AMEC's Statement on Panbo (2017/11/11)

Background

Alltek Marine Electronics Corp (AMEC) with head office located in New Taipei City, Taiwan, is a provider of advanced AIS solutions, and supplies a full range of AIS products including Class A, Class B-CS, Class B-SO, Portable AIS, AIS Receiver, AIS MOB, AIS AtoN, AIS SART, Sat-AIS tracking beacon, ECS software, and much more, with over 10 years expertise in the research and development and dedicated manufacturing facility.

AMEC launched its AIS Class B transponder model Camino-108 in early 2014 which is designed in accordance with related ITU-R & IEC standards. The product has been fully tested by accredited test labs including BSH, Phoenix Testlab, SGS, IST, and QuieTek. It has obtained BSH certificate in 2013 (refer to Annex **B.1**), CE R&TTE certificate in 2014 and CE RED in 2017 by Phoenix Testlab Notified Body, as well as USCG and FCC certificates in 2014.

The Camino-108 AIS Class B has small form-factor based on advanced digital-signal-processing technologies developed in-house. It is very compact, reliable, with high performance and trusted by global users. This model is in direct competition to SRT/Em-trak Class B solutions on worldwide markets and in some government tender projects.

Prior to our response to the TÜV test report, we do not really feel to be in the position to comment on the TÜV test report for two reasons. First, we are not in contact with TÜV to date to assist the tests to be done in compliance with IEC 62287-1 measurement-methods. Second, we have no way to verify whether the units supplied by a hostile party are manipulated or damaged. After all, NAVICO informed us in writing that the two NAIS-500 test units are RMA return units sent accidentally by NAVICO to SRT for repair service. We suppose that's the reason why the serial number of the test units are missing or removed in the test report.

Ultimately, it's our task now to clarify the claim in-depth with Phoenix Testlab how the discrepancies between the test reports on the same test item from Phoenix TestLab and TÜV come about.

AMEC's Comments on "TÜV Test Report"

Concerning the test on Adjacent Channel Selectivity by TÜV on Alltek-produced Class B device, the measurement method defined in IEC 62287-1 is shown in Annex A.1. In Phoenix Testlab's test, this item was fully passed with "Measurement Uncertainty" of +0.8 dB/-0.9 dB, please refer to Annex **C.1**. In SRT/TÜV's test, this item was partially failed with higher "Measurement Uncertainty" of +2.6 dB/-2.6 dB. If we take "measurement uncertainty" into consideration, the deviation seems can be offset or not significant, and the deviations could be caused by parts deviations during mass production. Therefore we think this could be caused by a different test-sample, different signal generators and of course the measurement uncertainty.

Regarding the test on Spurious Response Rejection by TÜV on Alltek-produced Class B device, the measurement method defined in IEC 62287-1 is shown in Annex **A.2**. By the definition of IEC 62287-1, the AIS-2 frequency is 162.025 MHz, AIS-1 frequency is 161.975 MHz, but the "lowest TDMA frequency" of the AIS transceiver is actually 156.025 MHz.
As described in IEC 62287-1, "the test shall be carried out on the lowest TDMA frequency declared by the manufacturer and AIS-2 (162.025 MHz)." Please refer to sub-clause (h) in clause 11.2.4.2, and sub-clauses (a) & (f) in clause 11.2.5.4.3, which are highlighted in Annex **A.1** and Annex **A.2**.

In accordance with IEC 62287-1, Phoenix Testlab did the tests both on the lowest TDMA frequency (156.025 MHz) and on AIS-2 (162.025 MHz) as shown in Annex **C.2.** During approval test period, when testing 156.025 MHz frequency is needed, Alltek shall configure the receiver of the EUT unit into the lowest TDMA frequency via a proprietary command, such that this test item can be performed without deviation.

If an off-the-shelf Alltek Class B device was taken for testing without Alltek's support, like SRT/TÜV did, they would not be able to configure the receiver into 156.025 MHz as lowest frequency; therefore they took AIS-1 (161.975 MHz) as lowest frequency, which will surely lead to different test results. That is why TÜV states in their document: "this is an unavoidable deviation" on page 14.

For your reference, when TÜV did approval test on SRT Class B device years ago,

they tested this item also only on AIS-2 (162.025 MHz) and lowest frequency 156.025 MHz. It seems to us that they did not additionally test on the AIS-1 frequency (161.975 MHz), at least this is what we have seen on their test report, shown in Annex **D.1** (this document was obtained from FCC website).

This week, we have done some tests in-house on two off-the-shelf SRT Class B devices (NAIS-400 & Em-trak B100) based on same measurement-method applied by TÜV on Alltek Class B device. We found that SRT Class B devices also failed the tests on Spurious Response Rejection. Please refer to Annex **F.1.**

Additionally, we also found that there is another SRT AIS device whose Spurious Response Rejection testing was not fully following the measurement-method as defined in IEC standards, it seems the AIS-2 frequency was not well tested as shown on the report. Please refer to Annex **D.2**.

AMEC's Comments on "Statement by Simon Tucker of SRT regarding Navico/Amec NAIS 500"

The comments below are our assessment of possible impact on day-to-day use given the conditions that the TÜV tests reflect the technical flaw legitimately, in the hope to validate if SRT's conclusions are justified.

SRT's Statement #1:

1) The radio will be unable to receive and process all AIS messages – due to the inability of the radio to filter spurious radio signals, AIS transmissions will be blocked. The result is that the user may not see the ship about to collide with them.

AMEC's Comment #1:

- The messages may not be received only during the period when spurious radio signals appear.
- Even one AIS channel is interfered by spurious radio signal; the second channel still can operate and receive AIS messages. Since AIS transmission is designed to alternate on AIS 1 and AIS 2, the surrounding ships can be seen as usual.
- For vessels equipped with "such Alltek AIS device" at a speed higher than 2 knots, the AIS transmitter may send out AIS report once-every-1-minute instead of typically once-every-30-second for the same instance when an onboard fixed-mount VHF-radio voice communication is on and if the VHF radio channel frequency is set on channel 60 (160.625 MHz), channel 80 (161.625 MHz), or channel 81 (161.675 MHz).
- As far as we know, VHF radio channels 60, 80, and 81 are typically categorized as international channels, non-USA channels. So USA users would not be affected. Please refer to VHF Radio Channel List in Annex E.1.

