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: **FT-TEC**

Type: **SEAANGEL SA14-SART**

Applying test standards: IEC 61097-14 Ed. 1.0

Test Report No.: BSH/4543/001/4552802/14-1

Applicant:

FT-TEC GmbH
Werner von Siemens Strasse 5
7343 Neutal
AUSTRIA

Hamburg, 03 December 2014
For the Federal Maritime and Hydrographic Agency

Heinrich Bartels
Test engineer

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**Federal Maritime and Hydrographic Agency**
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**D-20359 Hamburg**
**Germany**

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

# Bundesamt für Seeschifffahrt und Hydrographie

*Federal Maritime and Hydrographic Agency*

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

DAkkS Deutsche Akkreditierungsstelle

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**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

General

| | |
|---|---|
| Applicant: | FT-TEC GmbH<br>Werner von Siemens Strasse 5, 7343 Neutal, AUSTRIA |
| Equipment under test: | FT-TEC |
| Type: | SEAANGEL SA14-SART |
| Manufacturer: | FT-TEC GmbH<br>Werner von Siemens Strasse 5,<br>7343 Neutal,<br>AUSTRIA |
| Place of test: | BSH test laboratory Hamburg, Room 916 |
| Start of test: | 22 August 2014 |
| End of test: | 03 December 2014 |

**Test standards[1]:**

**IEC 61097-14 Ed. 1.0**
Global maritime distress and safety system (GMDSS) –
Part 14: AID 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) |
|---|---|---|---|
| 2 | IEC 61097-14 | 6 Performance tests | Passed |
| 3 | IEC 61097-14 | 7 Physical Radio tests | Passed |
| 4 | 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 a numbered entry is provided here.

### 1.1.1 EUT system no 1

| **Transponder** | | | | |
|---|---|---|---|---|
| Type | SEAANGEL SA14 | Part No.: | | |
| Delivery date | 2014-08-21 | Serial number | 130037 | |
| Test version, internal VHF antenne replaced by an antenna connector | | | | |
| HW Version: | Delivery date | 2014-08-21 | Version no | Prototype |
| | Installation date | 2014-08-21 | | |
| SW Version: | Delivery date | 2014-08-21 | Version no | V 1.1.3 |
| | Installation date | 2014-08-21 | | |
| SW Version: | Delivery date | 2014-09-23 | Version no | V 1.2.5 |
| | Installation date | 2014-09-23 | | |
| SW Version: | Delivery date | | Version no | |
| | Installation date | | | |

## 1.2 Test environment

Here it is recorded 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. 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 | 2014-08-22 | 2014-08-22 | Bartels |
| 1 | 2014-09-23 | 2014-09-24 | Bartels |
| Documents | 2014-09-24 | 2014-09-24 | Bartels |
| Documents | 2014-11-12 | 2014-11-12 | Bartels |
| Documents | 2014-12-02 | 2014-12-03 | 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 |

[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 |

This table is a template for more general remarks of some test items and should be copied if required

| Date | Result | Status |
|---|---|---|
| | | |
| | | |
| | | |

Issue of this template: 2014-08-15

Some items which are related to IEC 60945 are covered by a separate assessment report BSH/4543/001/4552802/14-5, 2014-12-03.

## 1.4 Test notes

Here are some effects noted which are observed during the normal test but independent of the actual test items.

### 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 |
| | | | |
| | | | |
| | | | |

# 2 6 Performance tests

## 2.1 6.1 Operational tests

*(see 3.2)*

*The requirements of 3.2 shall be verified as follows (the subclause reference is given in brackets).*

| **2014-11-12 Ba** | Test details: Operational tests | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| Verify the following items | | | |
| a) easy activation | Verify by inspection that the EUT can be easily activated by unskilled personnel | | Ok |
| b) Inadvertent activation | Verify by inspection that the EUT is fitted with means to prevent inadvertent activation | A slider which has to be moved with a certain force covers the activation button | Ok |
| c) Indication | Verify by inspection that the EUT is equipped with a means which is either visual or audible, or both visual and audible, to indicate correct operation | Visual indication | Ok |
| d) Activation | Verify by inspection that the EUT is capable of manual activation | | Ok |
| | Verify by inspection that the EUT is capable of manual deactivation | | Ok |
| | Check if provision for automatic activation is included (optional) | Means for automatic activation are provided:<br>- pull cord switch<br>- water contact switch | Ok |
| e) Drop into water | Verify by review of the IEC 60945 test report (section 8.6.2) that the EUT is capable of withstanding without damage drops from a height of 20 m into water | 2014-12-03:<br>Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |
| f) Watertight | Verify by review of the IEC 60945 test report (section 8.9.2) that the EUT is watertight at a depth of 10 m for at least 5 min | 2014-12-03:<br>Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |
| g) Thermal shock | Verify by review of the IEC 60945 test report (section 8.5) that the EUT can maintain water tightness when subjected to a thermal shock of 45 ℃ under specified conditions of immersion | 2014-12-03:<br>Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |

| | | | |
|---|---|---|---|
| h) Floating | Verify by test that the EUT is capable of floating (not neccesarily in an operating position)<br>It shall be placed in fresh water for 5 min, as a check that it is capable of floating; the device complete with its one metre mounting system shall float | Test 2014-11-14 Ba:<br>UTC 14:10<br>EUT was floating in fresh water (River Elbe).<br>Test has been performed for about 6 minuts, partly with telescopic pole extended and not.<br>The SART unit without the 1 m pole has also been tested and was floating | Ok |
| i) Lanyard | Verify by inspection that the EUT is equipped with a buoyant lanyard, suitable for use as a tether | | Ok |
| | Verify by measurement that the length is not less than 10 m | | Ok |
| j) Corrosion and oil resistance | Verify by review of the IEC 60945 test report (section 8.11/12) or waiver that the EUT is not unduly affected by seawater or oil | 2014-12-03:<br>Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |
| k) Sunlight resistance | Verify by review of the IEC 60945 test report (section 8.10) or waiver that the EUT is resistant to deterioration in prolonged exposure to sunlight | 2014-12-03:<br>Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |
| l) Colour | Verify by inspection that the EUT is of a highly visible yellow/orange colour on all surfaces where this will assist detection. | Yellow or orange | Ok |
| m) Construction | Verify by inspection that the EUT has a smooth external construction to avoid damaging the survival craft | | Ok |
| n) Antenna height | Verify by inspection that the EUT is provided with an arrangement to bring the AIS-SART antenna to a level of at least 1 metre above sea level | A telecope pole can be connected to the SART | Ok |
| | Check that an illustrated instruction is provided. The instructions shall illustrate the minimum requirement of 1 metre above sea level during use along with the installation method | In the manual | Ok |
| | Check that the manufacturer provides a visible means of indicating the base of the antenna | The base of the antenna is clearly indicated by the shape of the antenna. | Ok |
| | Verify by measurement that the height to the declared 1 metre mark from sea level is not less than 1 meter | The length of the antenna pole is 102 cm. Together with the length of the SART the antenna height is about 115 cm. | Ok |
| o) Reporting rate | Verify by observation of the VDL that the EUT is capable of transmitting with a reporting interval of 1 minute or less | This test is performed in section 8.2 | Ok |

| | | | |
|---|---|---|---|
| p) Internal position source | Verify by observation of the VDL that the EUT is equipped with an internal position source and be capable of transmitting its current position in each message | This test is performed in section 8.2 | Ok |
| q) Testing | Verify by observation of manufactuer's instructions that the EUT is capable of being tested for all functionalities using specific test information, and by observation of the VDL | This test with observation of the VDL is performed in section 8.3 | Ok |
| | | | |

## 2.2 6.2 Battery

### 2.2.1 6.2.1 Battery capacity test

This test is covered by the Physical Radio Tests (see 3.7).

### 2.2.2 6.2.2 Expiry date indication

*Section 3.3.2:*

*The life of the battery as defined by its expiry date shall be at least three years. The expiry date of the battery shall be the battery manufacturing date plus no more than half the useful life of the battery. The useful life of the battery is defined as the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the AIS-SART for at least 96 hours, after allowing for all losses over the useful life of the battery. To define the useful life of the battery, the following losses at the temperature of +20℃ ± 5 ℃ shall be included, in addition to the power required to operate the AIS-SART:*

*a) self-testing annually with GNSS data available;*

*b) self-discharge of the battery;*

*c) stand-by loads.*

*The manufacturer shall provide evidence to support the above battery life calculations including the time for self testing and assuming typical GNSS acquisition time.*

*The AIS-SART shall be clearly and durably marked with the battery expiry date (see 3.8).*

NOTE For example a battery that has a useful life of 10 years from the date of manufacture, cannot have an expiry date that exceeds 5 years from the date of manufacture and would have to be capable of providing enough power for 10 years of self-testing, self-discharge and stand-by loads in addition to the operational power requirement of the AIS-SART.

| **2014-09-24 Ba** | Test details: Expiry date indication | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| Indication | Verify by inspection that the EUT is clearly and durably marked with the battery expiry date | 2014-08-22 Ba:<br>Based on the label prototypes | Ok |
| Calculation | Check that the manufacturer provides evidence to support the battery life calculations | Document:<br>Batterielaufzeit<br>SEAANGEL – AIS-SART<br>V0.1, 2014-08-21 | Ok |
| | Check that the battery life calculations include<br>• Annual self-testing<br>• Self-discharge of the battery<br>• Stand-by loads<br>• assume typical GNSS acquisition time | | Ok |
| | Verify that the calculations are correct | | Ok |
| | | | |

### 2.2.3 6.2.3 Reverse polarity protection

*It shall not be possible to connect the battery with the polarity reversed.*

| **2014-09-24 Ba:** | Test details: Reverse polarity protection | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| Reversed polarity | Verify by inspection that it is not possible to connect the battery with the polarity reversed | The battery connector cannot plugged in in reverse direction | Ok |
| | | | |

## 2.3 6.3 Unique identifier

*This test is performed in section*

- *8.2.3 Message content of Message 1 and*
- *8.3.1 Transmission with EPFS data available*

## 2.4 6.4 Environment

*The AIS-SART shall meet the environmental condition requirements of IEC 60945 for equipment category Portable.*

| **2014-12-03 Ba** | Test details: Operational tests | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| IEC 60945 test report | Review the IEC 60945 test report. Verify that the requirements are fulfilled | Covered by IEC 60945 Assessment report BSH/4543/001/4362802/14-5 | Ok |
| | | | |

## 2.5 6.5 Range performance

*The nominal radiated power (EIRP) of the AIS-SART shall be 1W.*

*This radiated power provides the range performance of the AIS-SART as described in Annex*

This test is covered by the Physical Radio Tests.

