Indication	Verify the correct indication of operation		Passed

4.2.4 8.2.4 Message content of Message 14

a) Message ID = 14.

b) Repeat indicator = 0.

c) Source ID = as configured in the AIS-SART.

d) Text = "SART ACTIVE".

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1			
a) Message ID	Check that message ID = 14		Passed
b) Repeat indicator	Check that repeat indicator = 0		Passed
c) User ID	Check that User ID = as configured in the AIS-SART		Passed
d) Text	Check that text = "SART ACTIVE"		Passed

4.2.5 8.2.5 Transmission schedule for Message 1

For position reports transmitted after 15 minutes and before 40 minutes the following applies:

a) Verify that the AIS-SART has operated in sync mode 0 (UTC direct).

b) The AIS-SART transmits one burst of messages once per minute.

c) The duration of a burst is 14 s.

d) A burst consists of 8 messages.

e) The transmissions in a burst are alternating between AIS 1 and AIS 2.

f) Consecutive messages are 75 slots apart and on the other channel.

g) The same set of slots are used in each burst for 8 minutes

h) A new set of slots is randomly selected after 8 minutes.

i) The first slot of the new set of slots is within the interval of 1 minute +/- 6s from the first slot of the previous set of slots, that is the increment is randomly selected in the range 2025 to 2475 slots.

j) The manufacturer is to provide documentation on how the increment is selected randomly.

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1, minute 15 (GNSS active) to 40			
a) Sync mode	Check sync mode = 0 (UTC direct)		Passed
b) Burst rate	Check burst rate = 1 per minute		Passed
c) Burst duration	Check burst duration = 14 s		Passed
d) Number of message	Check that a burst consists of 8 messages		Passed
e) Channel alternation	Check that the transmissions in a burst are alternating between AIS 1 and AIS 2		Passed
f) Slot distance	Check that the slot distance between two messages in a burst is 75 slots		Passed
g) Burst time-out	Check that the same set of slots are used in each burst for 8 minutes		Passed
h) Random selection	Check that a new set of slots is randomly selected after 8 minutes		Passed
i) Selection range	Check that the new burst is at 1 min +/- 6s (increment = 2025 to 2475 slots)		Passed
j) Random selection methode	Verify the manufacturer's documentation on how the increment is selected randomly	The manufacturer has provided a satisfying description of the random methode	Passed

4.2.6 8.2.6 Communication state of Message 1

For position reports transmitted after 15 minutes and before 40 minutes the following applies:

a) The SOTDMA communication state as defined for message 1 is used.

b) The sync state = 0.

c) The time-out starts with 7 for all messages of the first burst after a change in slots.

d) The time-out value is decremented by 1 for each frame.

e) The time-out value is reset to 7 after time-out = 0.

f) The sub message for time-out 3,5,7 = number of received stations (0).

g) The sub message for time-out 2,4,6 = slot number.

h) The sub message for time-out 1 = UTC hour and minute.

i) The sub message for time-out 0 = slot offset to the transmission slot in the next frame.

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1, minute 15 (GNSS active) to 40			
a) Comm state	Check that a SOTDMA comm state as defined for message 1 is used.		Passed
b) Sync state	Check sync state = 0		Passed
c) Time-out start	Check that the time-out starts with 7 for all messages of the first burst after a change in slots.		Passed
d) Time-out decrement	Check that the time-out value is decremented by 1 for each frame		Passed
e) Time-out reset	Check that the time-out value is reset to 7 after time-out = 0		Passed
f) Number of received stations	Check that the sub message for time-out 3,5,7 = number of received stations = 0.		Passed
g) Slot number	Check that sub message for time-out 2,4,6 = actual slot number		Passed
h) UTC	Check that sub message for time-out 1 = UTC hour and minute		Passed
i) Slot offset	Check that sub message for time-out 0 = slot offset to the transmission slot in the next frame (2025 to 2475)		Passed

4.2.7 8.2.7 Transmission schedule of Message 14

a) Message 14 is transmitted every 4 minutes

b) The transmissions of Message 14 are alternating between AIS 1 and AIS 2

c) Message 14 is transmitted in a Message 1 slot, replacing the Message 1, on the channel for which the Message 1 was scheduled.

d) Message 14 did not replace a Message 1 with a time-out value = 0

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1			
a) Tx interval	Check that Message 14 is transmitted every 4 minutes		Passed
b) Channel alternating	Check that transmissions of Message 14 are alternating between AIS 1 and AIS 2.		Passed
c) Message 1 slot	Check that Message 14 is transmitted in a Message 1 slot, replacing the Message 1		Passed
	Check that Message 14 is transmitted on the same channel as the replaced Message 1		Passed
d) Time-out 0	Check that Message 14 did not replace a Message 1 with a time-out value = 0	Message 14 is transmitted at time-out 7 and 3	Passed

4.2.8 8.2.8 Transmission with lost EPFS

For position reports transmitted after 45 minutes the following applies:

a) The AIS-SART continues transmission.

b) The same transmission schedule is used as with EPFS data available.

c) Communication State Sync state = 3.

d) SOG = last valid SOG.

e) Position accuracy = low.

f) Position = last valid position.

g) COG = last valid COG.

h) Time stamp = 63.

i) RAIM-flag = 0.

j) Verify correct indication as per manufacturer's documentation.

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Evaluate the data recorded in 8.2.1, minute > 45 (GNSS disabled)			
a) Continued transmission	Check that the EUT continues transmission.		Passed
b) Tx schedule	Check that the same transmission schedule is used as with EPFS data available.		Passed
c) Sync state	Check that State Sync state = 3		Passed
d) SOG	Check that SOG = last valid SOG		Passed
e) PA-Flag	Check that Position accuracy = low.		Passed
f) Position	Check that position = last valid position		Passed
g) COG	Check that COG = last valid COG		Passed
h) Time stamp	Check that Time stamp = 63		Passed
i) RAIM flag	Check that RAIM-flag = 0		Passed
j) Indication	Verify correct indication as per manufacturer's documentation		Passed

4.3 8.3 Test mode tests

4.3.1 8.3.1 General

These tests require analysis of the transmissions of the AIS-SART.

4.3.2 8.3.2 Transmission with EPFS data available

8.3.2.1 Method of measurement

Activate the AIS-SART in test mode with EPFS data available and record transmissions.

8.3.2.2 Required results

a) The AIS-SART starts transmission after valid GNSS data is available.

b) A single burst of 8 messages in the correct order and correctly populated as per 3.7.2

c) User ID as configured in the AIS-SART

d) Navigational status = 15 (not defined).

e) SOG = actual SOG from GNSS receiver.

f) Position accuracy = according to the RAIM result if provided otherwise 0.

g) Position = actual position from internal GNSS receiver.

h) COG = actual COG from internal GNSS receiver.

i) Time stamp = actual UTC second (0...59).

j) The communication state time-out always = 0 with sub message = 0.

k) The transmission of Messages 1 and 14 stops after one burst of 8 messages.

l) The text message in Message 14 is "SART TEST".

m) Verify correct indication as per manufacturer's documentation.

2009-10-22 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Activate the AIS-SART in test mode with EPFS data available and record transmissions			
a) Start of transmission	Check that the EUT starts transmission when valid GNSS is available		Passed
b) Single burst	Check that one burst is transmitted		Passed
	Check that the burst consists of 8 messages		Passed
	Check that messages according to 3.7.2 are transmitted (1 msg 14, 6 msg 1, 1 msg 14.)		Passed
c) User ID	Check that User ID as configured in the AIS-SART		Passed
d) Navigational status	Check that Navigational status = 15		Passed
e) SOG	Check that SOG = SOG from internal GNSS		Passed
f) Position accuracy flag	Check that Position accuracy flag according to RAIM or 0	= 0	Passed
g) Position	Check that values of lat and lon are according to actual position		Passed
h) COG	Check that COG = COG from internal GNSS		Passed
i) Time stamp	Check time stamp = actual UTC second (0...59)	= 35	Passed
j) Comm state	Check that time-out = 0		Passed
	Check that sub message = 0		Passed
k) Stop of transmission	Check that transmission stops after one burst		Passed
l) Msg 14 text	Check that the text in Msg 14 is “SART TEST”		Passed
m) Indication	Verify the correct indication according to manufacturers documentation		Passed

4.3.3 8.3.3 Transmission without EPFS data available

8.3.3.1 Method of measurement

Activate the AIS-SART in test mode with no EPFS data available and record transmissions.

8.3.3.2 Required Results

a) The AIS-SART starts transmission within 15 minutes.

b) A single burst of 8 messages in the correct order and correctly populated as per 3.7.2

c) User ID as configured in the AIS-SART.

d) Navigational status = 15 (not defined).

e) SOG = default value.

f) Position accuracy = low.

g) Position = default values.

h) COG = default value.

i) Time stamp = 63.

j) The communication state time-out always = 0 with sub message = 0.

k) RAIM-flag = 0.

l) The transmission of Messages 1 and 14 stops after one burst of 8 messages.

m) The text message in Message 14 is "SART TEST".

n) Verify correct indication as per manufacturer's documentation.

2009-10-15 Ba	Test details: Operational tests		
Test item	Check	Remark	Result
Activate the AIS-SART in test mode with no EPFS data available and record transmissions			
a) Start of transmission	Check that the EUT starts transmission within 15 minutes		Passed
b) Single burst	Check that one burst is transmitted		Passed
	Check that the burst consists of 8 messages		Passed
	Check that messages according to 3.7.2 are transmitted (1 msg 14, 6 msg 1, 1 msg 14.)		Passed
c) User ID	Check that User ID as configured in the AIS-SART		Passed
d) Navigational status	Check that Navigational status = 15		Passed
e) SOG	Check that SOG = default		Passed
f) Position accuracy flag	Check that Position accuracy flag = 0		Passed
g) Position	Check that position values = default		Passed
h) COG	Check that COG = default		Passed
i) Time stamp	Check time stamp = 63		Passed
j) Comm state	Check that time-out = 0		Passed
	Check that sub message = 0		Passed
k) RAIM flag	Check that RAIM flag = 0		Passed
k) Stop of transmission	Check that transmission stops after one burst		Passed
l) Msg 14 text	Check that the text in Msg 14 is “SART TEST”		Passed
m) Indication	Verify the correct indication according to manufacturers documentation		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