SRT's Statement #2:

2) The radio will believe that transmit slots are busy. As such the device will then not transmit. In busy areas this will result in the transceiver not transmitting.

AMEC's Comment #2:

- In carrier-sense implementation, there are ten candidate-periods (CP) for each AIS transmitting for CSTDMA. The system will randomly define 10 candidate-periods (CP) in the transmission interval (TI). As long as one of the 10 candidate-periods passes, the transmission will be successful.
- AIS system architecture ensures the two AIS receivers working in redundancy, i.e. if one receiver is interfered, the other receiver will still be operational.
- Even one AIS channel is blocked due to interference by spurious radio signals, the transceiver still can transmit on alternate AIS channel. That is to say the transmission can be maintained even in noisy environment in such "worse-case" scenario which TÜV test report may imply.

ANNEX LIST

A.1 IEC 62287-1 Ed.2, Clause 11.2.4 Adjacent Channel Selectivity
A.2 IEC 62287-1, Ed.2, Clause 11.2.5 Spurious Response Rejection

B.1 BSH Certificate (German National Type Examination) Product: AMEC Camino-108

C.1 Test Report by Phoenix Testlab on “Adjacent Channel Selectivity”, EUT: AMEC Camino-108
C.2 Test Report by Phoenix Testlab on “Spurious Response Rejection”, EUT: AMEC Camino-108

D.1 Test Report by TÜV on “Spurious Response Rejection”, EUT: **SRT Class B (NAIS-400 & B100)**
D.2 Test Report by TÜV on “Spurious Response Rejection”, EUT: **SRT AIS Device**

E.1 VHF Radio Channel List (source: ICOM)

F.1 Test Report by Alltek on “Spurious Response Rejection”, EUT: **SRT Class B (NAIS-400 & B100)**

Annex A.1

IEC STANDARD SPECIFICATIONS

IEC 62287-1 Ed.2, Clause 11.2.4 Adjacent Channel Selectivity

11.2.4 Adjacent channel selectivity

11.2.4.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal which differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended.

11.2.4.2 Method of measurement

The measurement procedure shall be as follows:

a) The measurement configuration for co-channel rejection (11.2.3) shall be used.

b) The wanted signal, provided by signal generator A, shall be at the nominal frequency of the receiver and shall be modulated to generate test signal number 5.

c) The unwanted signal, provided by generator B, shall be frequency modulated with a 400 Hz sine wave giving a deviation of ±3 kHz. Generator B shall be at a frequency 25 kHz above that of the wanted signal.

d) The level of the wanted signal from generator A shall be adjusted to a level of –101 dBm.

e) The level of the unwanted signal from generator B shall be adjusted to –31 dBm.

f) The message measuring test set shall be monitored and the packet error rate observed.

g) The above measurement shall be repeated with the unwanted signal 25 kHz below the wanted signal.

h) The test shall be carried out on the lowest TDMA frequency declared by the manufacturer and AIS 2 (162,025 MHz).

11.2.4.3 Required results

The PER shall not exceed 20 %.

Annex A.2

IEC STANDARD SPECIFICATIONS

IEC 62287-1 Ed. 2, Clause 11.2.5 Spurious Response Rejection

11.2.5 Spurious response rejection

11.2.5.1 Definition

The spurious response rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal at any other frequency, at which a response is obtained.

11.2.5.2 Manufacturer's declarations

The manufacturer shall declare the following in order to calculate the "limited frequency range" over which the initial part of the test will be performed:

- list of intermediate frequencies (IF_1, IF_2, ...IF_N) in Hz;
- switching range of the receiver;

  NOTE 1 The switching range corresponds to the frequency range over which the receiver can be tuned.
- frequency of the local oscillator at AIS 2 (f_{LOH}) and at the lowest TDMA channel (f_{LOL}).

  NOTE 2 This can be a VCO, crystal, sampling clock, BFO, numerically controlled oscillator depending on the design of the equipment.

11.2.5.3 Introduction to the method of measurement

The initial evaluation of the unit shall be performed over the "limited frequency range" and shall then be performed at the frequencies identified from this test and at "specific frequencies of interest" (as defined below).

To determine the frequencies at which spurious responses can occur, the following calculations shall be made.

a) Calculation of the "limited frequency range"

The limits of the limited frequency range (LFR_{HI} LFR_{LO}) are determined by the following calculations:

$$LFR_{HI} = f_{LOH} + (IF_1 + IF_2 + \ldots + IF_N + sr/2)$$

$$LFR_{LO} = f_{LOL} - (IF_1 + IF_2 + \ldots + IF_N + sr/2)$$

b) Calculation of specific frequencies of interest (SFI) outside the limited frequency range

These are determined by the following calculations:

$$SFI_1 = (K \times f_{LOH}) \pm IF_1$$

$$SFI_2 = (K \times f_{LOL}) \pm IF_1$$

where K is an integer from 2 to 4.

11.2.5.4 Method of measurement over the limited frequency range

11.2.5.4.1 General

Two methods are available for the measurements over the limited frequency range, one based on SINAD measurements (A) and the other based on *PER* measurements (B). Either method may be used, but in each case shall be followed by the method of measurement at identified frequencies.