## 2.6 6.6 Transmission performance

*This test is performed in section*

- *8.2 Active mode tests for the active mode and section*
- *8.3 Test mode tests for the test mode*

## 2.7 6.7 Labelling

*In addition to the items specified in IEC 60945, the following shall be clearly indicated on the exterior of the equipment:*

*a) brief operating and test instructions (in English),*

*b) expiry date (in English) for the primary battery used and*

*c) the unique identifier (user ID field of the AIS messages)*

NOTE Expiry date is battery replacement date (see 3.3.1).

| **2014-08-22 Ba** | Test details: Labelling | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| Verify by inspection that on the exterior of the equipment it is clearly indicated | | | |
| Operating instructions | - brief operating and test instructions | Based on label prototypes | Ok |
| | Verify that the operating and test instructions are in English | | Ok |
| Expiry date | - expiry date (in English) for the primary battery used | Tested in section 6.2.2 | Ok |
| Unique identifier | - the unique identifier (user ID field of the AIS messages) | | Ok |
| | | | |

## 2.8 6.8 Manuals

*In addition to the requirements of IEC 60945, the manuals shall include instructions for periodic testing and maintenance for the AIS-SART.*

NOTE Instructions on how to operate the AIS-SART in a SART active situation shall be part of the labelling on the device (see 3.8).

| **2014-09-24 Ba** | Test details: Manuals | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| Periodic testing | Verify by inspection that the manuals include instructions for periodic testing | | Ok |
| Maintenance | Verify by inspection that the manuals include instructions for maintenance | | Ok |
| | | | |

## 2.9 6.9 Electronic Positon Fixing System

*An EPFS shall be used as the source for AIS-SART position reporting.*

*The internal EPFS shall be a GNSS receiver that meets the following requirements of IEC61108 series: position accuracy, acquisition, re-acquisition, receiver sensitivity, RF dynamic range, position update, effects of specific interfering signals but with an minimum update of once per minute, provide a resolution of one ten-thousandth of a minute of arc and use WGS84 datum.*

*The manufacturer shall provide evidence that an internal navigation device cold start is forced at every AIS-SART activation (cold start refers to the absence of time dependent or position dependent data in memory, which might affect the acquisition of the GNSS position).*

| **2014-11-12 Ba** | Test details: EPFS test | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| Check the GNSS test report for the following requirements | | | |
| GNSS test report | Position accuracy | | Ok |
| | Aquisition | | Ok |
| | Re-Aquisition | | Ok |
| | Receiver senstivity | | Ok |
| | RF dynamic range | | Ok |
| | Position update | | Ok |
| | Effects of specific interfering signals | | Ok |
| | Resolution of one ten-thousandths of a minute of arc | | Ok |
| | Use of WGS84 datum | | Ok |
| Documentation | Check by review of the documentation that an internal navigation device cold start is forced at every AIS-SART activation | 2014-12-03 Ba:<br>Confirmed by document:<br>Bestaetigung_SEAANGEL_SA14_SART.pdf | Ok |
| | | | |

## 2.10 6.10 Activator

*The Activator provides a means for manual activation and deactivation of the AIS-SART. Manual activation shall provide a means to avoid inadvertent activation such as the use of not less than two simple but independent actions.*

*The AIS-SART shall be provided with means to indicate that the AIS-SART has been previously activated, to advise the users of a possible reduction of the required battery capacity. These means shall not be capable of reset by the user. For example, manual activation requires the breaking of a seal that cannot be replaced by the user.*

*This indication of previous activation shall be unaffected when initiating the test mode. The Activator provides a means for manual activation and deactivation of the AIS-SART test mode.*

| **2014-08-22 Ba** | Test details: Activator | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| Activation | Verify by inspection that the EUT provides means for manual activation | | Ok |
| | Verify by inspection that the EUT provides a means to avoid inadvertent activation such as the use of not less than two simple but independent actions | 2 steps:<br>- Move slider to top<br>- Press on button | Ok |
| Deactivation | Verify by inspection that the EUT provides means for manual deactivation | Pressing the “Test” button for 3 s | Ok |
| Indication | Verify by inspection that the EUT provides an indication of previous activation | The slider has a smal nose which breaks by actiavation | Ok |
| | Verify by inspection that the indication cannot be reset by the user | The broken nose cannot be repaired | Ok |
| | Verify by inspection that the indication is not affected by initiating the test mode | The test mode can be activated when the slider is moved to a first position which does not break the nose. | Ok |
| Test mode | Verify by inspection that the EUT provides means for manual activation of the test mode | A yellow “Test” button. | Ok |
| | Verify by inspection that the EUT provides means for manual deactivation of the test mode | Pressing the “Test” button for 3 s | Ok |
| | | | |

## 2.11 6.11 Indicator

*The indicator shall be visual and /or audible.*

*The indicator shall indicate that the AIS-SART:*

- *has been activated*
- *is under going test*
- *has completed test*

*There shall be indication of the EPFS status whilst the AIS-SART is activated.*

| **2014-09-24 Ba** | Test details: Indicator | | |
|---|---|---|---|
| Test item | Check | Remark | Result |
| | | | |
| Visual/ audible | Check by inspection if the indicator is visual | The indication is visual, by a<br>• Distress LED<br>• Test LED<br>• Flash light | Ok |
| | Check by inspection if the indicator is audible | There is no audible indication | Ok |
| Indication | Check by inspection that the EUT indicates that it has been activated | By flashing Distress LED | Ok |
| | Check by inspection that the EUT indicates that is under going test | By flashing Test LED | Ok |
| | Check by inspection that the EUT indicates that it has completed test | By Distress LED<br>On for 5 s | Ok |
| | Check by inspection that the EUT indicates the EPFS status whilst the AIS-SART is activated | By distress LED:<br>Flashing: valid GNSS<br>Continous on: no GNSS | Ok |
| | | | |

# 3 7 Physical radio tests

*The purpose of these tests is to verify that the AIS-SART complies with the RF requirements under normal and extreme conditions. The tests are accomplished by the following procedures.*

*All the physical radio tests can be performed on either AIS 1 or AIS 2 unless otherwise stated.*

*Unless otherwise stated all the physical radio tests shall be performed with the modified AIS-SART(see 5.5).*

*The following tests shall be performed under normal conditions:*

- *Conducted output power*
- *Radiated output power with the standard AIS-SART*
- *Conducted spurious emissions*
- *Frequency error*
- *Modulation accuracy*
- *Modulation spectrum slotted transmission*
- *Power vs. time function*
- *Power as a function of time*

*The following tests shall be performed under extreme conditions:*

- *Conducted power*
- *Frequency error*

These tests are not part of this report; radio tests are performed by an external Radio test lab. The external test report is reviewed to verify that the EUT meets the requirements and only the result of the assessment documented here.

| **2014-11-12 Ba:** | Assessment of external Physical radio tests | | |
|---|---|---|---|
| Test item | Check | Remark | assess ment |
| Verify by review of the external Physical radio test report that the EUT meats the requirements<br>Test Lab : Phoenix Testlab<br>Test rep.No.: F142199E1 dated: 15 September 2014 | | | |
| Transmitter shutdown<br>4.2.1.3 | An automatic transmitter shutdown shall be provided to ensure that transmission does not continue for more than 2 s. | Document:<br>*"Transmitter_Shutdown_Beschreibung_SEAANGEL_5400013V03_v0.2.pdf"* | Ok |
| | This shutdown shall be independent of the operating software | | Ok |
| Normal conditions | 7.2 Frequency error | | Ok |
| | 7.3 Conducted output power | | Ok |
| | 7.4 Radiated output power with the standard AIS-SART | Test was performed with a battery which was pre-discharged by operation of the SART for 92 hours (page 9) | Ok |
| | 7.5 Modulation spectrum slotted transmission | | Ok |
| | 7.6 Transmitter test sequence and modulation accuracy | | Ok |
| | 7.7 Transmitter output power versus time function | | Ok |

| | | | |
|---|---|---|---|
| | 7.8 Spurious emissions form the transmitter | | Ok |
| Extreme conditions | 7.2 Frequency error | | Ok |
| | 7.3 Conducted output power | | Ok |
| | 7.6 Transmitter test sequence and modulation accuracy | | Ok |
| | Test condition | Normal operating voltage: 9.0 V<br>Min. operating voltage: 5.0 V,<br>Max. operating voltage: 9.2 V<br>Minimum temperature: -20℃,<br>Maximum temperature: + 55℃ | Ok |
| | | The minimum operating voltage has been determined as decribed in an e-mail 2014-09-26, stored as PDF | Ok |

# 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.*

| **2014-08-22 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 | UTC 07:25 – 07:50<br>The sync jitter does not exceed ± 200 µs | Ok |
| | | | |

## 4.2 8.2 Active mode tests

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

### 4.2.1 8.2.1 Methode 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.*

| **2014-08-22 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 07:10 | Ok |
| | | | |
| Inhibit EPFS data and record transmissions for further 20 minutes | | | |
| Time of inhibit | Record the time of inhibit EPFS data | UTC 08:00<br>It took up to 5 min to really inhibit the GPS signal | Ok |
| | | | |

## 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.*

| **2014-08-22** | 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 | The first transmission starts 6 s after activation, with default position.<br>I recommend to wait up to one minute with the first transmission for a valid position, to increase the probability that the first burst is transmitted with a valid position.<br>Retest 2014-09-24 Ba:<br>The first burst is transmitted about 40 s after activation and includes a valid position | Ok |
| b) Valid position | Verify that the first message with a valid position is transmitted within 15 minutes | After 15 min | Ok |
| | | | |

## 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.*

| **2014-08-22 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 | | Ok |
| b) Repeat indicator | Check that repeat indicator = 0 | | Ok |
| c) User ID | Check that User ID as configured in the AIS-SART | Remark: the test prototyp did not yet use a valid SART MMSI.<br>The test MMSI was 001234567 | Ok |
| d) Navigational status | Check that Navigational status = 14 | | Ok |
| e) ROT | Check that ROT = default | = default | Ok |
| f) SOG | Check that SOG = SOG from internal GNSS | = 0 kn | Ok |
| g) Position accuracy flag | Check that Position accuracy flag according to RAIM or 0 | = 0 | Ok |
| h) Position | Check that values of lat and lon are according to actual position | | Ok |
| i) Position update | Check that the position is updated once per minute, for each burst | | Ok |
| j) COG | Check that COG = COG from internal GNSS | COG = 0<br>Remark: if the COG cannot be evaluated because SOG = 0 it should be 360° | Ok |

| | | | |
|---|---|---|---|
| k) Heading | Check that heading = default | = default | Ok |
| l) Time stamp | Check time stamp = actual UTC second (0...59) | | Ok |
| m) Indication | Verify the correct indication of operation | Test 2014-09-23 Ba:<br>Flash LED is flashing<br>Distress LED is flashing | Ok |
| | | | |

### 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".*

| **2014-08-22 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 | | Ok |
| b) Repeat indicator | Check that repeat indicator = 0 | | Ok |
| c) User ID | Check that User ID as configured in the AIS-SART | | Ok |
| d) Text | Check that text = "SART ACTIVE" | Text = "SART ACTIVDA"<br>Retest 2014-09-23 Ba:<br>Text = "SART ACTIVE@"<br>See Note) | Ok |
| | | | |

Note)
The text has 11 characters = 66 bit. Together with 40 bit header this results in 106 bit total message length. The next byte boundary is 112 bit. So 6 bit have to be added to get a message with byte boundary length. This is one additional character. The EUT fills this correctly with a "@" character (bits 000000).