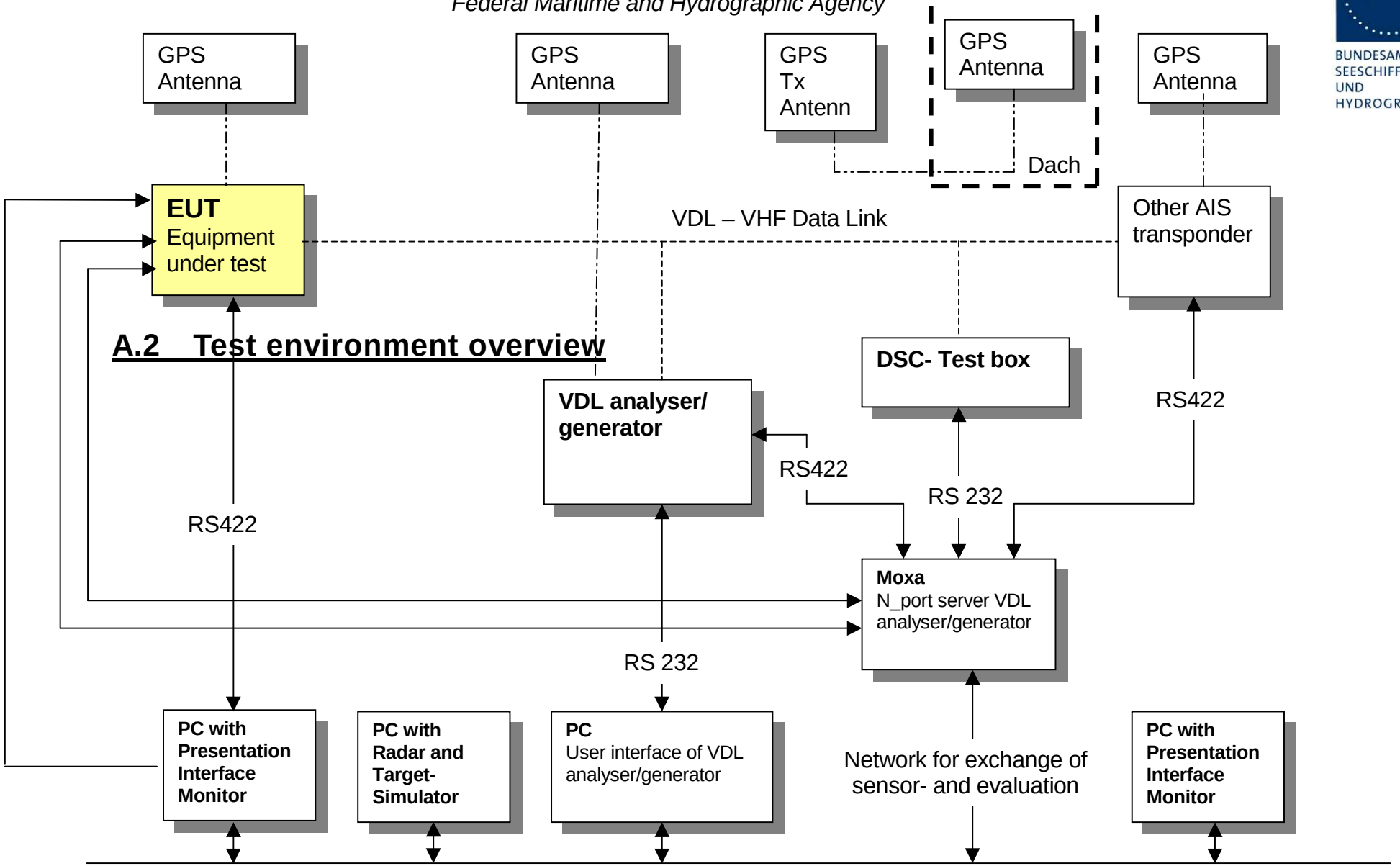
The software modification of the DSC controller comprises a remote control input/output facility

- 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.

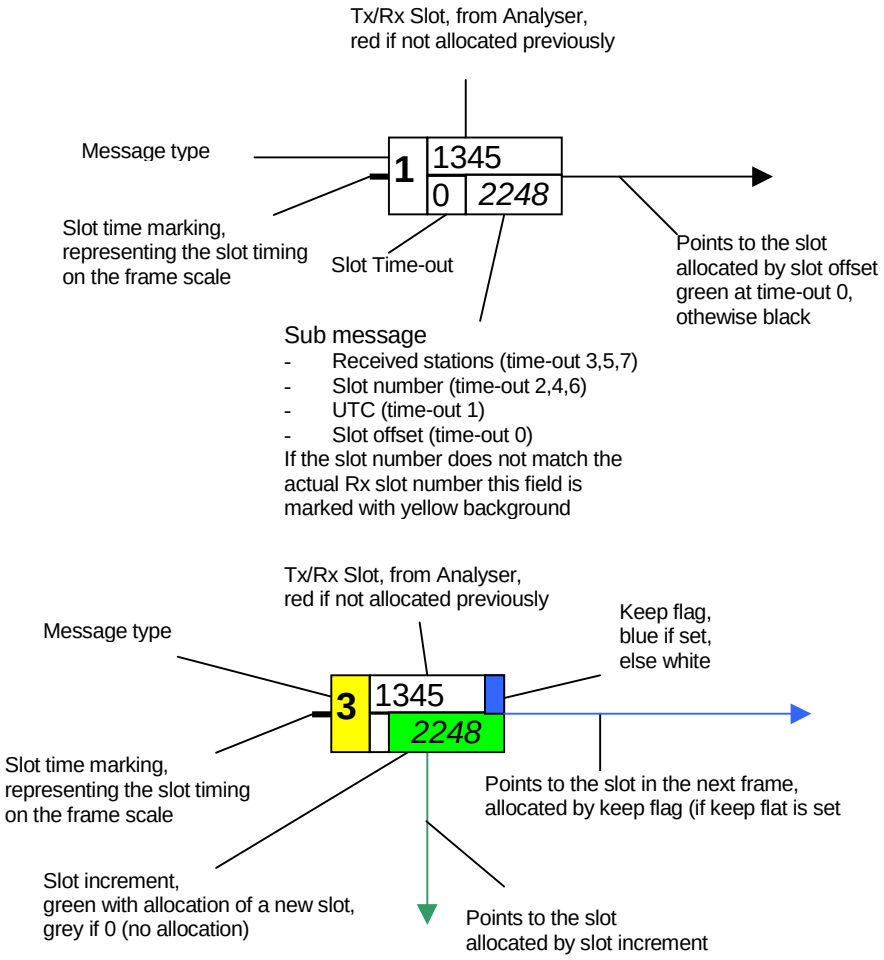
BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

A.2 Test environment overview



Annex B Test diagrams

B.1 Legend of graphical presentation



Main frame color:
Normal frame color is black
A red color indicates use of second set of channels in area setting test.
The message has been received by receiver 3 and 4 of the analyser
A yellow color indicates an CRC error in the received message, the content may be incorrect.

Slot allcocation arrows:
There are arrows pointing from the current message to the allocated slot. If there is no message found in this slot the arrow is replaced by a short red line, indicating that the target of the arrow/ allocation is missing.

Time marking:
The time mark represents the slot timing of the message within the frame scale. It in normally in the middle of a message frame.
Sometimes it is necessary to shift the message frame up or down to avoid that 2 messages are overlapping. In this case the time mark is not shifted and indicates the exact timing.

B.2 Statement of randomness

McMurdo 'S5' AIS SART

Statement on randomness of 'slot offset' selection

AIS SART specification 61097-14 requires under section 8.2.5 j that the manufacturer provides an explanation regarding the randomness of the 'new slot offset' selection process. This document provides that explanation.

Software description

The firmware within the 'S5' AIS SART uses a standard C compiler random number generation function to provide the random number used for the 'slot offset' value. The method used by the C compiler is a very common pseudo random generation method known as the "linear congruential generation" or LCG. This uses the formula below to scale, increment and then crop the previous random number. The choice of formula values [a, c, m] being chosen from a wide range of prime numbers to give the best performance in terms of distribution or 'whiteness'.

$$X_{n+1} = (aX_n + c) \mod m$$

The particular coefficients used by this C compiler are :

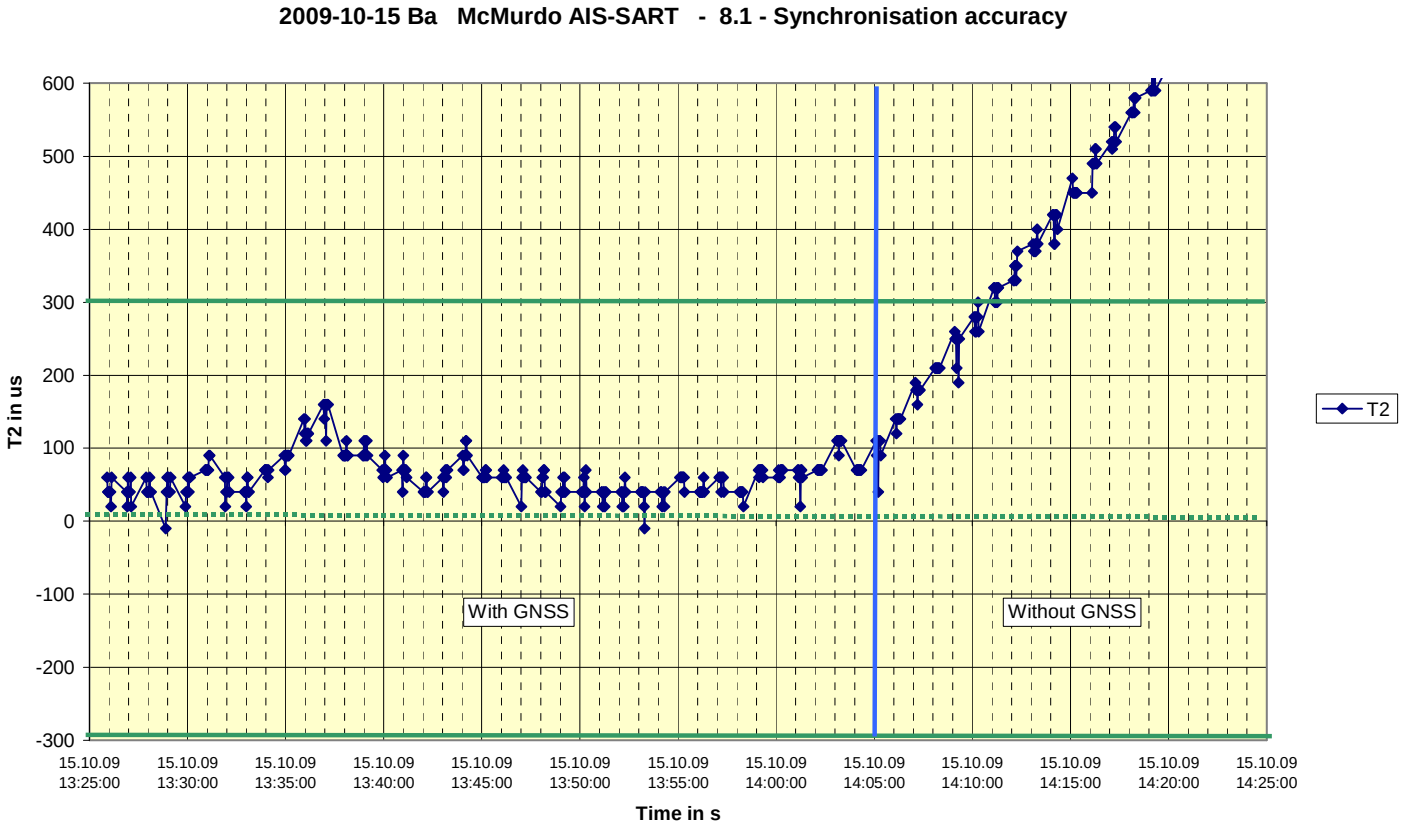
*w=(int) ((randx=randx*1103515245L + 12345)>>16) & 077777;*

As with any 'pseudo' random generator the choice of initial 'seed' value is important to ensure fast and random entry into the huge sequence of random numbers. To ensure this the firmware uses a combination of AIS SART serial number and the first available UTC time reading as a seed value. This ensures randomness even in the unlikely event of never obtaining a UTC time reading.