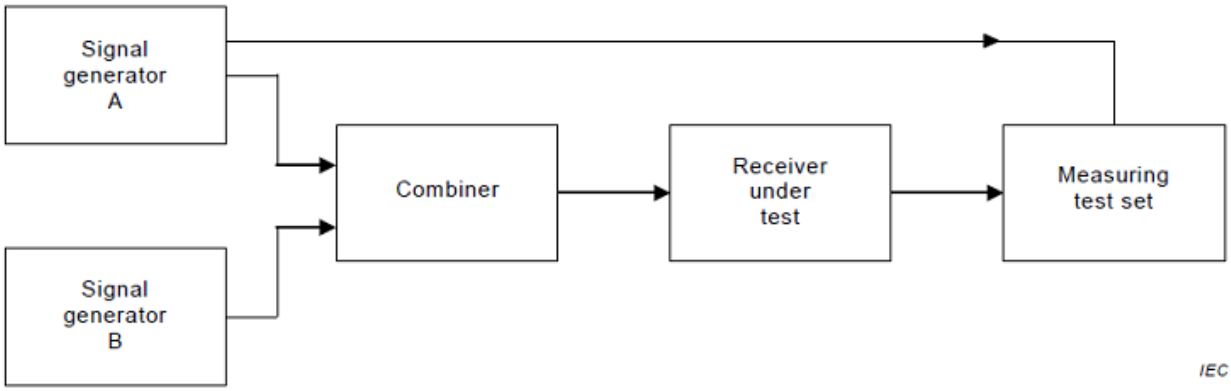


Figure 14 – SINAD or PER/BER measuring equipment

11.2.5.4.2 A) Method of search over the "limited frequency range" using SINAD measurement

For the SINAD measurement, proceed as follows.

a) Two generators A and B shall be connected to the receiver via a combining network (see Figure 14).

   The wanted signal, provided by generator A, shall be at AIS 2 and shall be modulated with 1 kHz sine wave at ±2,4 kHz deviation.

   The unwanted signal, provided by generator B, shall be frequency modulated with a 400 Hz sine wave giving a deviation of ±3 kHz.

b) Initially, generator B (unwanted) shall be switched off (maintaining the output impedance).

   The signal level from generator A (wanted) shall be adjusted to –101 dBm at the receiver.

   The SINAD value shall be noted (and should be greater than 14 dB).

c) Signal generator B shall be switched on and adjusted to –27 dBm at the receiver.

d) The frequency of the unwanted signal shall be varied in steps of 5 kHz over the limited frequency range (from LFR_{LO} to LFR_{HI}).

e) The frequency of any spurious response detected (by an decrease in SINAD of 3 dB or more) during the search shall be recorded for use in the next measurements.

f) Set the receiving frequency to the lowest frequency and repeat the test.

11.2.5.4.3 B) Method of search over the "limited frequency range" using PER or BER measurement

For PER or BER measurement, proceed as follows.

a) Two generators A and B shall be connected to the receiver via a combining network (see Figure 14).

The wanted signal, provided by generator A, shall be at AIS 2 and shall be modulated to generate test signal number 5.

The unwanted signal, provided by generator B, shall be frequency modulated with a 400 Hz sine wave giving a deviation of ±3 kHz.

b) Initially, generator B (unwanted) shall be switched off (maintaining the output impedance).

The signal level from generator A (wanted) shall be adjusted to –101 dBm at the receiver.

The PER or BER shall be noted.

c) Signal generator B shall be switched on and adjusted to –27 dBm at the receiver.

d) The frequency of the unwanted signal shall be varied in steps of 5 kHz over the limited frequency range (from LFR_{LO} to LFR_{HI}).

e) The frequency of any spurious response detected (by an increase in either PER or BER) during the search shall be recorded for use in the next measurements.

f) Set the frequency to the lowest frequency and repeat the test.

g) In the case where operation using a continuous packet stream is not possible a similar method may be used.

11.2.5.5 Method of measurement (at identified frequencies)

Proceed as follows.

a) Two generators A and B shall be connected to the receiver via a combining network (see Figure 14).

The wanted signal, provided by generator A, shall be at AIS 2 and shall be modulated to generate test signal number 5.

The unwanted signal, provided by generator B, shall be frequency modulated with a 400 Hz sine wave giving a deviation of ±3 kHz. Generator B shall be at the frequency of that spurious response being considered.

b) Initially, generator B (unwanted) shall be switched off (maintaining the output impedance).

The signal level from generator A (wanted) shall be adjusted –101 dBm at the receiver.

c) Generator B shall be switched on, and the level of the unwanted signal set to –31 dBm.

d) For each frequency noted during the tests over the limited frequency range and the specific frequencies of interest (SFI_1), transmit 200 packets to the EUT and note the PER.

e) Set the receiving frequency to the lowest and repeat the test for each frequency noted during the tests over the limited frequency range on the lowest frequency and the specific frequencies of interest (SFI_2).

11.2.5.6 Required results

At any frequency separated from the nominal frequency of the receiver by two channels or more, the spurious responses shall not result in a PER of greater than 20 %.

Annex B.1

BSH Certificate (German National Type Examination)

Certified Product: AMEC Camino-108

Bundesrepublik Deutschland

Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie

Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Baumusterprüfbescheinigung

Type examination certificate no.

Nr. BSH/4542/001/4322516/13

Die Navigationsausrüstung **AIS Class B**
The navigation equipment:

mit der Typbezeichnung **Camino-108/108W**
with the type designation

des Herstellers **Alltek Marine Electronics Corp.**
of the manufacturer **7F, NO.605 Ruei-Guang Rd. Neihu District**
Taipei 11492
TAIWAN

zusätzliche Handelsnamen
additional trade names

ist nach den folgenden Normen/Standards geprüft worden:
has been type-tested in accordance with the following standards:

Norm/Standard	Prüfnorm/Test Standard
IMO MSC. 74 (69) Annex 3 [1]	IEC 60945 Ed.4.0, 2002 [2]
ITU-R M. 825-3, 1998	IEC 61108-1 Ed.2.0, 2003 [2]
ITU-R M. 1084-5, 2012	IEC 61162-1 Ed.4.0, 2010 [2]
ITU-R M. 1371-4, 2010 [1]	IEC 61162-2 Ed.1.0, 1998 [2]
	IEC 62287-1 Ed.2.0, 2010, Am1 Ed.2.0

[1] *as relevant to AIS Class B*

[2] *Limited to requirements of IEC 62287-1*

und wird für den Antragsteller **Alltek Marine Electronics Corp.**
and has been approved for the applicant

für den nachstehenden Verwendungszweck zugelassen: **AIS Class B**
for the following application:

Die Zulassung berechtigt zur Anbringung der Baumusternummer (Nr. der Baumusterprüfbescheinigung).
With the approval it is granted, that the equipment can be labelled with the type approval number (no. of the Type examination certificate).