## 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.*

| **2014-08-22 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) | | Ok |
| b) Burst rate | Check burst rate = 1 per minute | | Ok |
| c) Burst duration | Check burst duration = 14 s | | Ok |
| d) Number of message | Check that a burst consists of 8 messages | | Ok |
| e) Channel alternation | Check that the transmissions in a burst are alternating between AIS 1 and AIS 2 | | Ok |
| f) Slot distance | Check that the slot distance between two messages in a burst is 75 slots | | Ok |
| g) Burst time-out | Check that the same set of slots are used in each burst for 8 minutes | | Ok |
| h) Random selection | Check that a new set of slots is randomly selected after 8 minutes | | Ok |
| i) Selection range | Check that the new burst is at 1 min +/- 6s<br>(increment = 2025 to 2475 slots,<br>slot distance = 1725 +/- 225 = 1500 ... 1950) | | Ok |
| j) Random selection methode | Verify the manufacturer's documentation on how the increment is selected randomly | E-Mail dated 2014-09-26, stored as PDF | Ok |
| | | | |

## 4.2.6 8.2.6 Communication state of Message 1

*For position reports transmitted after 15 minutes and before 40 minutes:*

*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.*

| **2014-08-22 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 | | Ok |
| b) Sync state | Check sync state = 0 | | Ok |
| c) Time-out start | Check that the time-out starts with 7 for all messages of the first burst after a change in slots | | Ok |
| d) Time-out decrement | Check that the time-out value is decremented by 1 for each frame | | Ok |
| e) Time-out reset | Check that the time-out value is reset to 7 after time-out = 0 | | Ok |
| f) Number of received stations | Check that the sub message for time-out 3,5,7 = number of received stations = 0 | | Ok |
| g) Slot number | Check that sub message for time-out 2,4,6 = actual slot number | | Ok |
| h) UTC | Check that sub message for time-out 1 = UTC hour and minute | | Ok |
| i) Slot offset | Check that sub message for time-out 0 = slot offset to the transmission slot in the next frame (2025 to 2475) | | Ok |
| | | | |

## 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.*

| **2014-08-22 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 | | Ok |
| b) Channel alternating | Check that transmissions of Message 14 are alternating between AIS 1 and AIS 2 | | Ok |
| c) Message 1 slot | Check that Message 14 is transmitted in a Message 1 slot, replacing the Message 1 | | Ok |
| | Check that Message 14 is transmitted on the same channel as the replaced Message 1 | | Ok |
| d) Time-out 0 | Check that Message 14 did not replace a Message 1 with a time-out value = 0 but with time-out 7 and 3 (according to 3.7.2) | | Ok |
| | | | |

## 4.2.8 8.2.8 Transmission with lost GNSS

*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.*

| **2014-08-22 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 | | Ok |
| b) Tx schedule | Check that the same transmission schedule is used as with GNSS data available | | Ok |
| c) Sync state | Check that State Sync state = 3 | Sync state = 1<br>Retest 2014-09-23 Ba:<br>Sync state = 3 | Ok |
| d) SOG | Check that SOG = last valid SOG | SOG = 123 = 12,3 kn<br>It seems this is confused with the default speed (1023 = 102.3 kn)<br>Retest 2014-09-23 Ba:<br>SOG = last valid SOG (3.6 kn) | Ok |
| e) PA-Flag | Check that Position accuracy = low | | Ok |
| f) Position | Check that position = last valid position | Default positon<br>Retest 2014-09-23 Ba:<br>Position = last valid positon | Ok |
| g) COG | Check that COG = last valid COG | Default COG<br>Retest 2014-09-23 Ba:<br>SOG = last valid SOG (0°) | Ok |
| h) Time stamp | Check that Time stamp = 63 | Time stamp = last valid time stamp<br>Retest 2014-09-23 Ba:<br>Time stamp = 63 | Ok |
| i) RAIM flag | Check that RAIM-flag = 0 | | Ok |
| j) Indication | Verify correct indication as per manufacturer's documentation | Test 2014-09-23 Ba:<br>Flash LED is flashing<br>Distress LED is continuos on | Ok |
| Transmission slots in comm state | The transmission slots in the comm state (time-out 6,4,2) are 27 slots less than the correct slots (e.g. 177 instead of 204, 190 instead of 217 and 89 instead of 116.<br>This cannot be caused by the clock drift. The clock drift during the test was less than 1 slot, and in the other direction, to later times<br>Retest 2014-09-23 Ba:<br>The Tx slots in the comm state are correct during the 20 min. test duration. | | Ok |

# 4.3 8.3 Test mode tests

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

## 4.3.1 8.3.1 Transmission with EPFS data available

### *8.3.1.1 Method of measurement*

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

### *8.3.1.2 Required results*

*a) The AIS-SART starts transmission once 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.*

| **2014-08-22 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 | About 80 s after activation | Ok |
| b) Single burst | Check that one burst is transmitted | | Ok |
| | Check that the burst consists of 8 messages | | Ok |
| | Check that messages according to 3.7.2 are transmitted (1 msg 14, 6 msg 1, 1 msg 14) | | Ok |
| c) User ID | Check that User ID as configured in the AIS-SART | | Ok |
| d) Navigational status | Check that Navigational status = 15 | | Ok |
| e) SOG | Check that SOG = SOG from internal GNSS | | Ok |
| f) Position accuracy flag | Check that Position accuracy flag according to RAIM or 0 | | Ok |
| g) Position | Check that values of lat and lon are according to actual position | | Ok |
| h) COG | Check that COG = COG from internal GNSS | = 0 | Ok |
| i) Time stamp | Check time stamp = actual UTC second (0...59) | | Ok |
| j) Comm state | Check that time-out = 0 | | Ok |
| | Check that sub message = 0 | | Ok |
| k) Stop of transmission | Check that transmission stops after one burst | | Ok |
| l) Msg 14 text | Check that the text in msg 14 is “SART TEST” | Text = “TEST”<br>Retest 2014-09-23 Ba:<br>Text = “SART TEST” | Ok |
| m) Indication | Verify the correct indication according to manufacturers documentation | Test 2014-09-23 Ba: | Ok |
| | | | |

## 4.3.2 8.3.2 Transmission without EPFS data available

***8.3.2.1 Method of measurement***

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

***8.3.2.2 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.*

| **2014-08-22 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 | After 15 min | Ok |
| b) Single burst | Check that one burst is transmitted | | Ok |
| | Check that the burst consists of 8 messages | | Ok |
| | Check that messages according to 3.7.2 are transmitted (1 msg 14, 6 msg 1, 1 msg 14) | | Ok |
| c) User ID | Check that User ID as configured in the AIS-SART | | Ok |
| d) Navigational status | Check that Navigational status = 15 | | Ok |
| e) SOG | Check that SOG = default | | Ok |
| f) Position accuracy flag | Check that Position accuracy flag = 0 | | Ok |
| g) Position | Check that position values = default | | Ok |
| h) COG | Check that COG = default | | Ok |
| i) Time stamp | Check time stamp = 63 | Time stamp = 60<br>Retest 2014-09-23 Ba:<br>Time stamp = 63 | Ok |
| j) Comm state | Check that time-out = 0 | | Ok |
| | Check that sub message = 0 | | Ok |
| k) RAIM flag | Check that RAIM flag = 0 | | Ok |
| k) Stop of transmission | Check that transmission stops after one burst | | Ok |
| l) Msg 14 text | Check that the text in msg 14 is “SART TEST” | Text = “TEST”<br>Retest 2014-09-23 Ba:<br>Text = “SART TEST” | Ok |
| m) Indication | Verify the correct indication according to manufacturers documentation | Test 2014-09-23 Ba: | Ok |
| | | | |

# Annex A Test equipment

## A.1 Test equipment summary

| # | description | type | identification |
|---|---|---|---|
| 1 | VDL Analyser / Generator | AIS Test unit MKII | S/N AA08PN<br>Bund BSH/2012, 7200002112<br>BSH PC10745<br>SW AISterm V1.0rev47<br>AISmain V1.47011120R |
| 2 | Target simulator software | Furuno Navintra | BSH PC 9169 |
| 3 | Presentation Interface Monitor | BSH | BSH PC 8441<br>BSH PC 9457<br>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,<br>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<br>Wavesurfer 422 | LCRY 0301 J 15673 |
| 11 | Unbalanced Standard Attenuator | Rhode & Schwarz<br>DPR BN 18024/50 | BUND KK 11201 |
| 12 | 2 fixed voltage power supply<br>(24 V/10A) | SITOP | BUND 102452, 102453 |
| 13 | 1 fixed voltage power supply<br>(12 V/4,5A) | Siemens | |
| 14 | 2 adjustable power supplies<br>(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<br>Bund 102710/2002<br>Prüfgerät Nr. 1 |
| 16 | VDL Analyser / Generator | AIS equipment tester | Prüfgerät Nr. 2 |