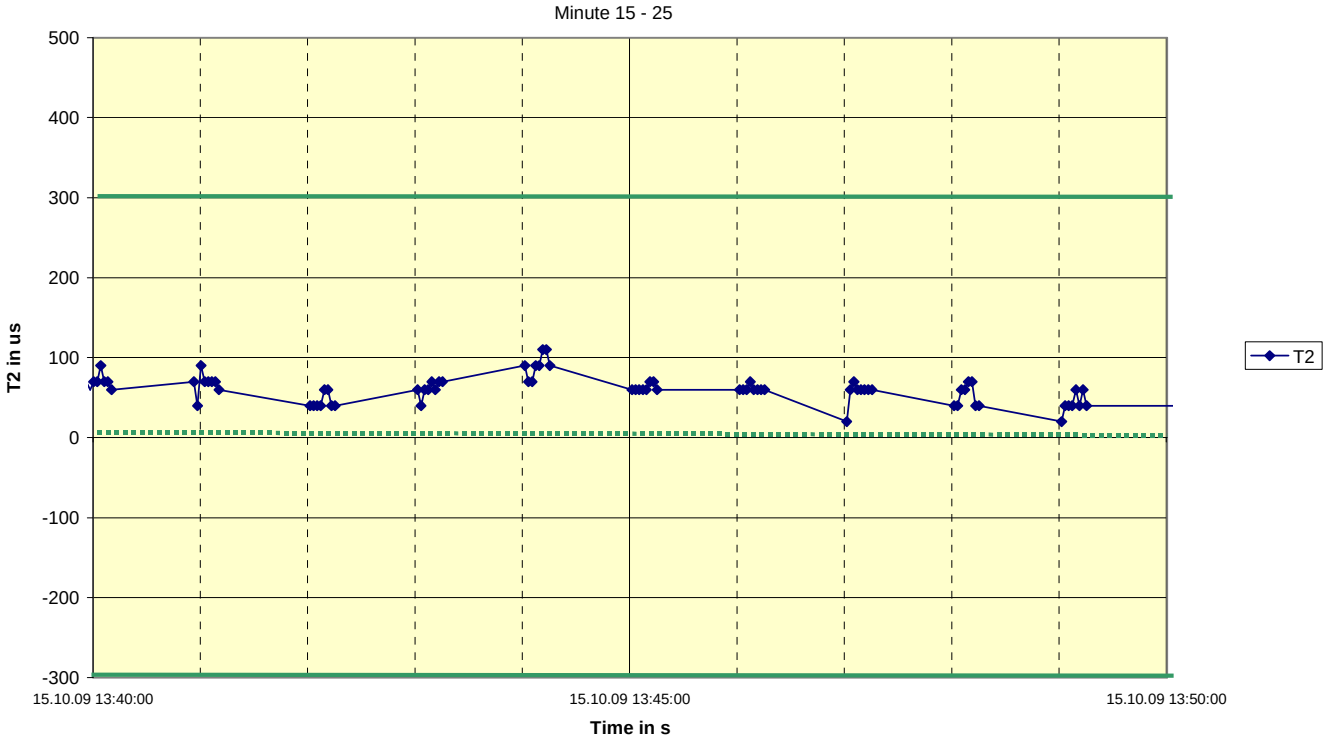
John Norrish
Senior Design Engineer
McMurdo

23 October 2009

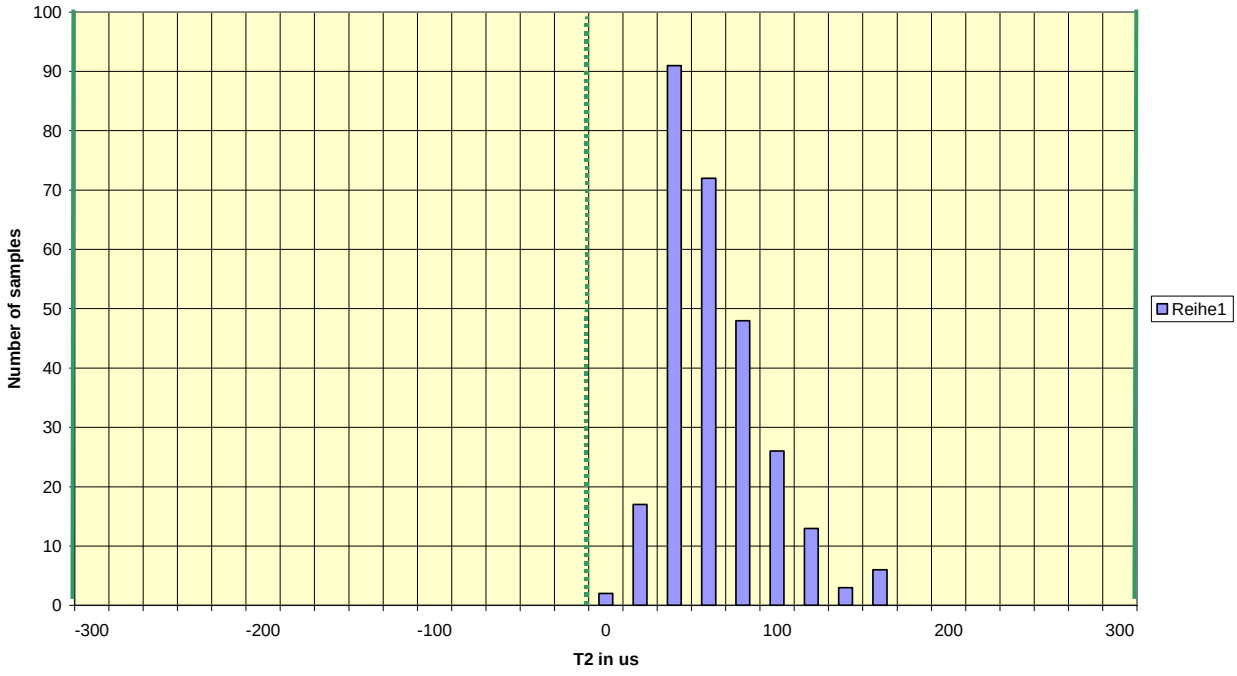
B.3 8.1 Synchronisation accuracy



2009-10-15 Ba McMurdo AIS-SART - 8.1 - Synchronisation accuracy

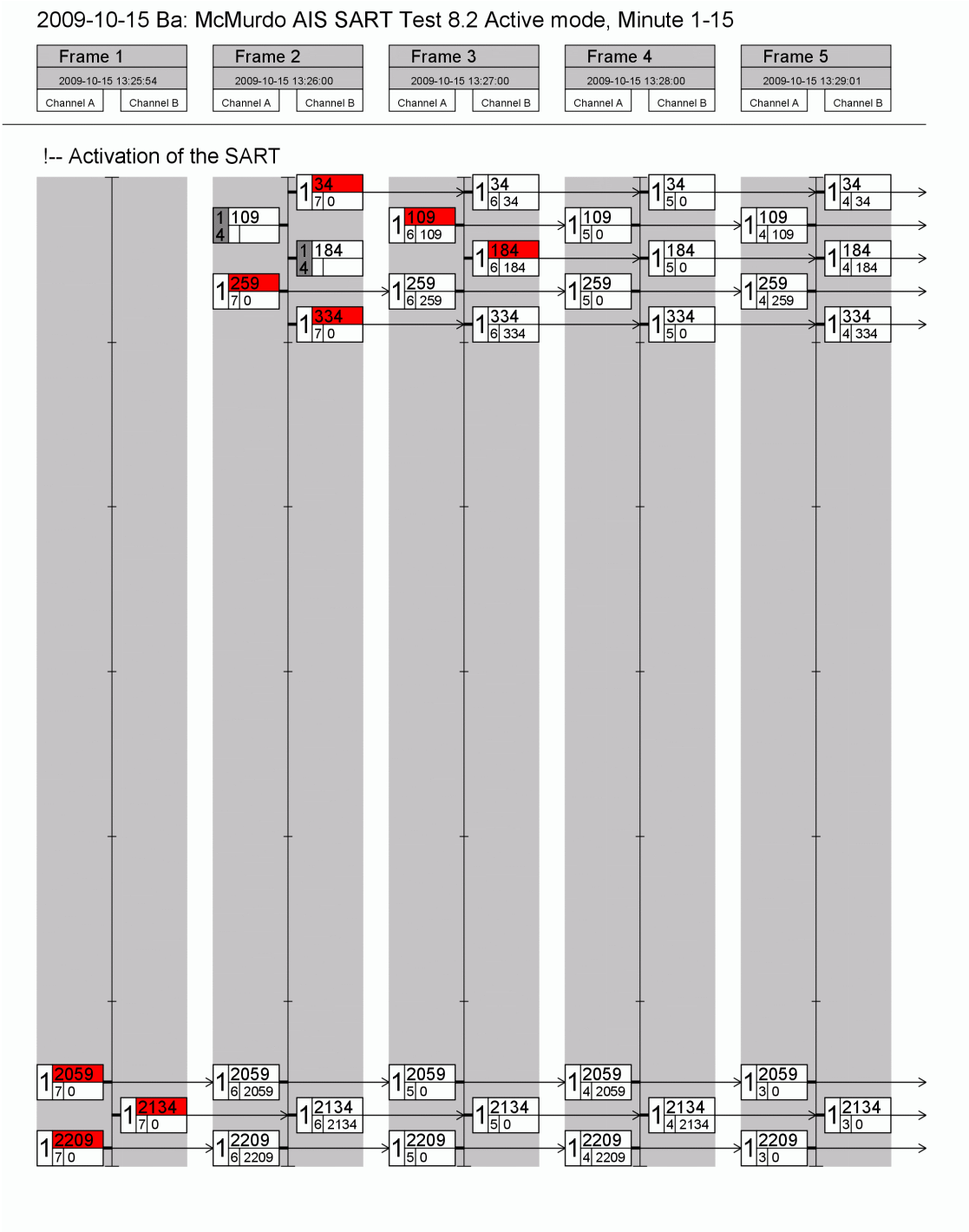


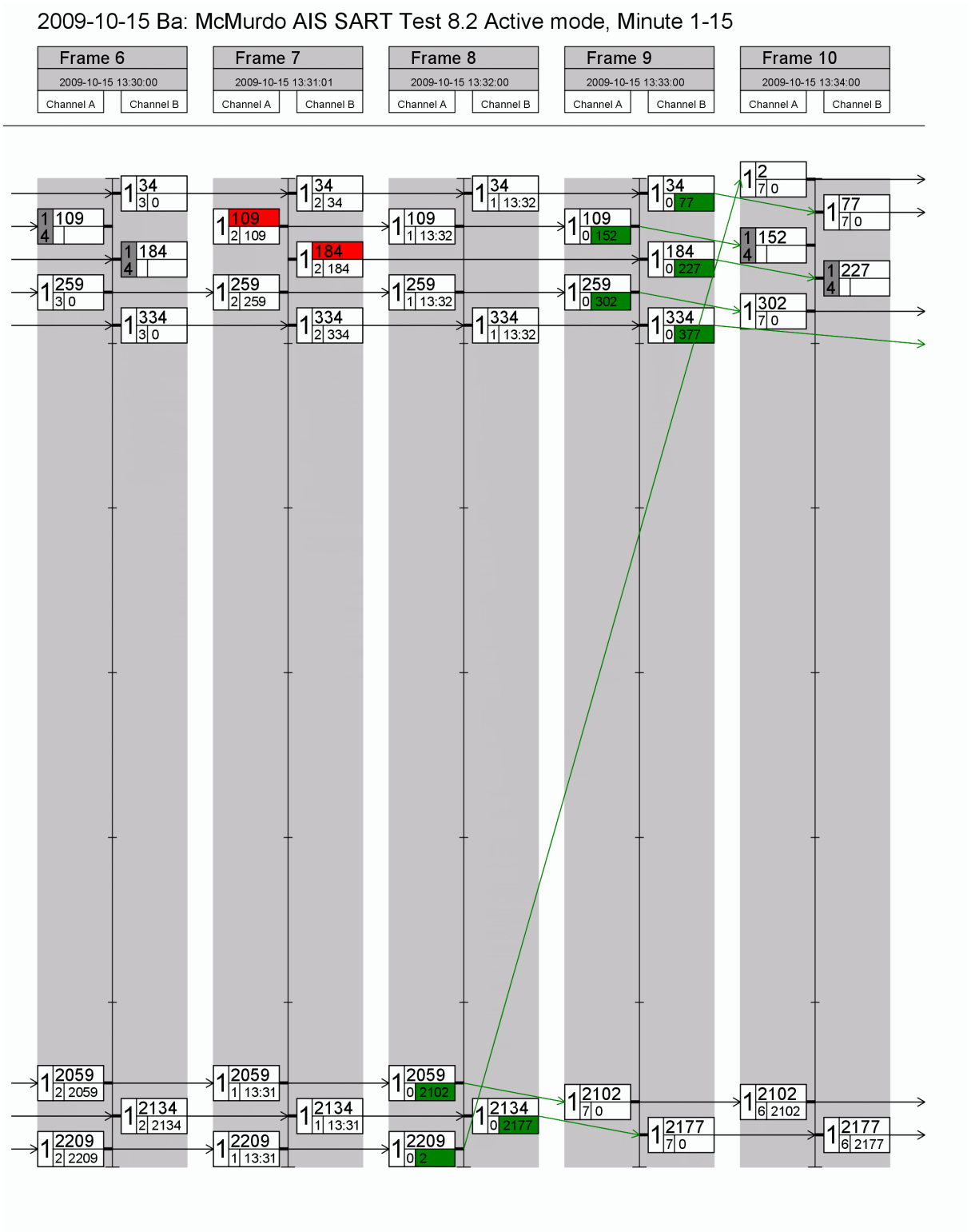
2009-10-15 Ba McMurdo AIS-SART - 8.1 - Synchronisation accuracy