Ausgabedatum: 2013-10-22
Date of issue:

Ausgegeben durch: **Bundesamt für Seeschifffahrt und Hydrographie**
Issued by: **Bernhard-Nocht-Str. 78, 20359 Hamburg**
Germany

Ablaufdatum: 2018-10-21
Expiry date:

Dienstsiegel
Official seal

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE 10

Im Auftrag
For the Federal Maritime and Hydrographic Agency
Ralf-Dieter Preuß

Diese Baumusterprüfbescheinigung besteht aus 2 Seiten.
This Type examination certificate consists of 2 pages.

Annex C.1
TEST REPORT by Phoenix Testlab
On “Adjacent Channel Selectivity”
EUT: AMEC Camino-108

PHOENIX TESTLAB

TEST REPORT REFERENCE: F130840E1

6.4 ADJACENT CHANNEL SELECTIVITY — SUBCLAUSE 11.2.4

Ambient temperature	20 °C	Relative humidity	45 %

Operation mode: Receive in AIS mode
Wanted signal: P = -101 dBm
Unwanted signal: Modulated with 400 Hz / 3 kHz deviation, P = -31 dBm

TEMPERATURE	VOLTAGE	WANTED SIGNAL	UNWANTED SIGNAL	SIGNAL RATIO	PACKET ERROR RATE
T_{nom} (+20°C)	U_{nom} (12.0 V DC)	156.025 MHz	156.000 MHz	70 dB	13.7%
			156.050 MHz	70 dB	14.2%
		162.025 MHz	162.000 MHz	70 dB	7.3%
			162.050 MHz	70 dB	0.7%
Measurement uncertainty				+ 0.8 dB / - 0.9 dB	

LIMITS: SUBCLAUSE 11.2.4.3

The maximum PER shall not exceed 20%.

Annex C.2
TEST REPORT by Phoenix Testlab
On “Spurious Response Rejection”
EUT: AMEC Camino-108

PHOENIX TESTLAB

TEST REPORT REFERENCE: F130840E1

6.5 SPURIOUS RESPONSE REJECTION — SUBCLAUSE 11.2.5

Ambient temperature	20 °C	Relative humidity	45 %

Operation mode: Receive in AIS-mode, Channel A = 156.025 MHz (1st LO-Freq. = 134.625 MHz)
Wanted signal: P = -101 dBm
Unwanted signal: Modulated with 400 Hz / 3 kHz deviation, P = -27 dBm

DEFINITION IF	UNWANTED FREQUENCY	MEASSURED PACKET ERROR RATE
1st IF	21.4 MHz	0.7%
1st LO-Freq. - IF	113.225 MHz	0.9%
2 x 1st LO-Freq. – IF	247.850 MHz	0.1%
2 x 1st LO-Freq. + IF	290.650 MHz	0.5%
3 x 1st LO-Freq. – IF	382.475 MHz	0.7%
3 x 1st LO-Freq. + IF	425.275 MHz	1.1%
4 x 1st LO-Freq. – IF	517.100 MHz	0.2%
4 x 1st LO-Freq. + IF	599.900 MHz	0.0%
-	No other spurious response rejection frequencies found.	-
-		-
-		-
Measurement uncertainty		+ 0.8 dB / - 0.9 dB

Remark:
An additional frequency sweep of the unwanted signal generator was carried out to make sure that there are no other unwanted frequencies not calculated according to the table above.

Continued next page:

Continued:

Operation mode: Receive in AIS-mode, Channel B = 162.025 MHz (1st LO-Freq. = 140.625 MHz)
Wanted signal: P = -101 dBm
Unwanted signal: Modulated with 400 Hz / 3 kHz deviation, P = -27 dBm

DEFINITION IF	UNWANTED FREQUENCY	MEASSURED PACKET ERROR RATE
1st IF	21.4 MHz	1.4%
1st LO-Freq. - IF	119.225 MHz	1.3%
2 x 1st LO-Freq. – IF	259.850 MHz	1.4%
2 x 1st LO-Freq. + IF	302.650 MHz	0.6%
3 x 1st LO-Freq. – IF	400.475 MHz	1.2%
3 x 1st LO-Freq. + IF	443.275 MHz	0.1%
4 x 1st LO-Freq. – IF	541.100 MHz	0.2%
4 x 1st LO-Freq. + IF	583.900 MHz	0.6%
-	No other spurious response rejection frequencies found.	-
-		-
-		-
Measurement uncertainty		+ 0.8 dB / - 0.9 dB

Remark:
An additional frequency sweep of the unwanted signal generator was carried out to make sure that there are no other unwanted frequencies not calculated according to the table above.

LIMITS: SUBCLAUSE 11.2.5.6

At any frequency separated from the specified frequency of the receiver by 50 kHz or more, the PER shall not exceed 20%.

Annex D.1

TEST REPORT by TÜV

On “Spurious Response Rejection”

EUT: **SRT Class B (B100 series)**

Product Service

2.10 TDMA RECEIVER – SPURIOUS RESPONSE REJECTION

2.10.1 Specification Reference

IEC 62287-1, Clause 11.2.5

2.10.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.10.3 Date of Test and Modification State

25 January 2011 - Modification State 1

2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.10.5 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	29%

2.10.6 Test Results

12 V DC Supply

Wanted: Test Signal Number 5

Spurious Responses (MHz)	Ratio (dB)	
	Lowest Transmit Frequency	AIS 2
	156.025 MHz	162.025 MHz
Measurement uncertainty (dB)	± 3.62	

No spurious responses were found yielding a BER> 20%

Limit Clause 11.2.5.6

At any frequency separated from the nominal frequency of the receiver by two channels or more, the spurious responses shall not result in a PER of greater than 20 %.