## 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 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

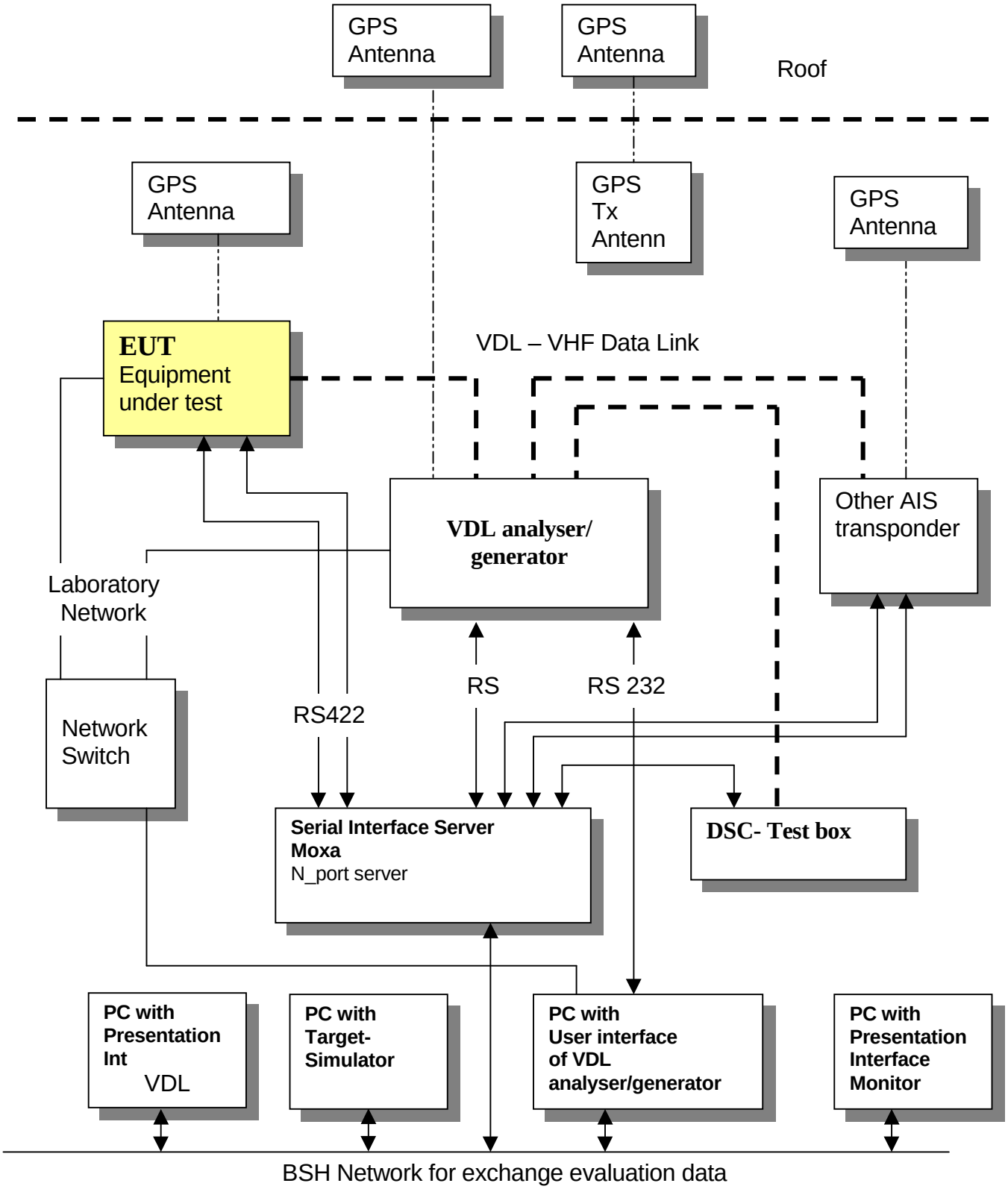
A special laboratory network connect controlling PCs with equipment of the test environment (VDL Generator/ analyser) and with EUT if equipped with an ethernet interface.

## A.1.8 GPS Retransmitter

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

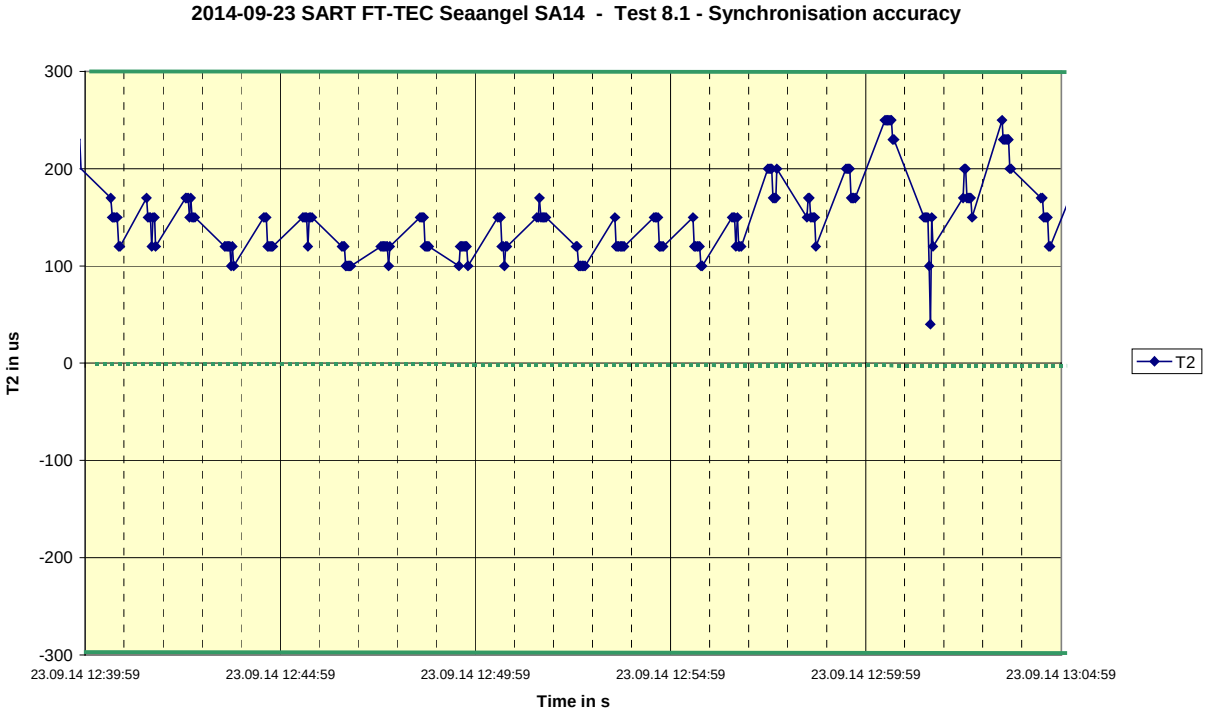
To avoid the need to connect all AIS equipment to GPS antennas outside the laboratory a re-transmitting GPS antenna is installed in the lab. It amplifies and radiates a GPS signal in the laboratory which is received by active GPS antenna on the roof.