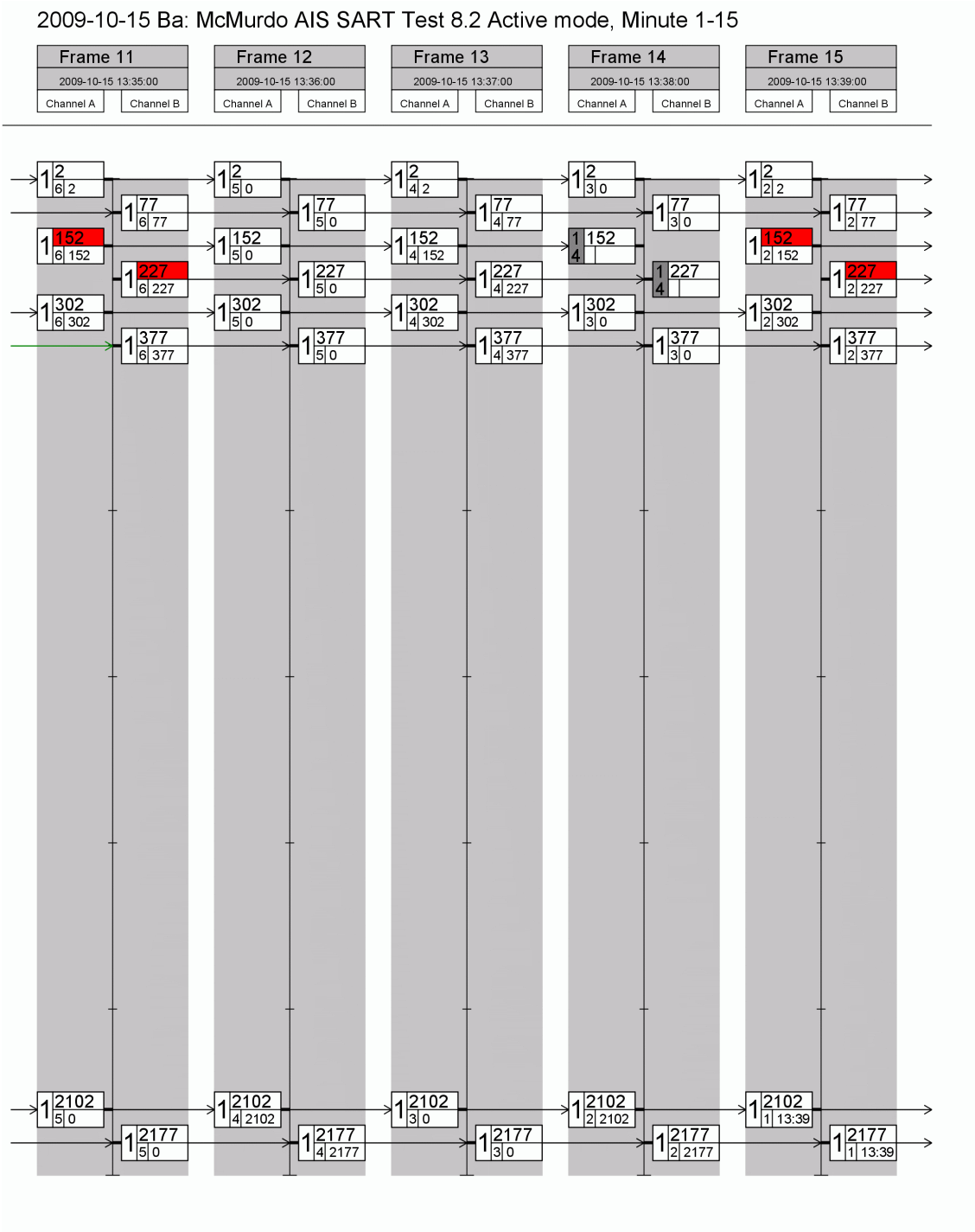


B.4 8.2 Active mode tests

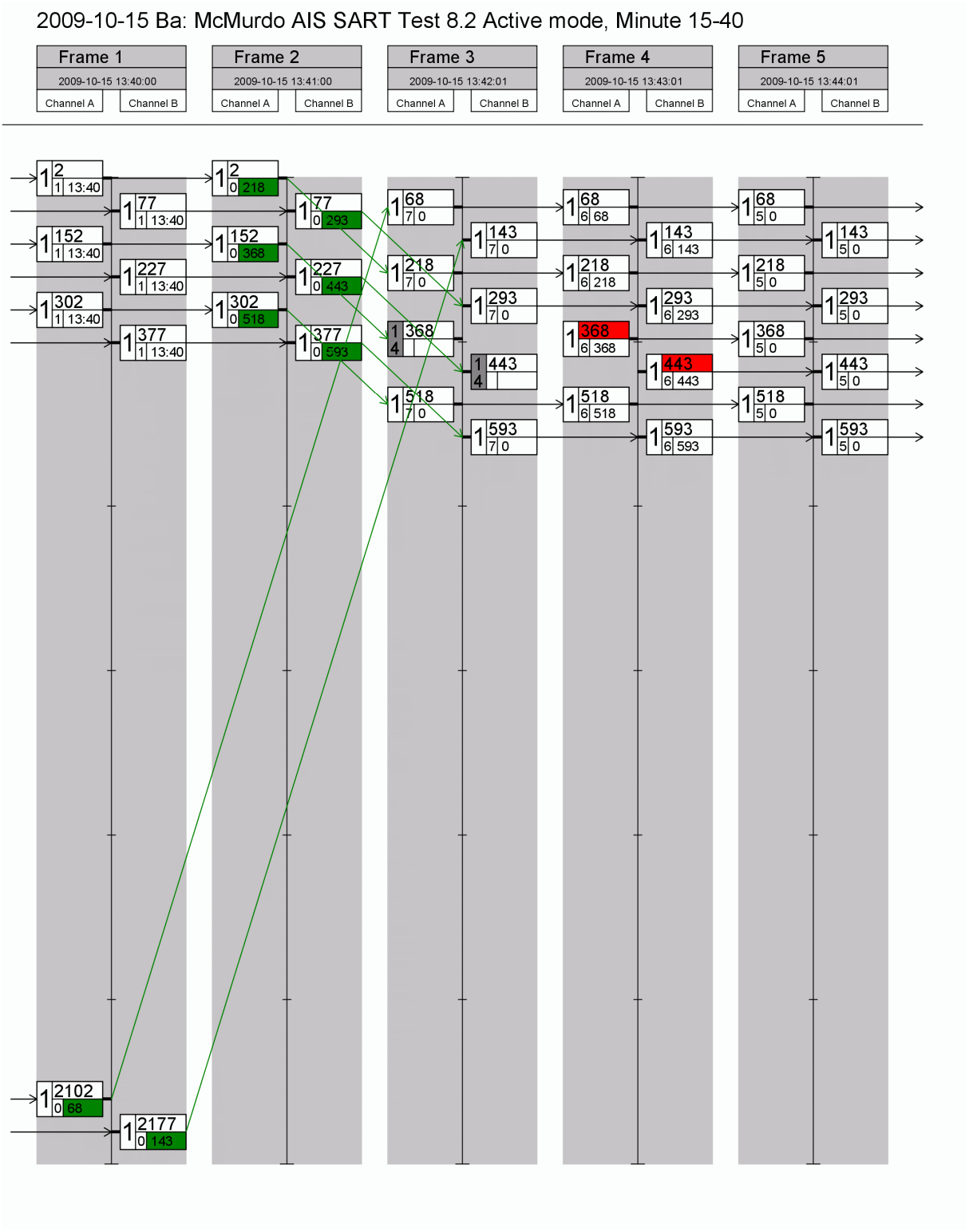
B.4.1 8.2.5 Transmission schedule for mesage 1