Annex D.2

TEST REPORT by TÜV

On “Spurious Response Rejection”

EUT: SRT AIS Device

Product Service

2.5 SPURIOUS RESPONSE REJECTION

2.5.1 Specification Reference

IEC 62320-2, Clause 7.1.2.5

2.5.2 Equipment Under Test and Modification State

Carbon S/N: P216FTU021 – TUV TSR Reference 0033 - Modification State 0

2.5.3 Date of Test

16 January 2013, 17 January 2013 & 04 March 2013

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions

Ambient Temperature	22.4 - 24.9°C
Relative Humidity	20.2 - 24.7%

2.5.6 Test Results

The level of the wanted signal from generator A shall be adjusted to -101 dBm for a Type 3 device and to -91 dBm for a Type 2 device.

Signal generator B shall be switched on, and the level of the unwanted signal set to -31 dBm.

RX1

12 V DC Supply

Test Signal Number 3

162.000 MHz*

*Manufacturer’s specified receiver frequencies did not include 161,975 MHz. 162,000 MHz was used as an alternative.

Spurious Response Frequency (MHz)	PER (%)
-	-

No responses were detected.

The manufacturer declared the following infomation in order to calculate the limited frequency range:

IF_1 = 19.655MHz
IF_2 = 0.455MHz

Switching Range = 6MHz
F_{LO} is low side, RF – IF_1, where RF is 156.025MHZ to 162.025MHz

LFR_{LO} = 113.26MHz
LFR_{HI} = 165.48MHz

The frequencies where a reduction in SINAD of 3dB or more were detected as follows from the limited frequency search:

152.175MHz, 153.145MHz, 153.230MHz, 154.055MHz, 156.455MHz, 157.365MHz, 157.615MHz, 158.445MHz, 161.090MHz, 162.825MHz.

The following specific frequencies of interest were calculated for RF = 162.000MHz:

F_{LO} = 162.000MHz – 19.655MHz = 142.345MHz.

265.035MHz, 304.345MHz, 407.380MHz, 446.690MHz, 549.725MHz, 589.035MHz

Limit Clause 7.1.2.5.8

At any frequency separated from the specified frequency of the receiver by 50 kHz or more, the PER shall not exceed 20%.

RX2

12 V DC Supply

Test Signal Number 3

162.000 MHz*

*Manufacturer's specified receiver frequencies did not include 161,975 MHz. 162,000 MHz was used as an alternative.

Spurious Response Frequency (MHz)	PER (%)
-	-

No responses were detected.

The manufacturer declared the following infomation in order to calculate the limited frequency range:

IF_1 = 29.255MHz
IF_2 = 0.455MHz
Switching Range = 6MHz
F_{LO} is high side, RF – IF_1, where RF is 156.025MHZ to 162.025MHz

LFR_{LO} = 152.57MHz
LFR_{HI} = 223.99MHz

The frequencies where a reduction in SINAD of 3dB or more were detected as follows from the limited frequency search:

157.615MHz, 161.255MHz, 162.745MHz, 162.910MHz.

The following specific frequencies of interest were calculated for RF = 162.000MHz:

F_{LO} = 162.000MHz + 29.255MHz = 191.255MHz.