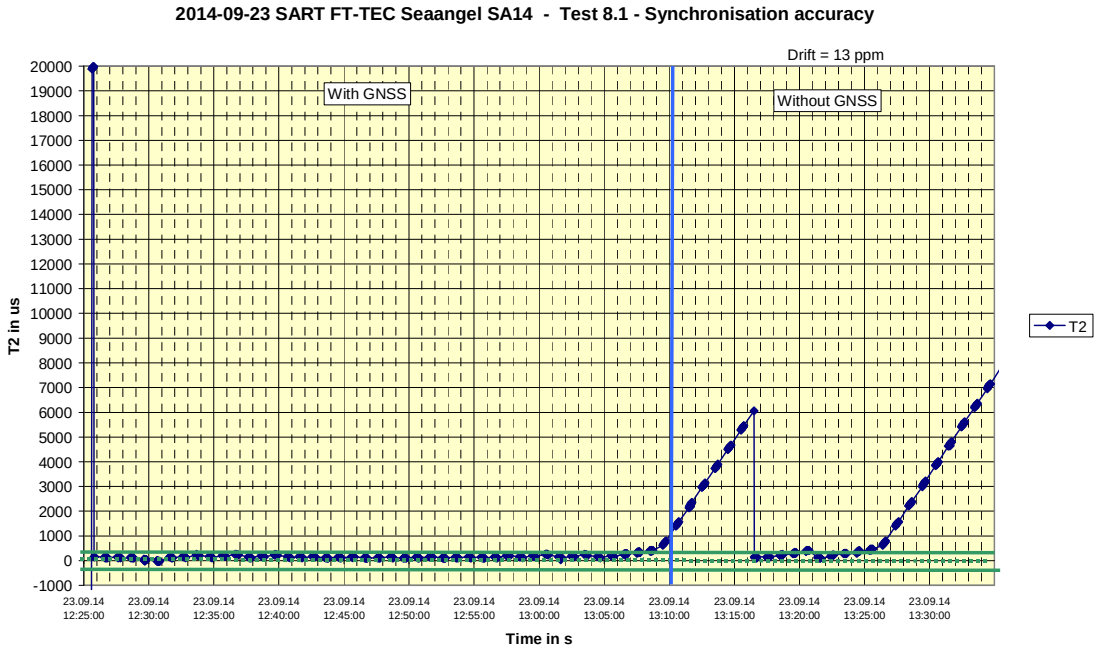
## A.2 Test environment overview



# Annex B Test diagrams

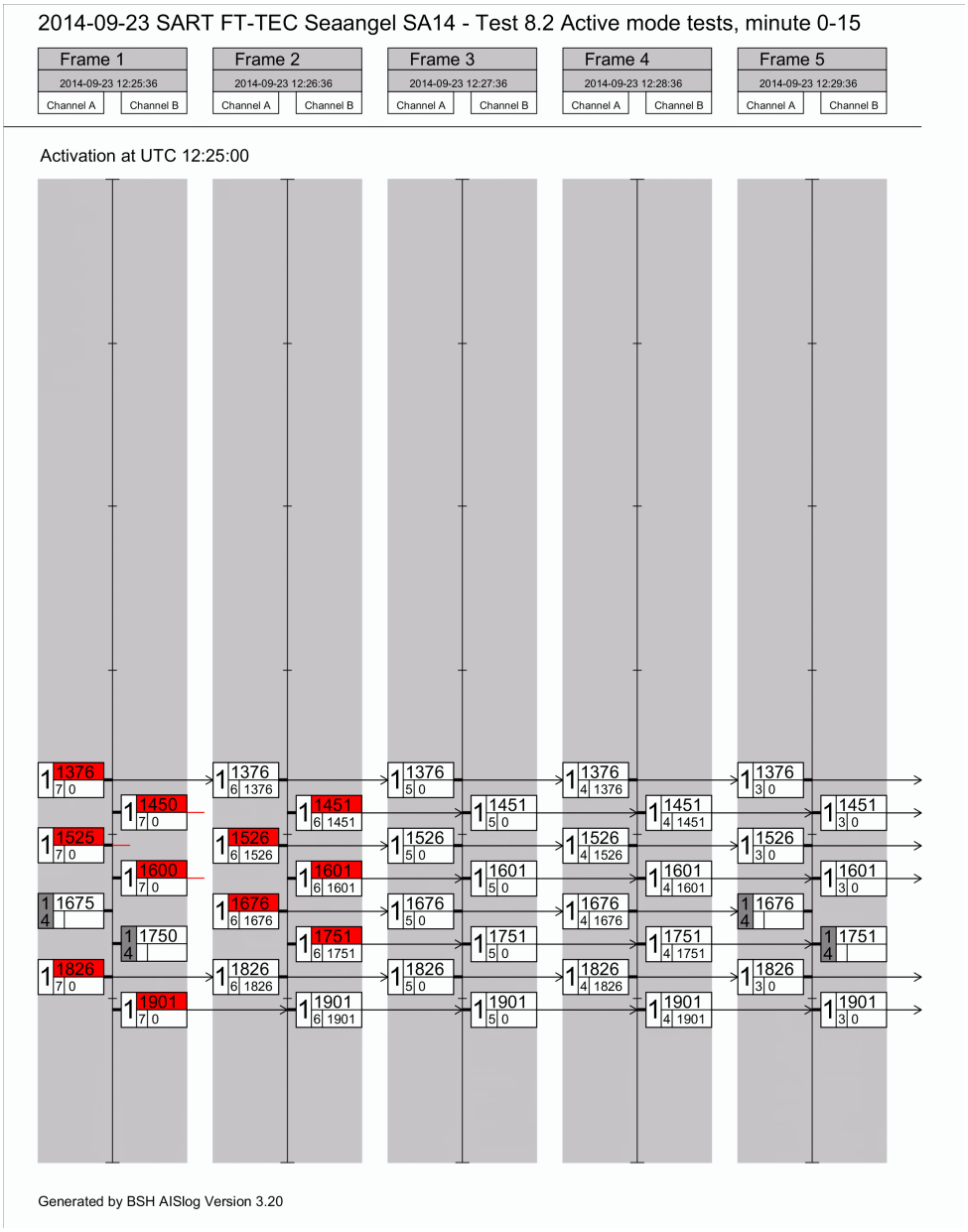
## B.1 8.1 Synchronisation accuracy

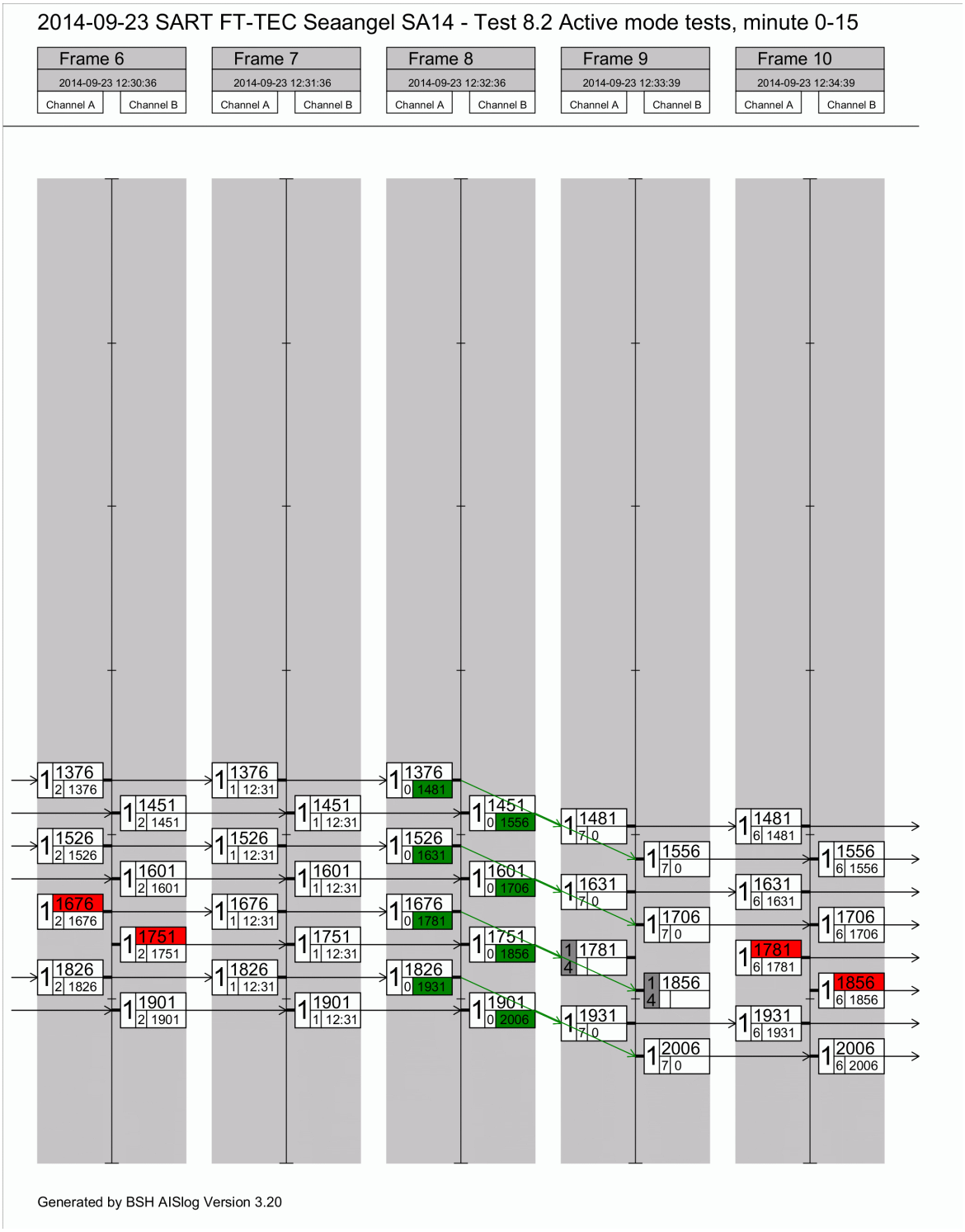


# B.2 8.2.5 Active mode, Transmission schedule

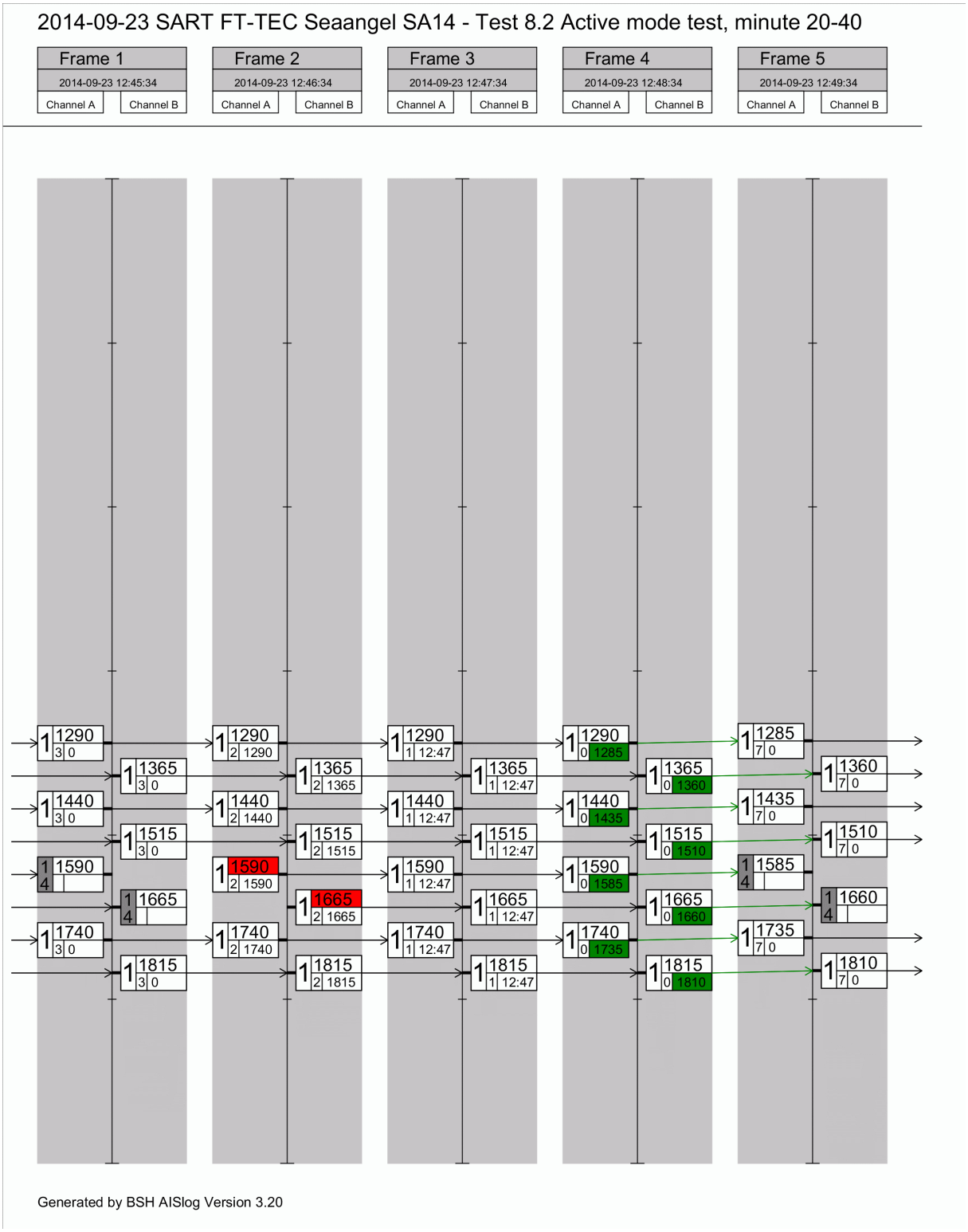
## B.2.1 Minute 1 to 10

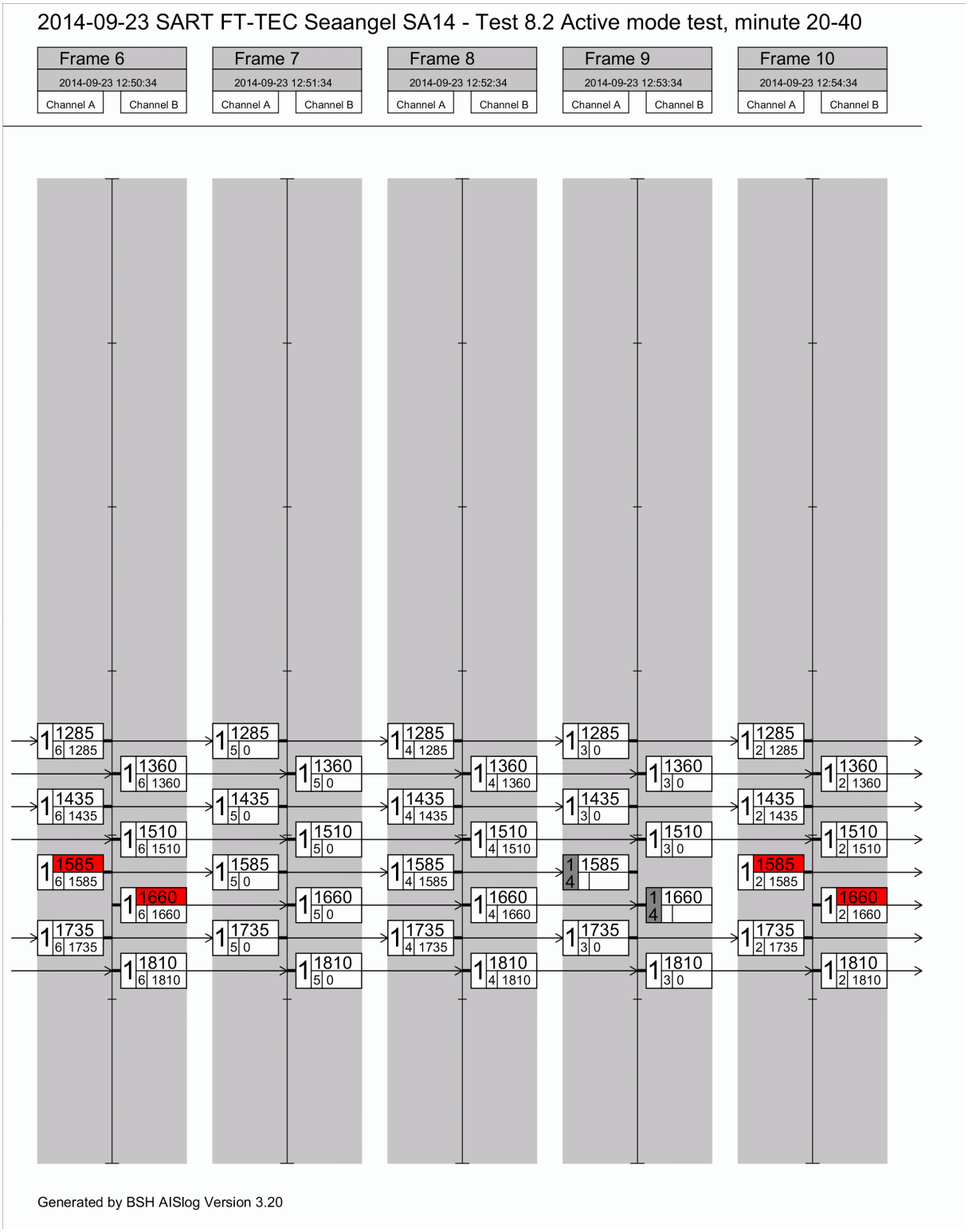