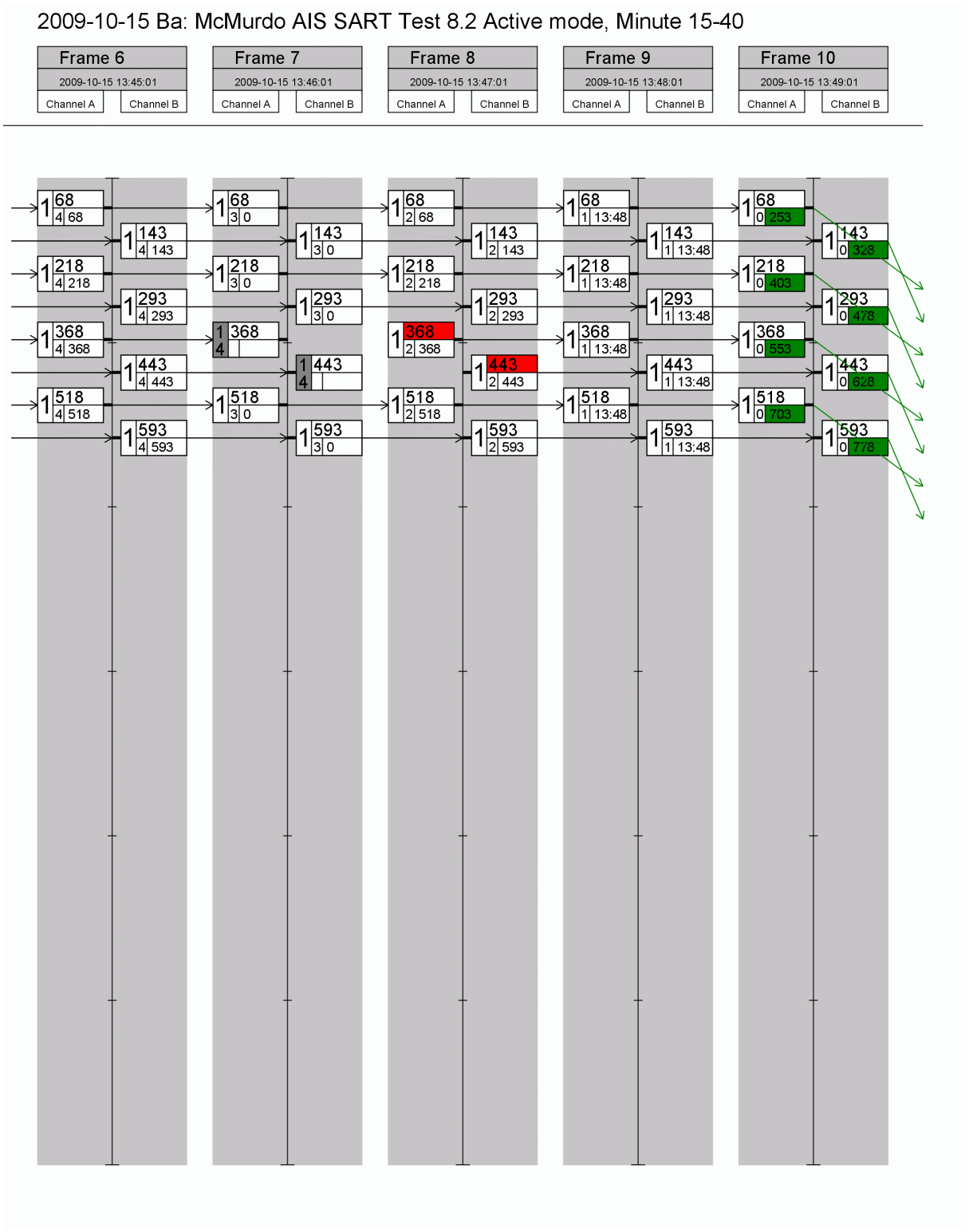


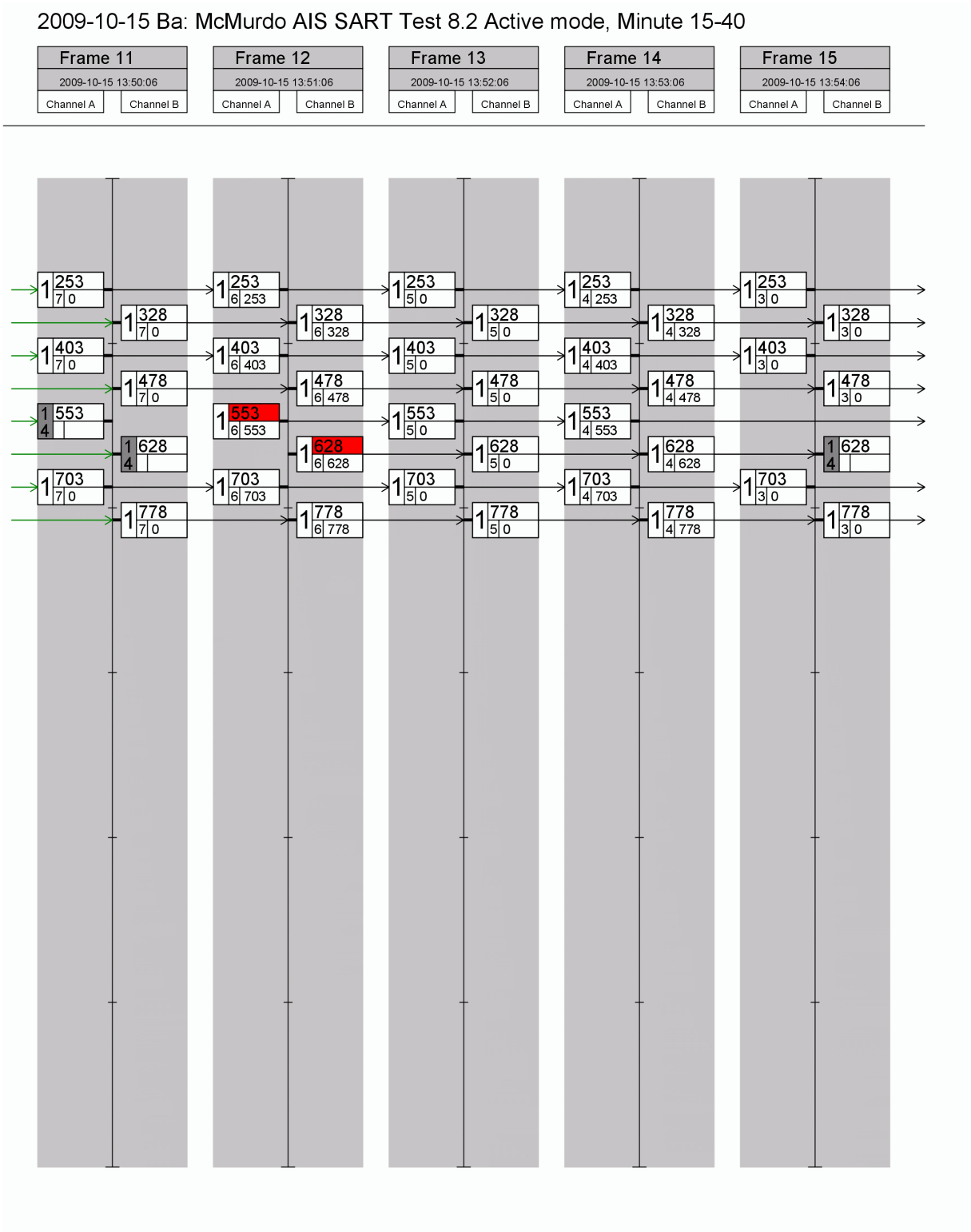

2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 1-15
Frame 6
2009-10-15 13:30:00
Channel A
Channel B
Frame 7
2009-10-15 13:31:01
Channel A
Channel B
Frame 8
2009-10-15 13:32:00
Channel A
Channel B
Frame 9
2009-10-15 13:33:00
Channel A
Channel B
Frame 10
2009-10-15 13:34:00
Channel A
Channel B

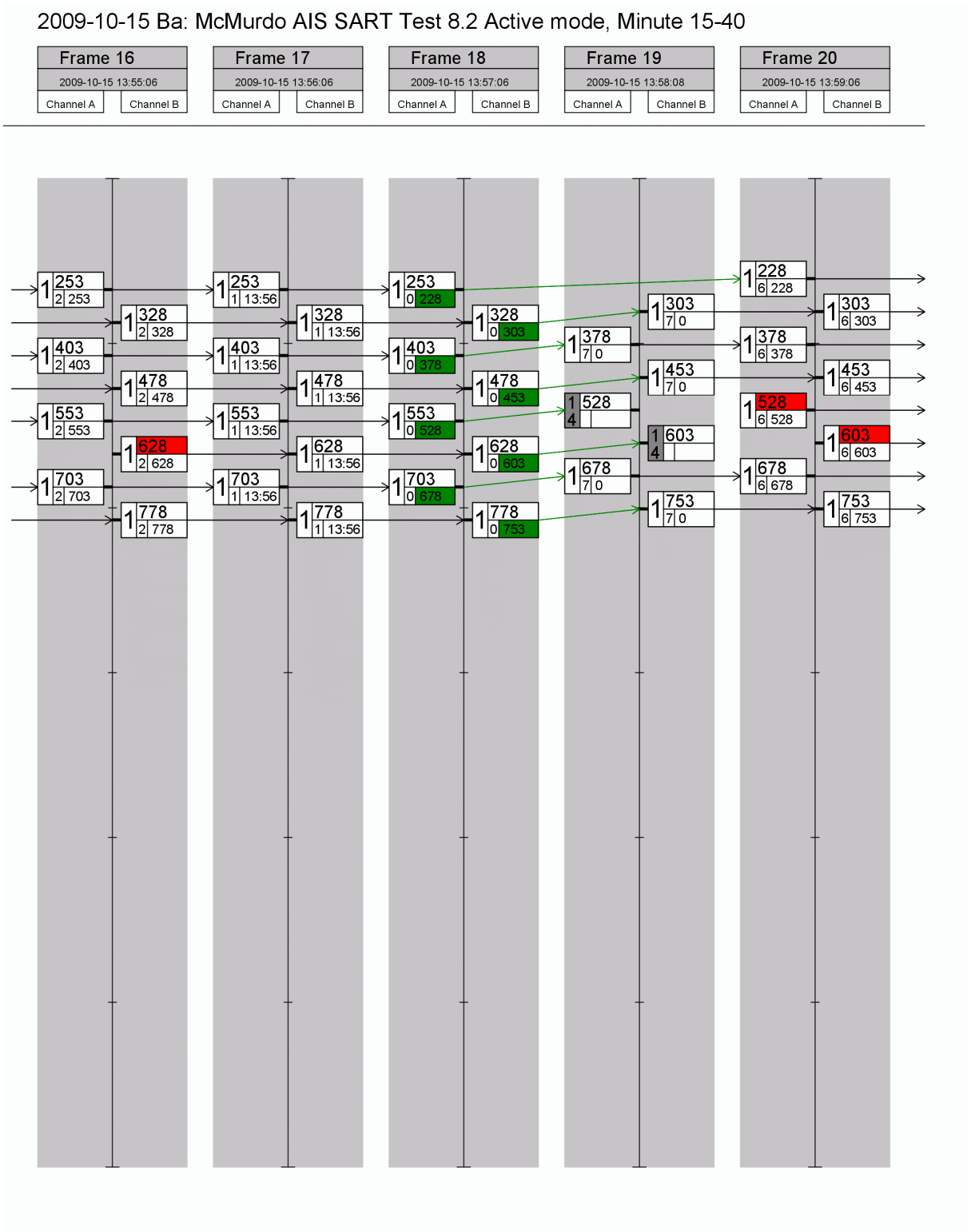


Remark: The tx slot field is marked red automatically if the slot is not previously allocated. The replacement of message by message 14 is considered by the evaluation program in a way that the slot in the next frame is marked as not allocated, so it is marked red. This is a property of the evaluation program.
The function of the EUT is correct.

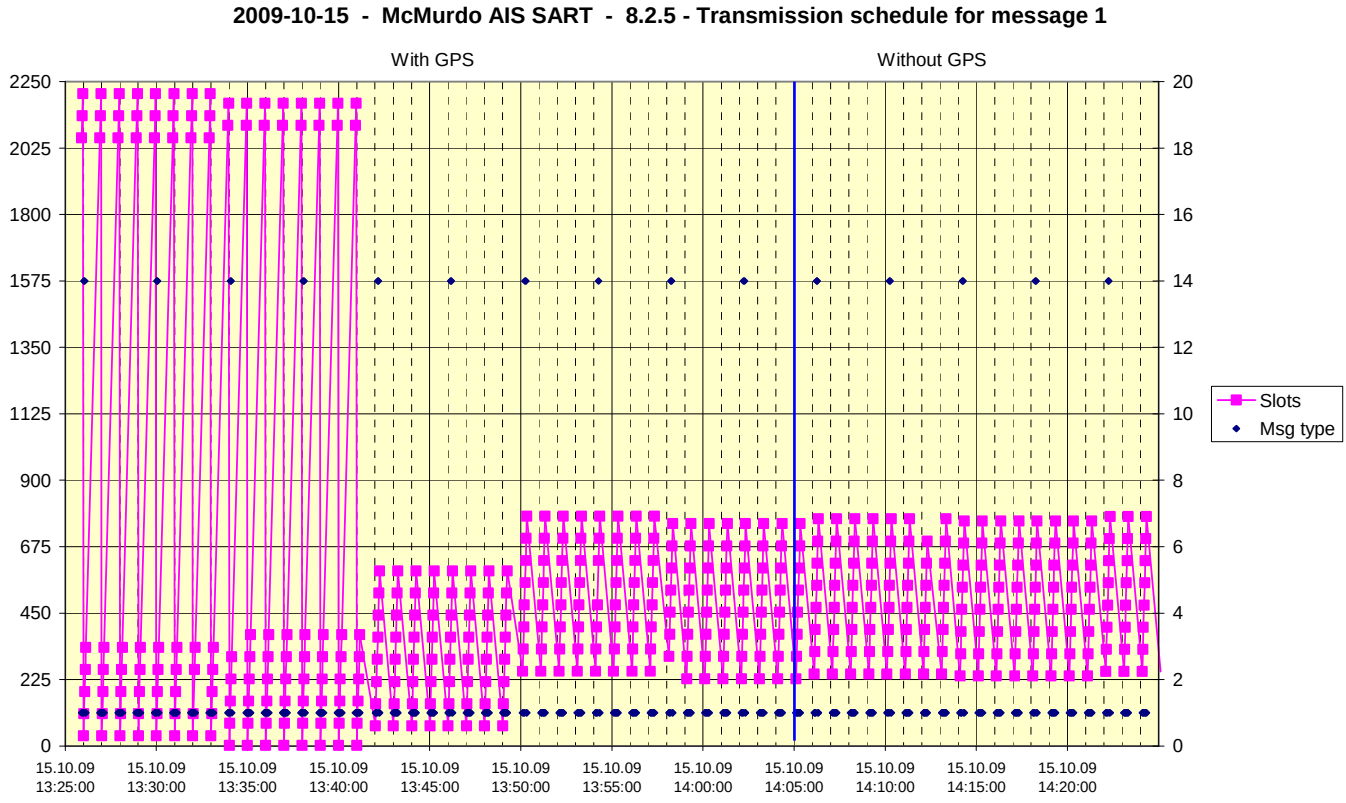

2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 15-40
Frame 1
2009-10-15 13:40:00
Channel A
Channel B
Frame 2
2009-10-15 13:41:00
Channel A
Channel B
Frame 3
2009-10-15 13:42:01
Channel A
Channel B
Frame 4
2009-10-15 13:43:01
Channel A
Channel B
Frame 5
2009-10-15 13:44:01
Channel A
Channel B