353.255MHz, 411.765MHz, 544.510MHz, 603.020MHz, 735.765MHz, 794.275MHz

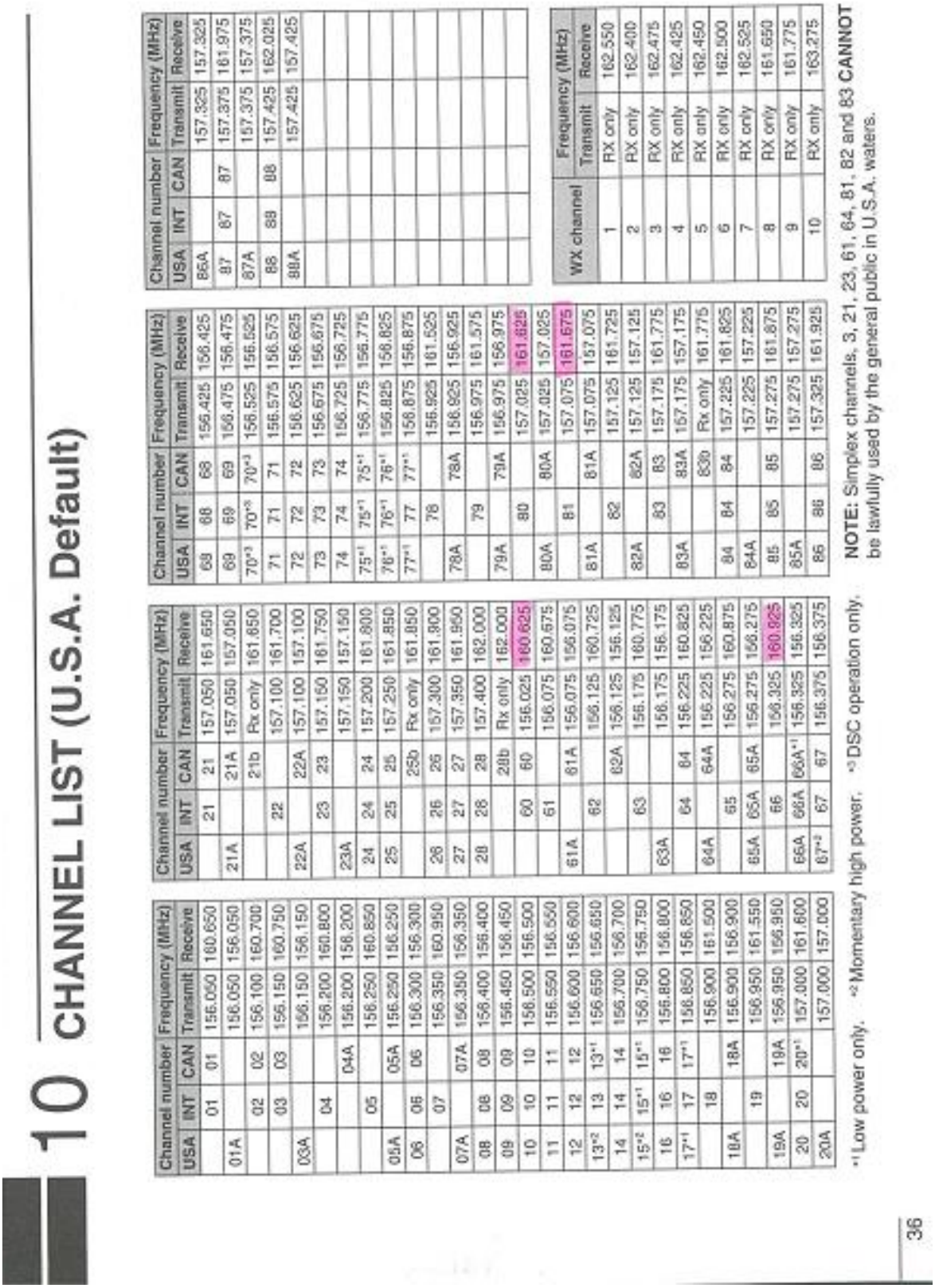
Limit Clause 7.1.2.5.8

At any frequency separated from the specified frequency of the receiver by 50 kHz or more, the PER shall not exceed 20%.

Annex E.1

VHF Radio (DSC) Channel List

Source: ICOM



10 CHANNEL LIST (U.S.A. Default)

Channel number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive
	01	01	156.050	160.650
01A			156.050	156.050
	02	02	156.100	160.700
	03	03	156.150	160.750
03A			156.150	156.150
	04		156.200	160.800
		04A	156.200	156.200
	05		156.250	160.850
05A		05A	156.250	156.250
06	06	06	156.300	156.300
	07		156.350	160.950
07A		07A	156.350	156.350
08	08	08	156.400	156.400
09	09	09	156.450	156.450
10	10	10	156.500	156.500
11	11	11	156.550	156.550
12	12	12	156.600	156.600
13[*2]	13	13[*1]	156.650	156.650
14	14	14	156.700	156.700
15[*2]	15	15[*1]	156.750	156.750
16	16	16	156.800	156.800
17[*1]	17	17[*1]	156.850	156.850
	18		156.900	161.500
18A		18A	156.900	156.900
	19		156.950	161.550
19A		19A	156.950	156.950
20	20	20[*1]	157.000	161.600
20A			157.000	157.000

Channel number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive
	21	21	157.050	161.650
21A		21A	157.050	157.050
		21b	Rx only	161.850
	22		157.100	161.700
22A		22A	157.100	157.100
	23	23	157.150	161.750
23A			157.150	157.150
24	24	24	157.200	161.800
25	25	25	157.250	161.850
		25b	Rx only	161.850
26	26	26	157.300	161.900
27	27	27	157.350	161.950
28	28	28	157.400	162.000
		28b	Rx only	162.000
	60	60	156.025	160.625
	61		156.075	160.675
61A		61A	156.075	156.075
	62		156.125	160.725
		62A	156.125	156.125
	63		156.175	160.775
63A			156.175	156.175
	64	64	156.225	160.825
64A		64A	156.225	156.225
	65		156.275	160.875
65A	65A	65A	156.275	156.275
	66		156.325	160.925
66A	66A	66A[*1]	156.325	156.325
67[*2]	67	67	156.375	156.375

Channel number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive
69	68	68	156.425	156.425
69	69	69	156.475	156.475
70[*3]	70[*5]	70[*3]	156.525	156.525
71	71	71	156.575	156.575
72	72	72	156.625	156.625
73	73	73	156.675	156.675
74	74	74	156.725	156.725
75[*1]	75[*1]	75[*1]	156.775	156.775
76[*1]	76[*1]	76[*1]	156.825	156.825
77[*1]	77	77[*1]	156.875	156.875
	78		156.925	161.525
78A		78A	156.925	156.925
	79		156.975	161.575
79A		79A	156.975	156.975
	80		157.025	161.625
80A		80A	157.025	157.025
	81		157.075	161.675
81A		81A	157.075	157.075
	82		157.125	161.725
82A		82A	157.125	157.125
	83	83	157.175	161.775
83A		83A	157.175	157.175
		83b	Rx only	161.775
84	84	84	157.225	161.825
84A			157.225	157.225
85	85	85	157.275	161.875
85A			157.275	157.275
86	86	86	157.325	161.925

Channel number			Frequency (MHz)	
USA	INT	CAN	Transmit	Receive
86A			157.325	157.325
87	87	87	157.375	161.975
87A			157.375	157.375
88	88	88	157.425	162.025
88A			157.425	157.425

WX channel	Frequency (MHz)	
	Transmit	Receive
1	RX only	162.550
2	RX only	162.400
3	RX only	162.475
4	RX only	162.425
5	RX only	162.450
6	RX only	162.500
7	RX only	162.525
8	RX only	161.650
9	RX only	161.775
10	RX only	163.275

[*1]Low power only. [*2]Momentary high power. [*3]DSC operation only.

NOTE: Simplex channels, 3, 21, 23, 61, 64, 81, 82 and 83 **CANNOT** be lawfully used by the general public in U.S.A. waters.