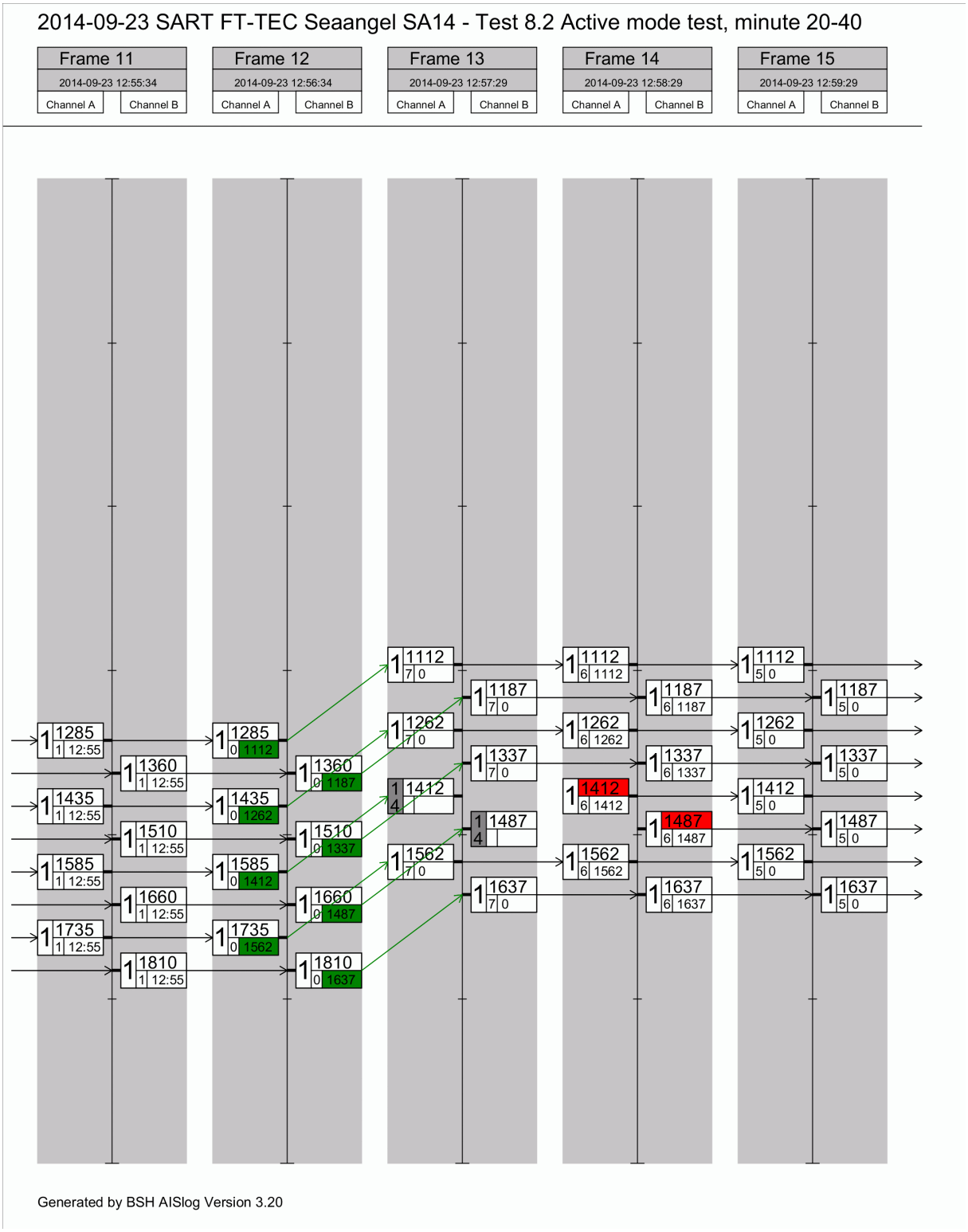


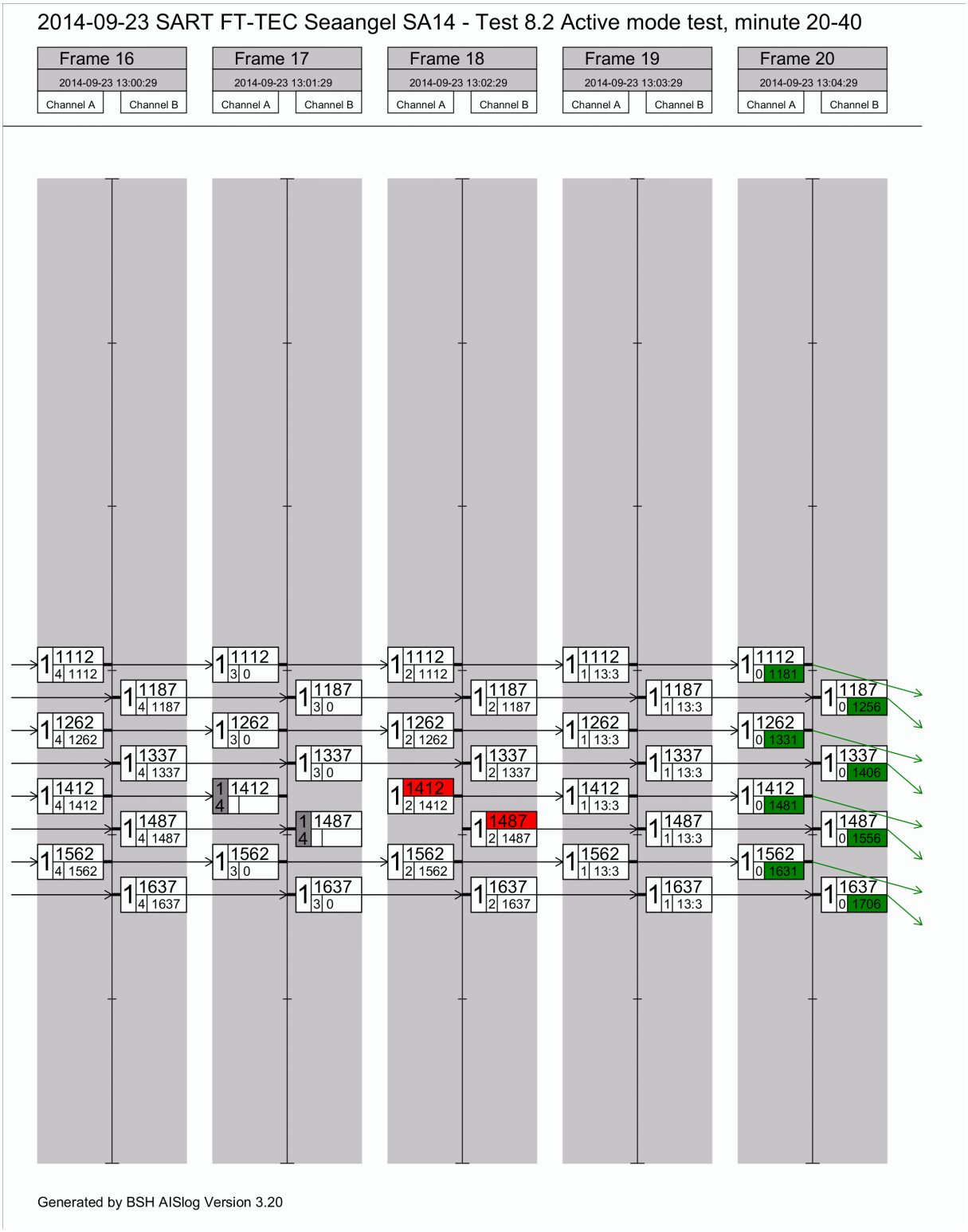

Some messages are marked with a red slot number. This is a function of the evaluation software and is caused by the preceeding message 14 instead of message 1. It is not an error of the EUT.
This remark is related also to the following diagrams.