2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 15-40
Frame 6
2009-10-15 13:45:01
Channel A
Channel B
Frame 7
2009-10-15 13:46:01
Channel A
Channel B
Frame 8
2009-10-15 13:47:01
Channel A
Channel B
Frame 9
2009-10-15 13:48:01
Channel A
Channel B
Frame 10
2009-10-15 13:49:01
Channel A
Channel B


2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 15-40
Frame 11
2009-10-15 13:50:06
Channel A
Channel B
Frame 12
2009-10-15 13:51:06
Channel A
Channel B
Frame 13
2009-10-15 13:52:06
Channel A
Channel B
Frame 14
2009-10-15 13:53:06
Channel A
Channel B
Frame 15
2009-10-15 13:54:06
Channel A
Channel B

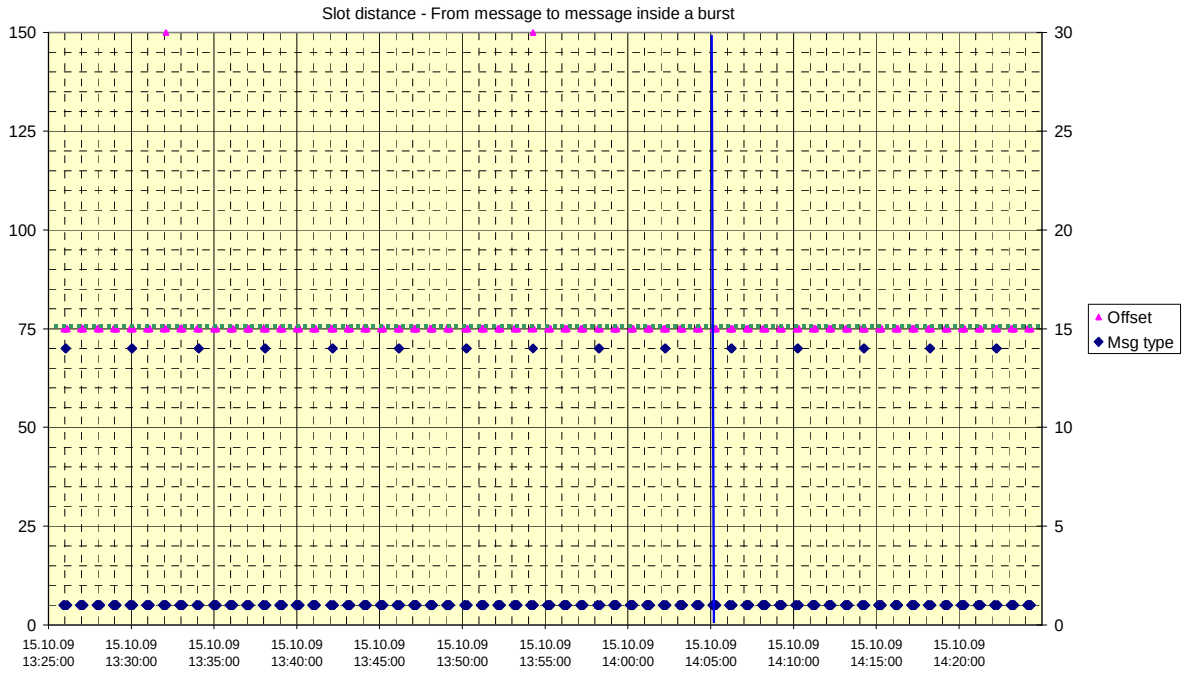

2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 15-40
Frame 16
2009-10-15 13:55:06
Channel A
Channel B
Frame 17
2009-10-15 13:56:06
Channel A
Channel B
Frame 18
2009-10-15 13:57:06
Channel A
Channel B
Frame 19
2009-10-15 13:58:08
Channel A
Channel B
Frame 20
2009-10-15 13:59:06
Channel A
Channel B

B.4.2 8.2.5 Transmission schedule, slot distance



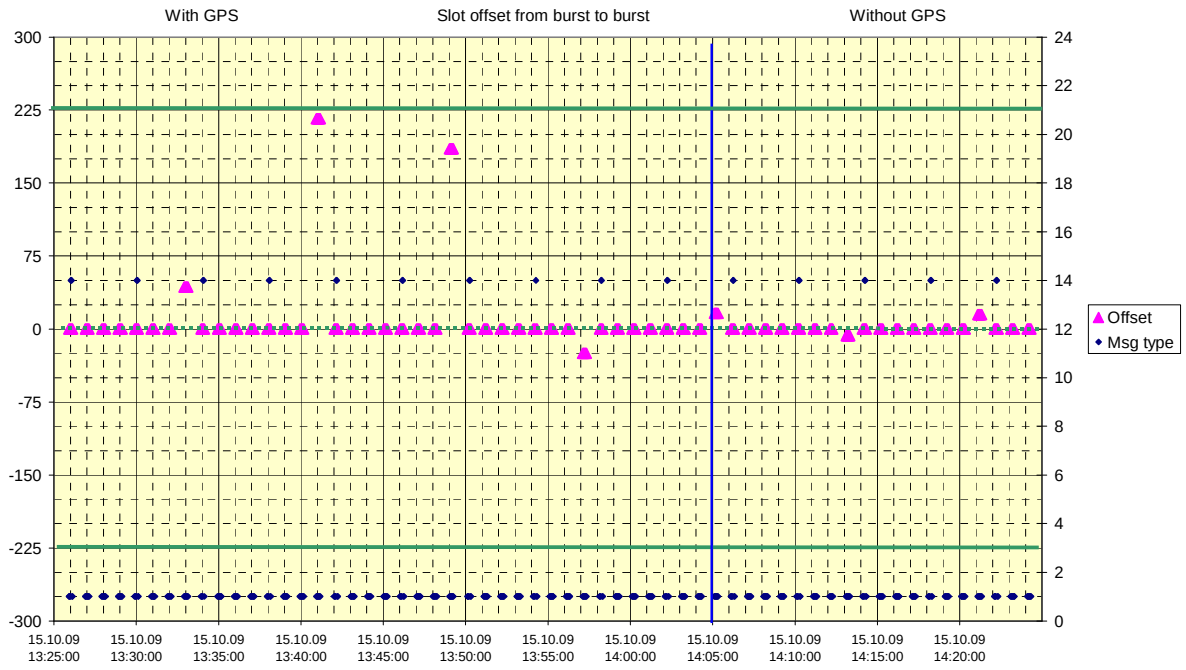
There are a few messages which have not been received by the VDL analyser equipment because of receiving problems of the VDL analyser. This is not a problem of the EUT.