36

Annex F.1
TEST REPORT by Alltek
On “Spurious Response Rejection”

EUT: SRT AIS Class B (NAIS-400 & B100)

Spurious Response Rejection tests on SRT/Em-trak B100 and NAIS-400 Units

1) Specification Reference
IEC 62287-1 edition 2 2010-11, clause 11.2.5

2) EUT
EUT-1: **NAIS-400**, S/N: 42100024530114 (produced by SRT)
EUT-2: **Em-trak B100**, S/N: 41100022860051 (produced by SRT)

3) Test performed on RX2 at 162.025 MHz

Wanted signal: 162.025 MHz
Unwanted signal (spurious signal): various spurious signals are tested

4) TEST RESULTS

4.1) Test result of EUT1: NAIS-400, **failed at the following spurious frequency**

Spurious Response Frequency (MHz)	PER (%)
161.970	81.33

4.2) Test result of EUT-2: Em-trak B100, **failed at the following spurious frequency**

Spurious Response Frequency (MHz)	PER (%)
161.970	100

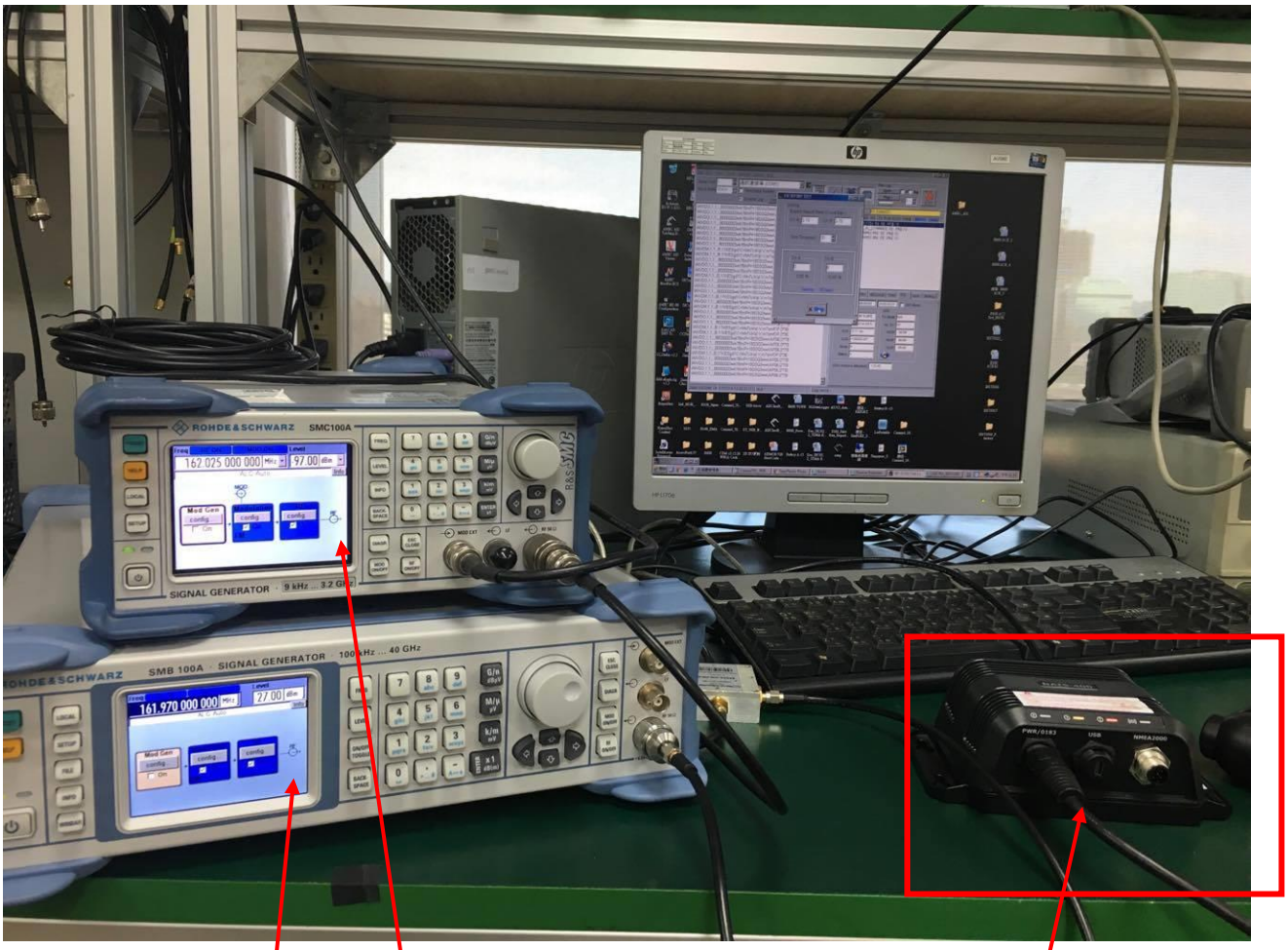
5) Required Results (as defined in IEC 62287-1 clause 11.2.5.6)
At any frequency separated from the nominal frequency of the receiver by two channels or more, the spurious responses shall not result in a PER of greater than 20 %.