## B.2.2 Minute 30-40

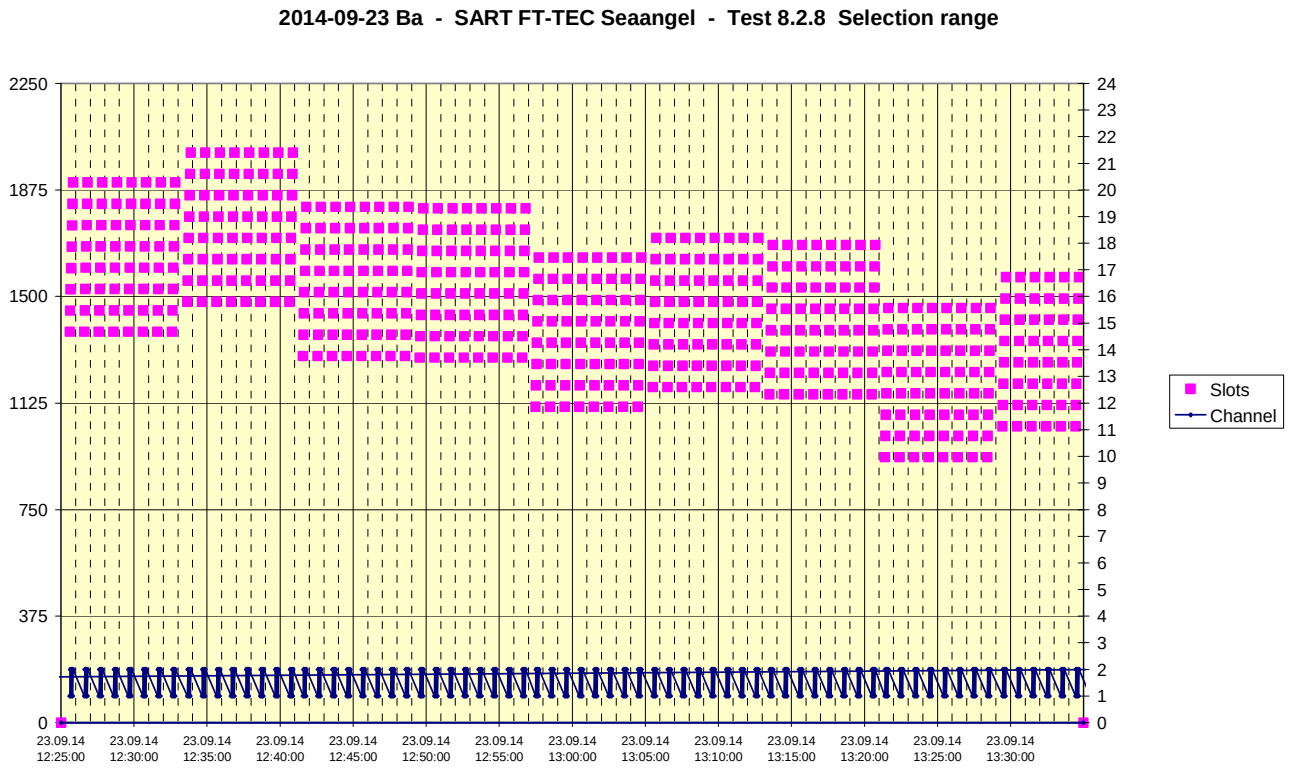


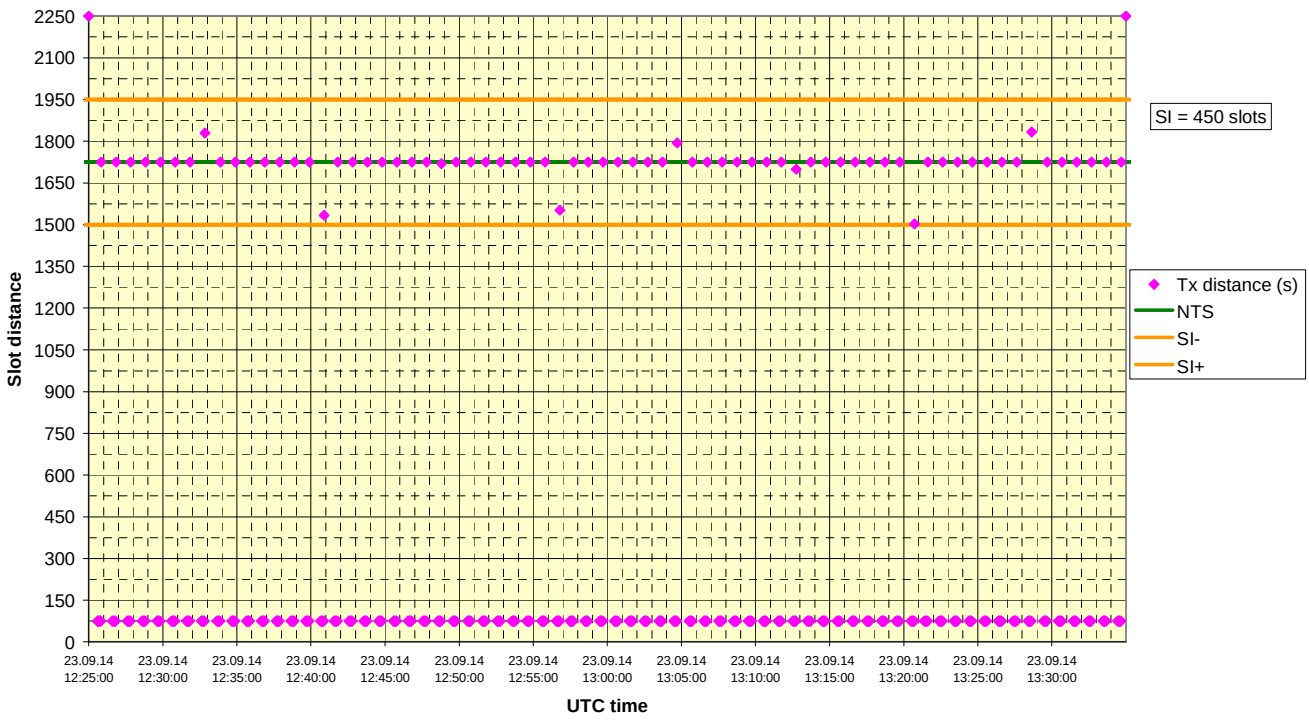

2014-09-23 SART FT-TEC Seaangel SA14 - Test 8.2 Active mode test, minute 20-40
Frame 6
2014-09-23 12:50:34
Channel A
Channel B
Frame 7
2014-09-23 12:51:34
Channel A
Channel B
Frame 8
2014-09-23 12:52:34
Channel A
Channel B
Frame 9
2014-09-23 12:53:34
Channel A
Channel B
Frame 10
2014-09-23 12:54:34
Channel A
Channel B
1285
1360
1435
1510
1585
1660
1735
1810
Generated by BSH AISlog Version 3.20


2014-09-23 SART FT-TEC Seaangel SA14 - Test 8.2 Active mode test, minute 20-40
Frame 11
2014-09-23 12:55:34
Channel A
Channel B
Frame 12
2014-09-23 12:56:34
Channel A
Channel B
Frame 13
2014-09-23 12:57:29
Channel A
Channel B
Frame 14
2014-09-23 12:58:29
Channel A
Channel B
Frame 15
2014-09-23 12:59:29
Channel A
Channel B
1285
1360
1435
1510
1585
1660
1735
1810
1112
1187
1262
1337
1412
1487
1562
1637
Generated by BSH AISlog Version 3.20

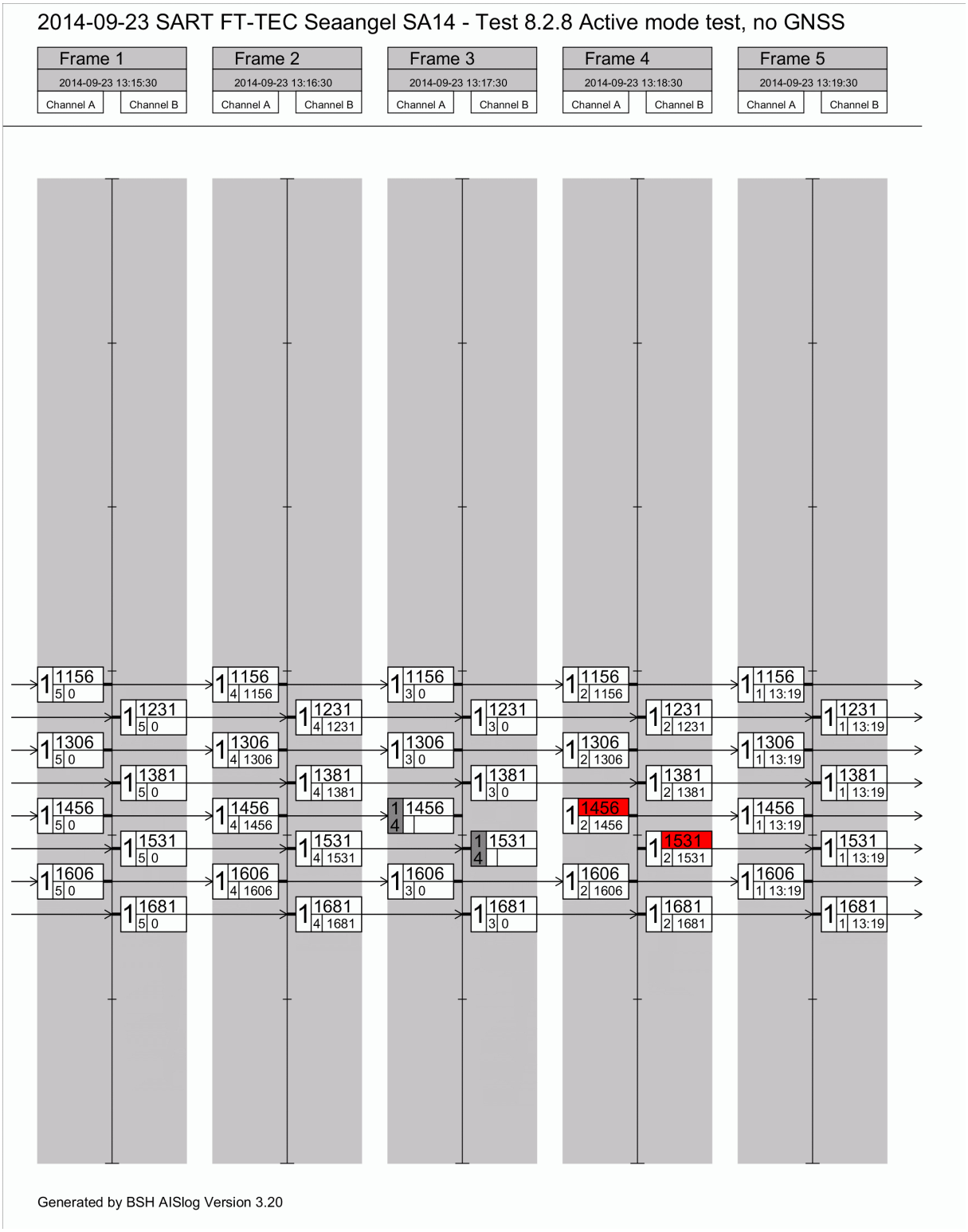

2014-09-23 SART FT-TEC Seaangel SA14 - Test 8.2 Active mode test, minute 20-40
Frame 16
2014-09-23 13:00:29
Channel A
Channel B
Frame 17
2014-09-23 13:01:29
Channel A
Channel B
Frame 18
2014-09-23 13:02:29
Channel A
Channel B
Frame 19
2014-09-23 13:03:29
Channel A
Channel B
Frame 20
2014-09-23 13:04:29
Channel A
Channel B
Generated by BSH AISlog Version 3.20