2009-10-15 - McMurdo AIS SART - 8.2.5 - Transmission schedule for message 1

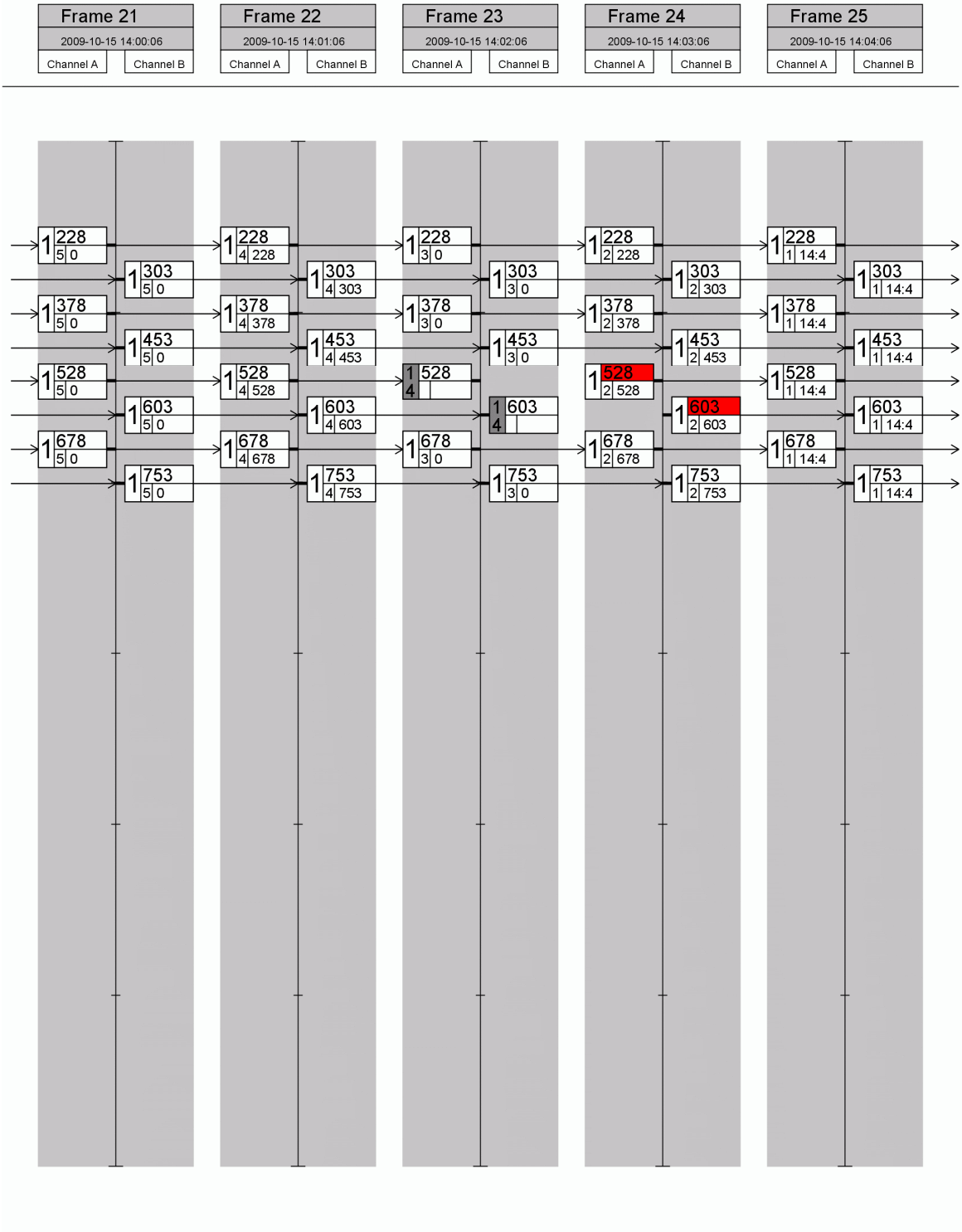


The 2 items with 150 slots distance result from missing Rx of message 1

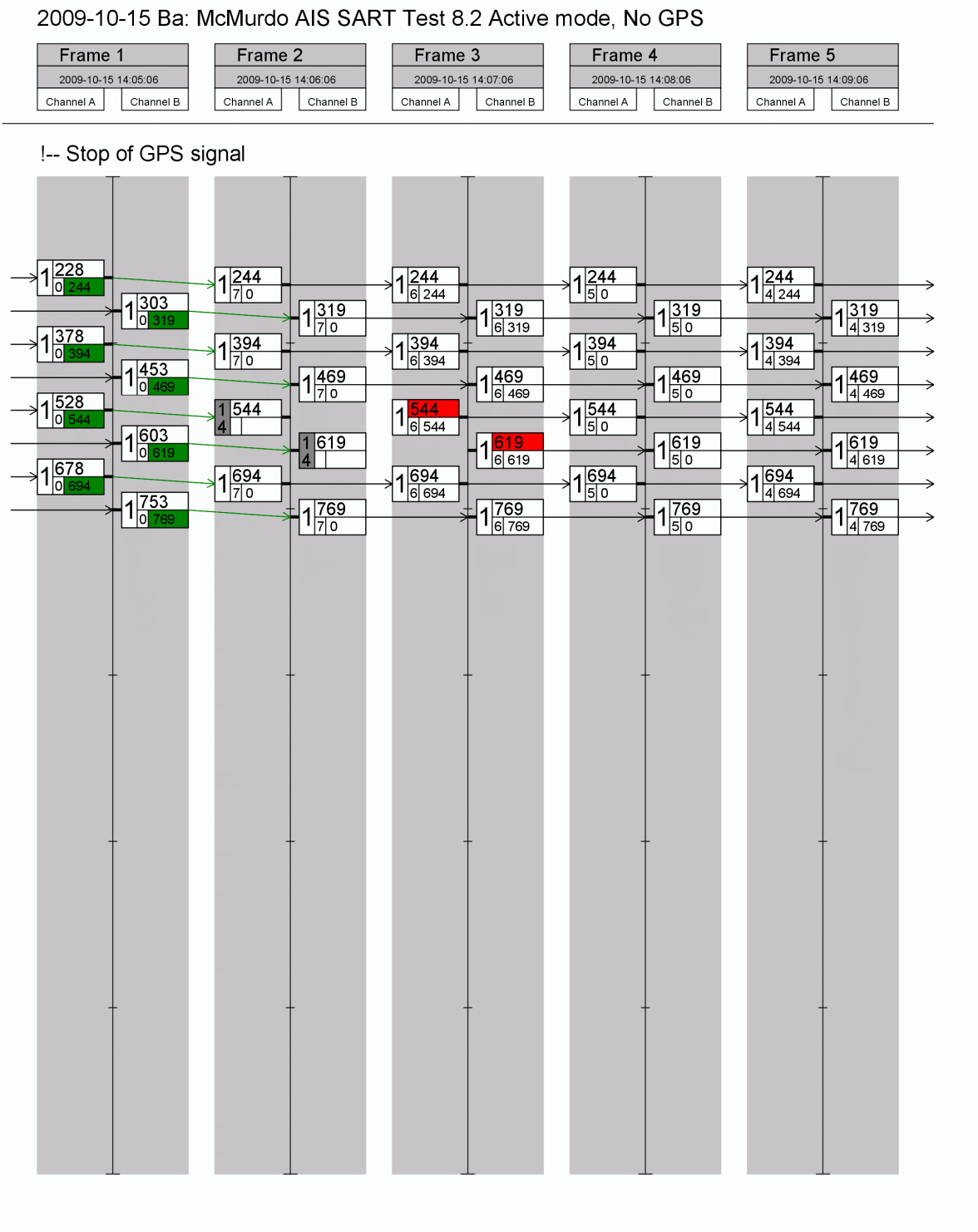
2009-10-15 - McMurdo AIS SART - 8.2.5 - Transmission schedule for message 1

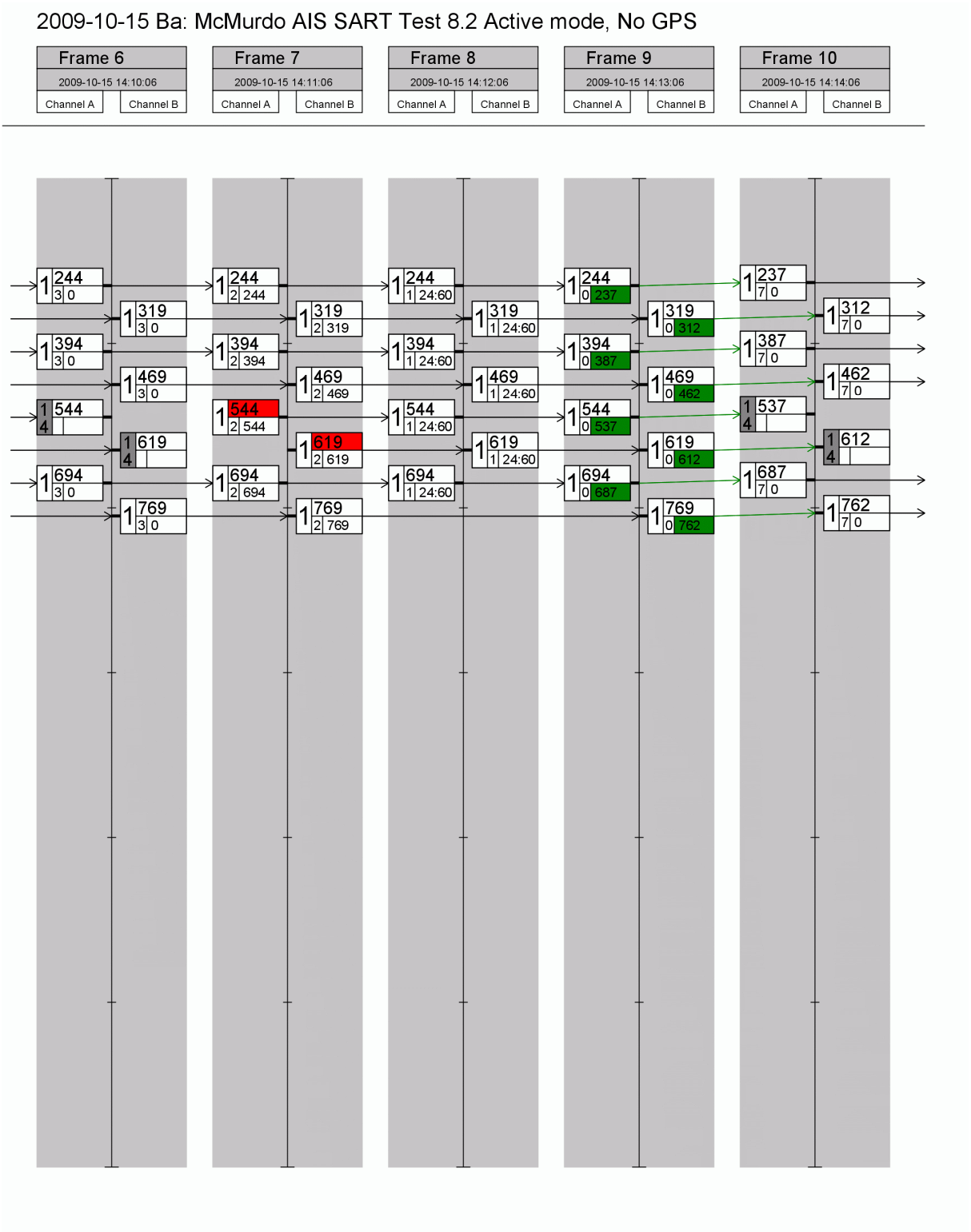


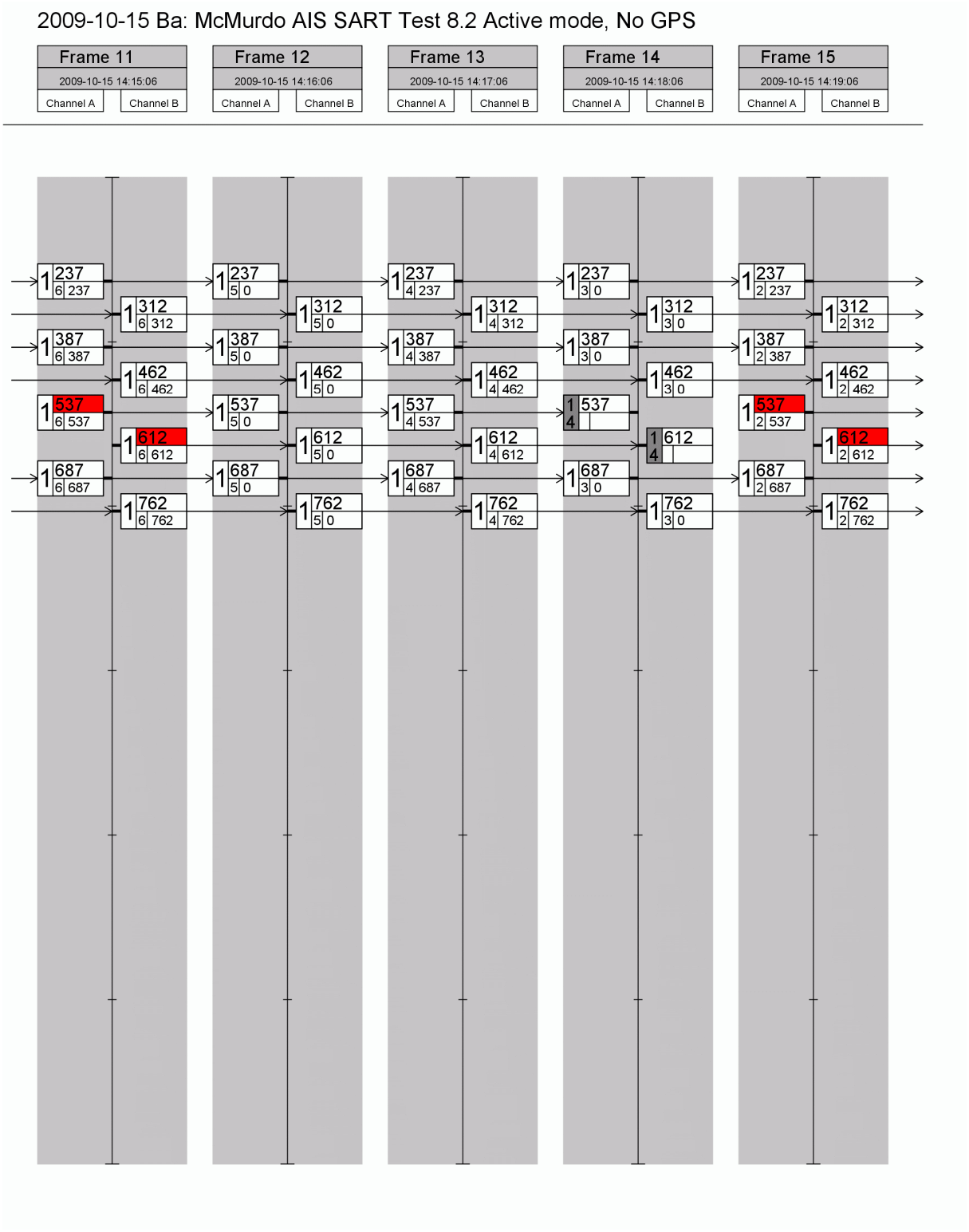
2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, Minute 15-40