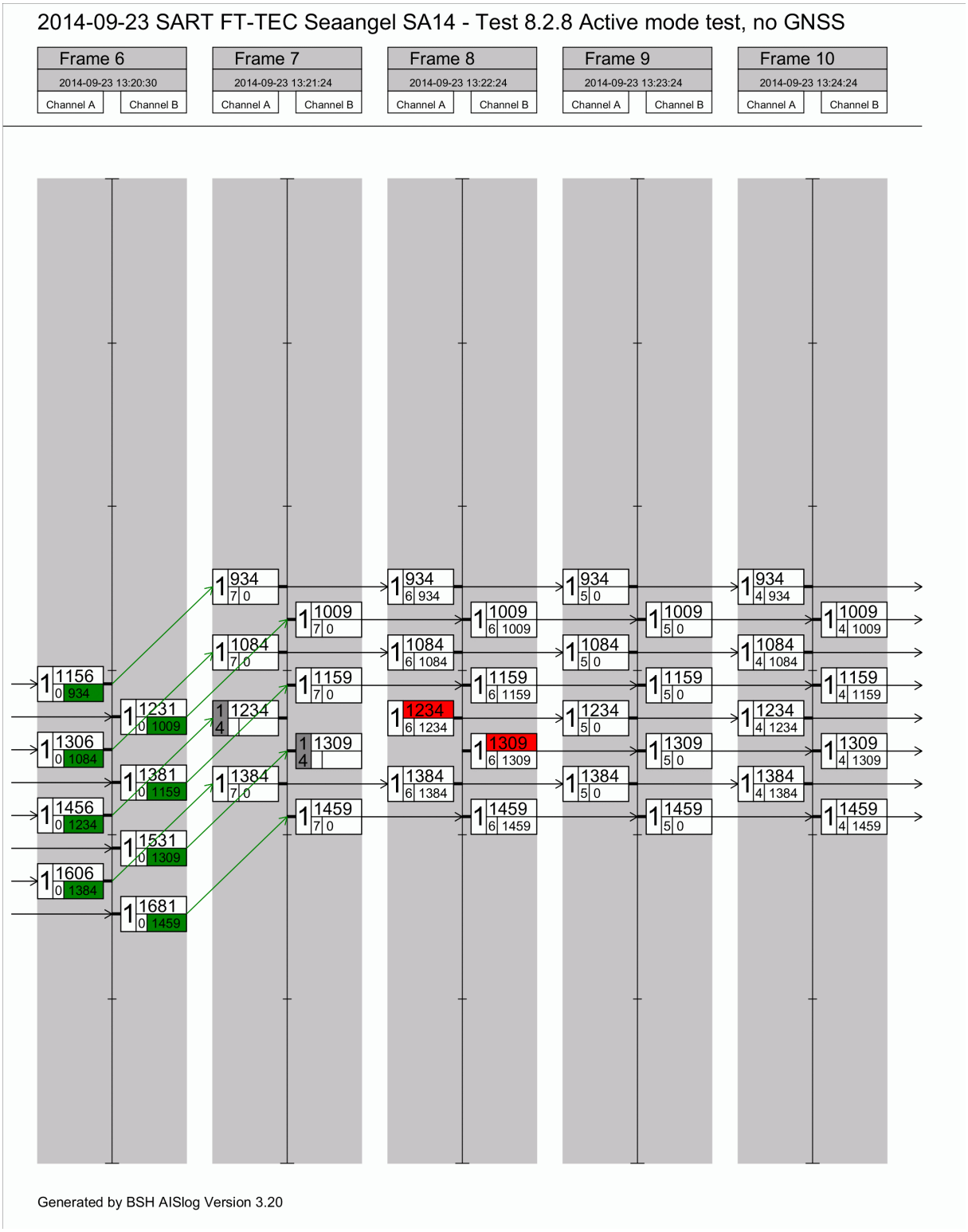
## B.2.3 Slot distance



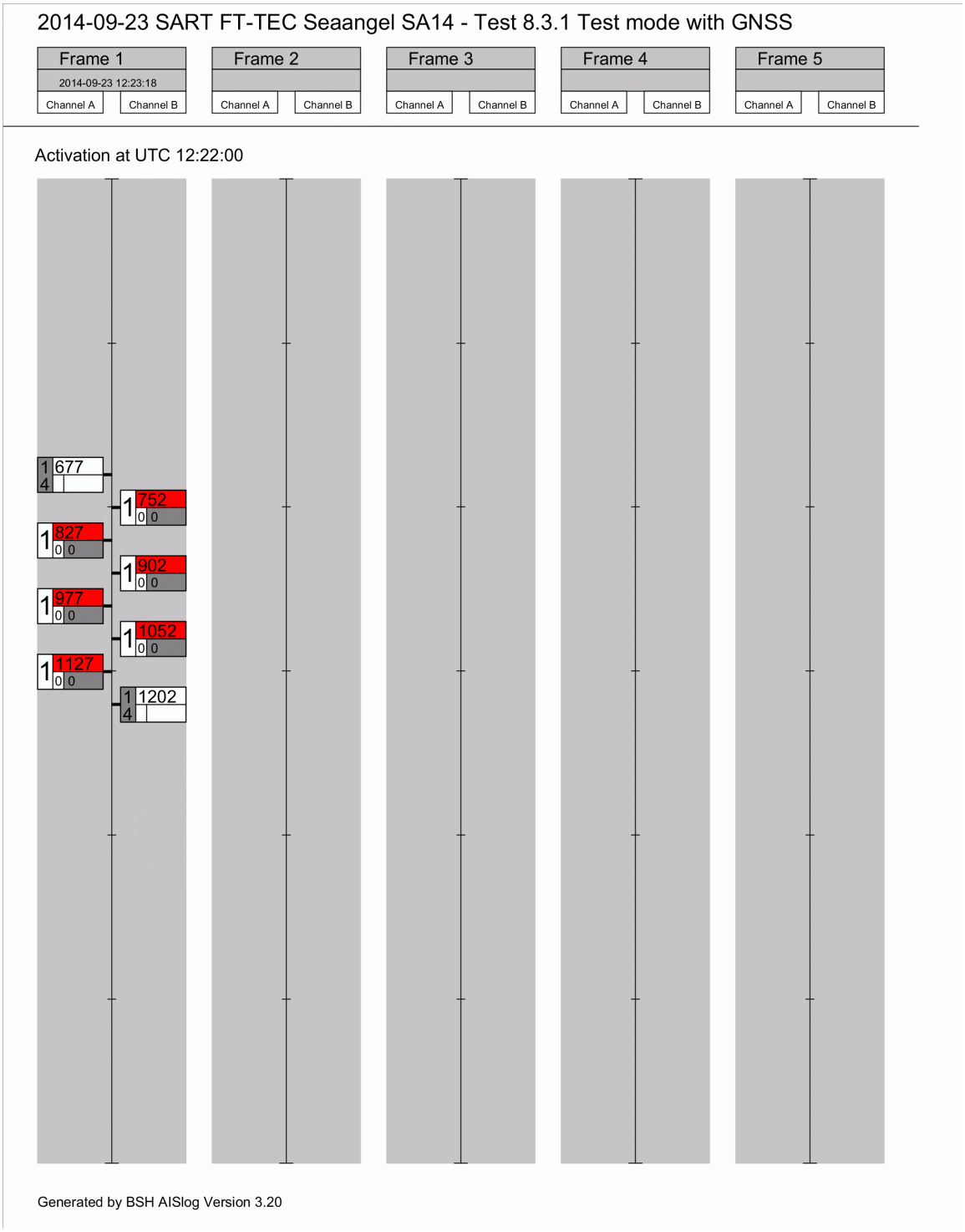
## B.2.4 Minute 50-60 (no GNSS)



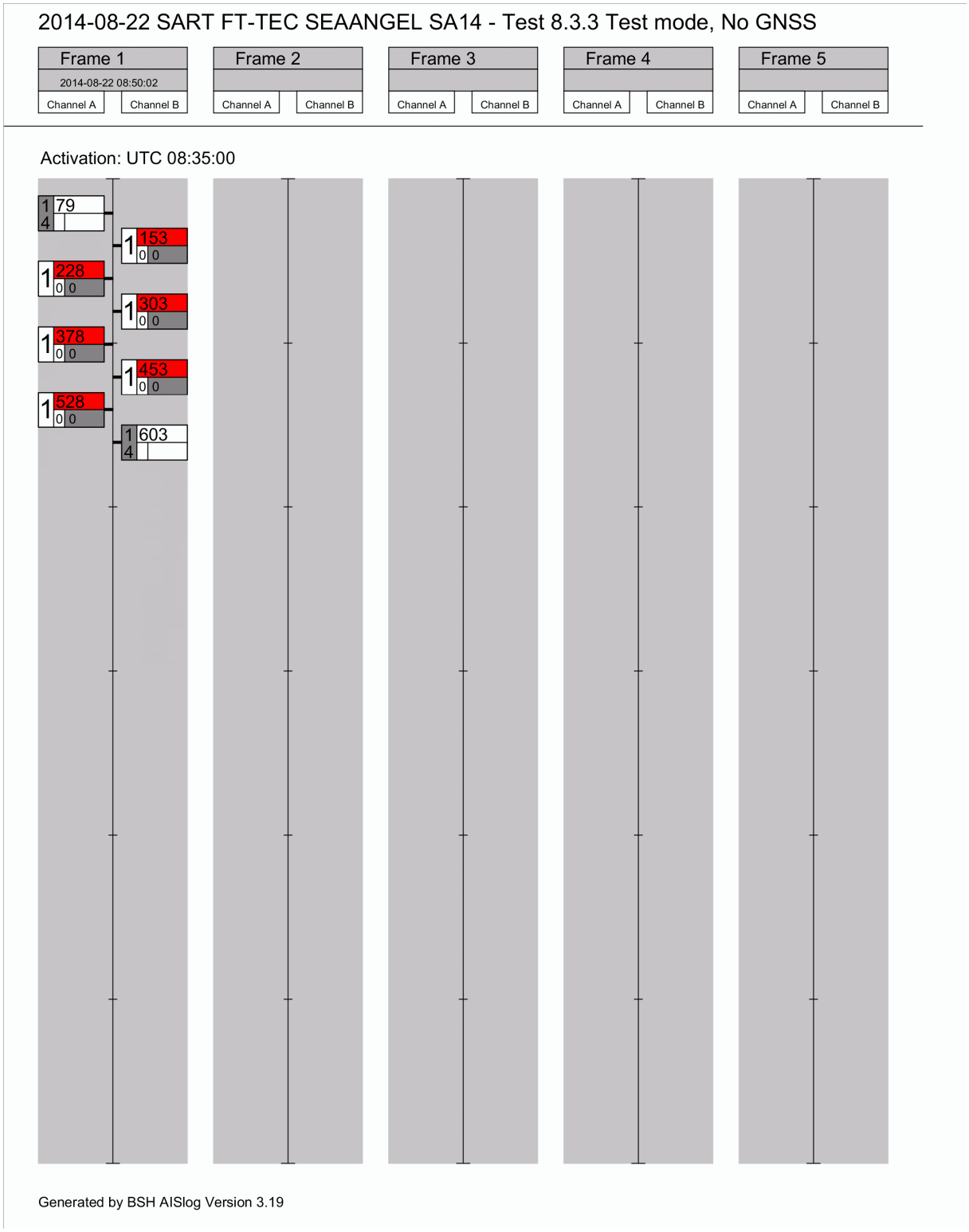

2014-09-23 SART FT-TEC Seaangel SA14 - Test 8.2.8 Active mode test, no GNSS
Frame 6
2014-09-23 13:20:30
Channel A
Channel B
Frame 7
2014-09-23 13:21:24
Channel A
Channel B
Frame 8
2014-09-23 13:22:24
Channel A
Channel B
Frame 9
2014-09-23 13:23:24
Channel A
Channel B
Frame 10
2014-09-23 13:24:24
Channel A
Channel B
Generated by BSH AISlog Version 3.20

# B.3 8.3 Test mode tests

## B.3.1 8.3.1 Test with GNSS available



## B.3.2 8.3.1 Test without GNSS available



# Annex C Photos of equipment under test

## C.1 SART Unit




USER ID: 970970000
S/N: 001000000
-LY-4


LITHIUM-BATTERIE
CR-2/3AK
-LY-1
-LP
-PT-