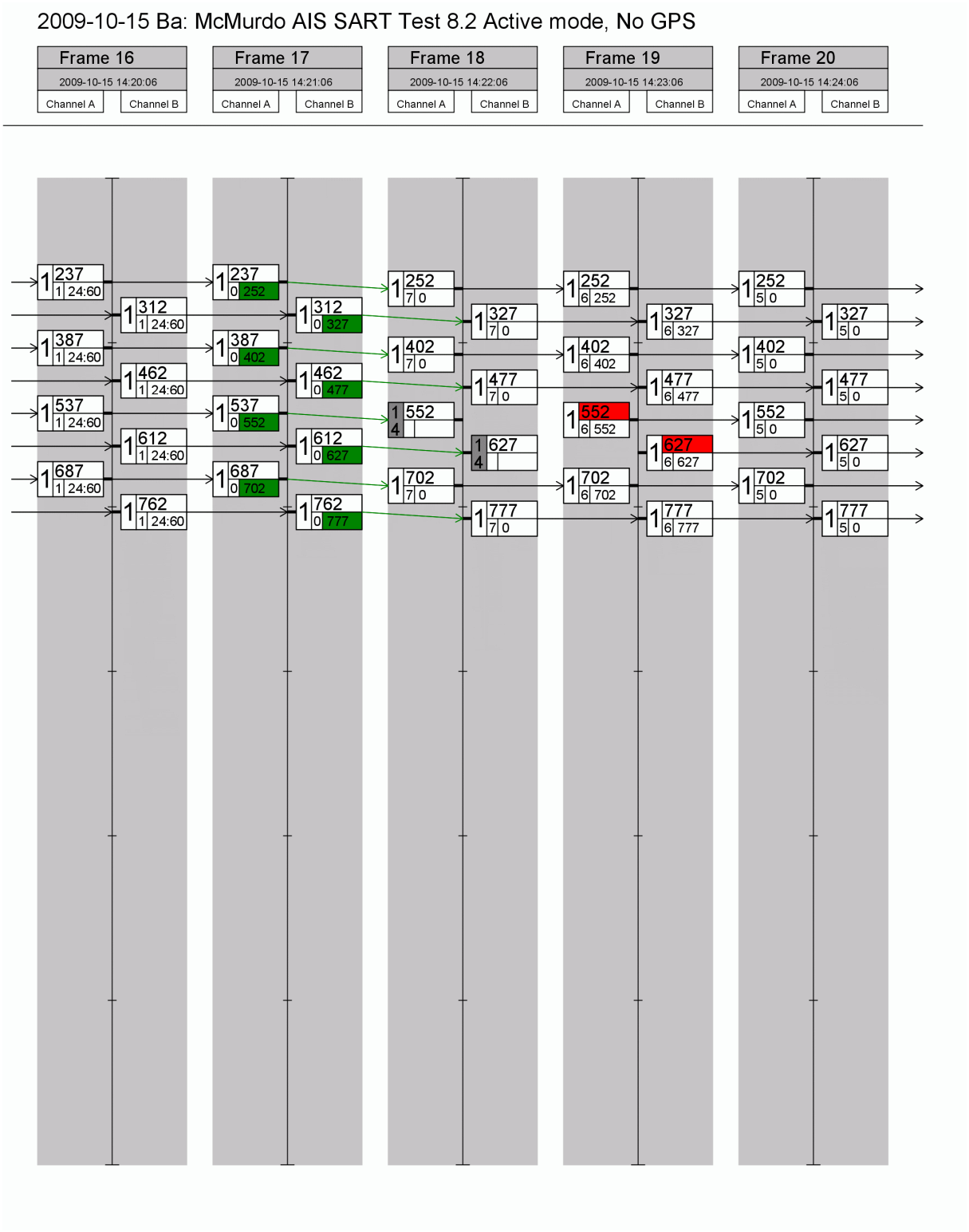


B.4.3 8.2.8 Transmission with lost GPS



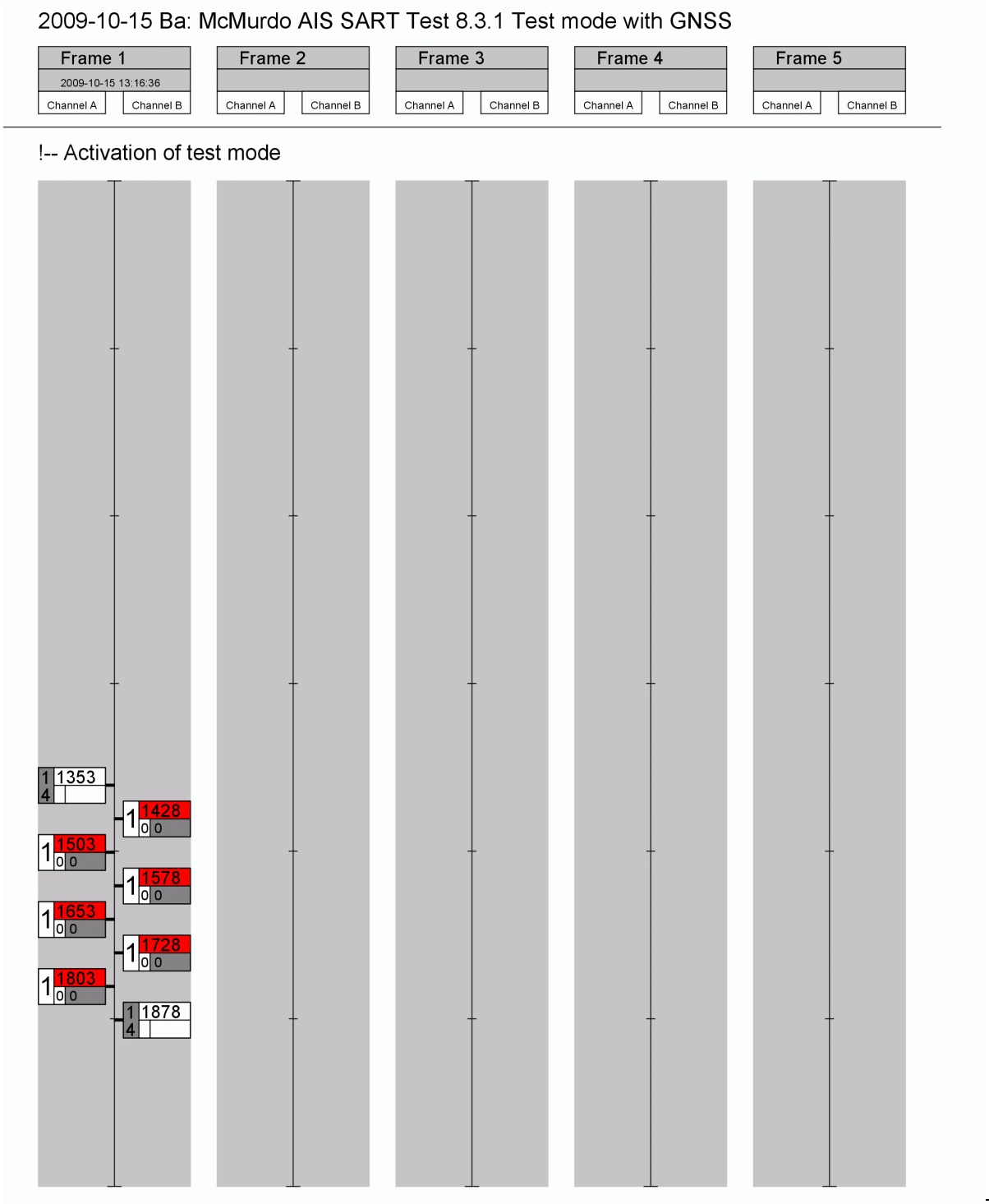

2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, No GPS
Frame 6
2009-10-15 14:10:06
Channel A
Channel B
Frame 7
2009-10-15 14:11:06
Channel A
Channel B
Frame 8
2009-10-15 14:12:06
Channel A
Channel B
Frame 9
2009-10-15 14:13:06
Channel A
Channel B
Frame 10
2009-10-15 14:14:06
Channel A
Channel B


2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, No GPS
Frame 11
2009-10-15 14:15:06
Channel A
Channel B
Frame 12
2009-10-15 14:16:06
Channel A
Channel B
Frame 13
2009-10-15 14:17:06
Channel A
Channel B
Frame 14
2009-10-15 14:18:06
Channel A
Channel B
Frame 15
2009-10-15 14:19:06
Channel A
Channel B


2009-10-15 Ba: McMurdo AIS SART Test 8.2 Active mode, No GPS
Frame 16
2009-10-15 14:20:06
Channel A
Channel B
Frame 17
2009-10-15 14:21:06
Channel A
Channel B
Frame 18
2009-10-15 14:22:06
Channel A
Channel B
Frame 19
2009-10-15 14:23:06
Channel A
Channel B
Frame 20
2009-10-15 14:24:06
Channel A
Channel B

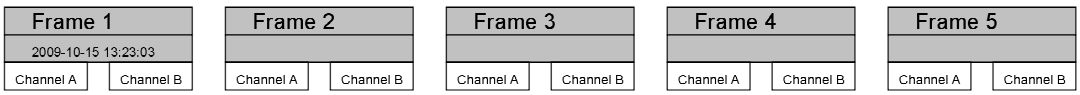
B.5 8.3 Test mode tests

B.5.1 8.3.2 Transmission with EPFS data available

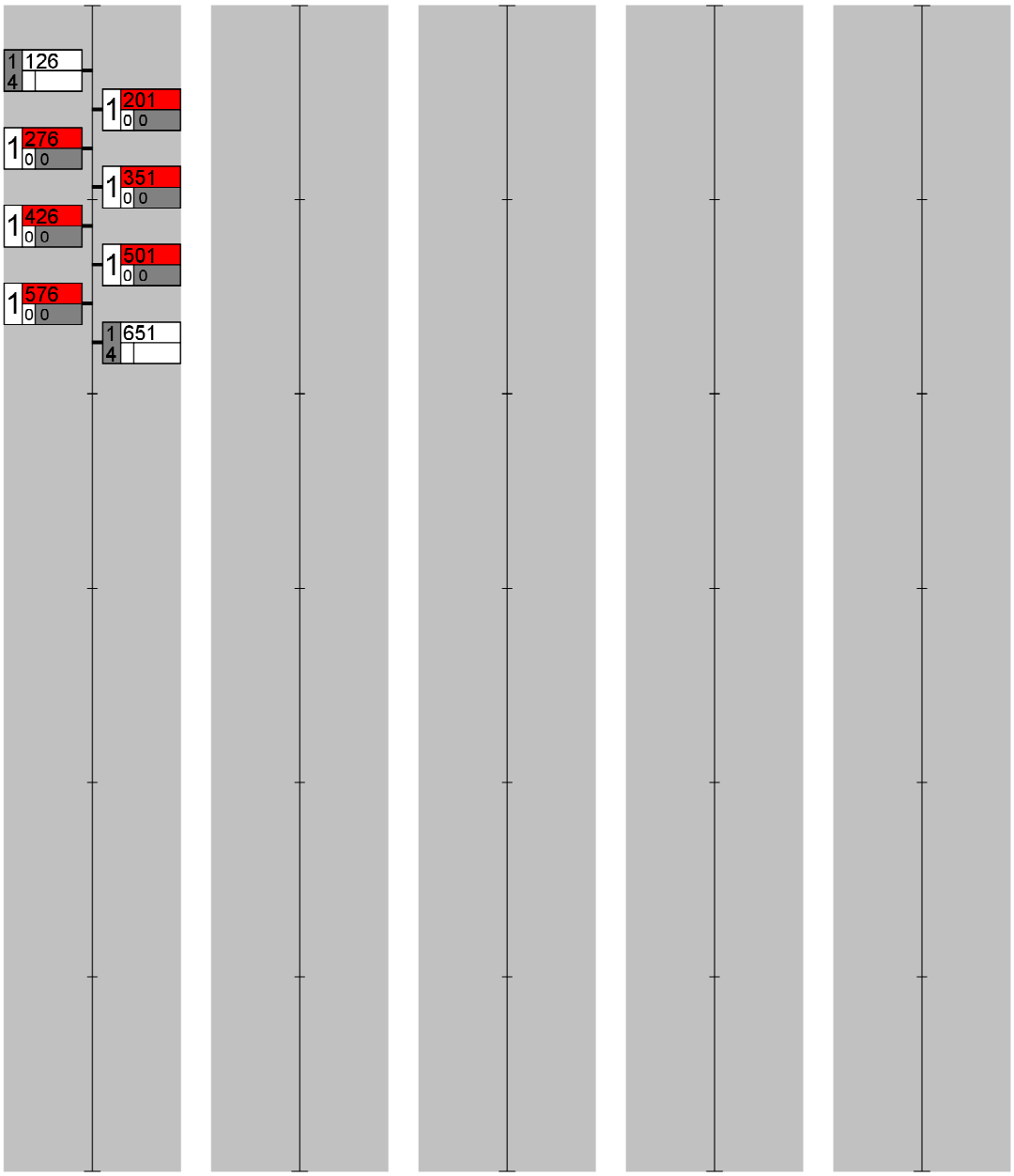


B.5.2 8.3.3 Transmission without EPFS data available

2009-10-15 Ba: McMurdo AIS SART Test 8.3.2 Test mode without GNSS



!-- 5 min after start of test mode



Annex C Photos of equipment under test

C.1 SART Unit

The housing of the unit under test is a prototype housing of the modified unit. For the final housing the connections will be removed and a label added.