6) TEST SUMMARY

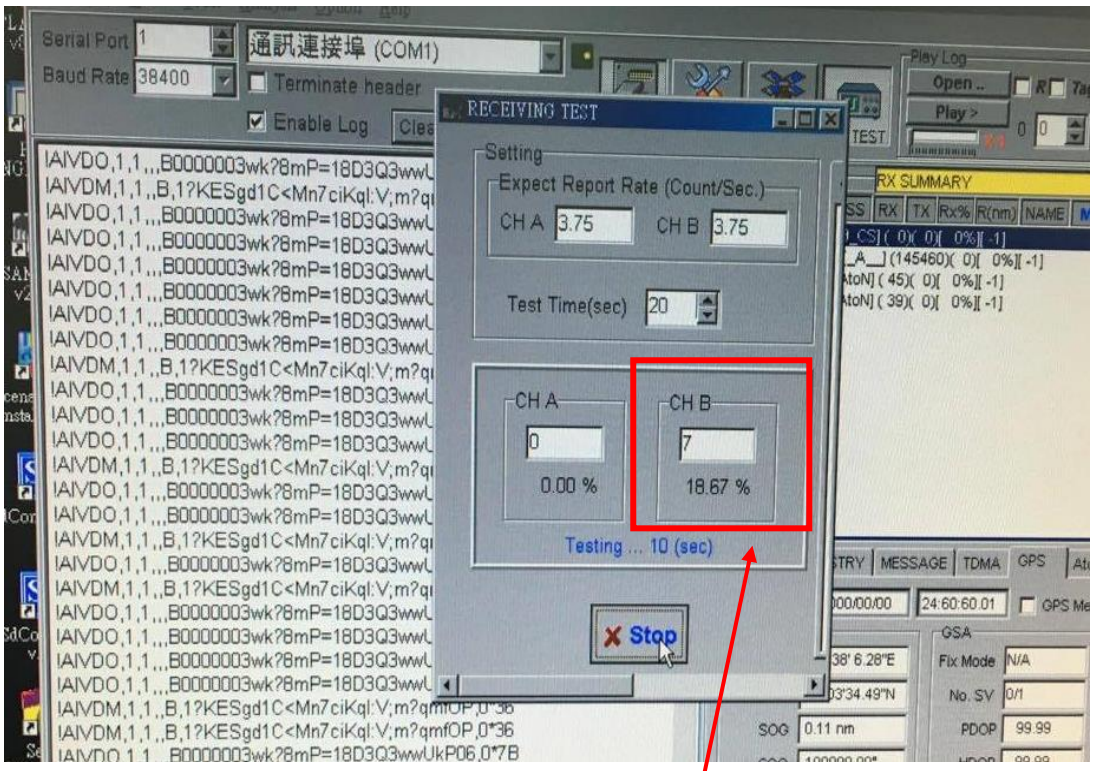
Both EUT-1 (Navico NAIS-400 produced by SRT) and EUT-2 (SRT Em-trak B100) are not fully comply with IEC 62287-1 clause 11.2.5.6.

7) Test Setup & Photos

7.1) Test conducted on EUT-1 NAIS-400 (produced by SRT)

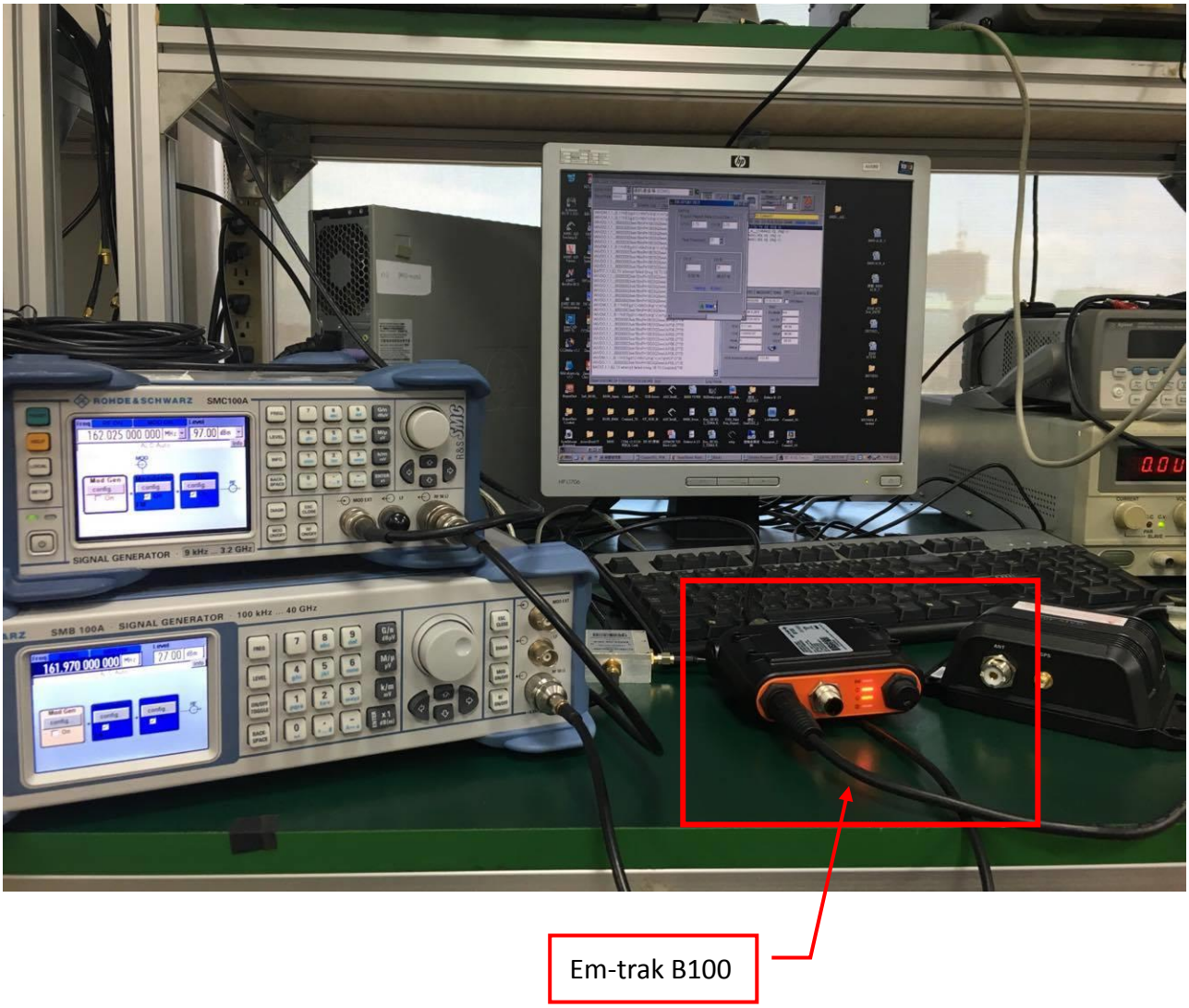


7.2) Test result screenshot of EUT-1 (NAIS 400) testing

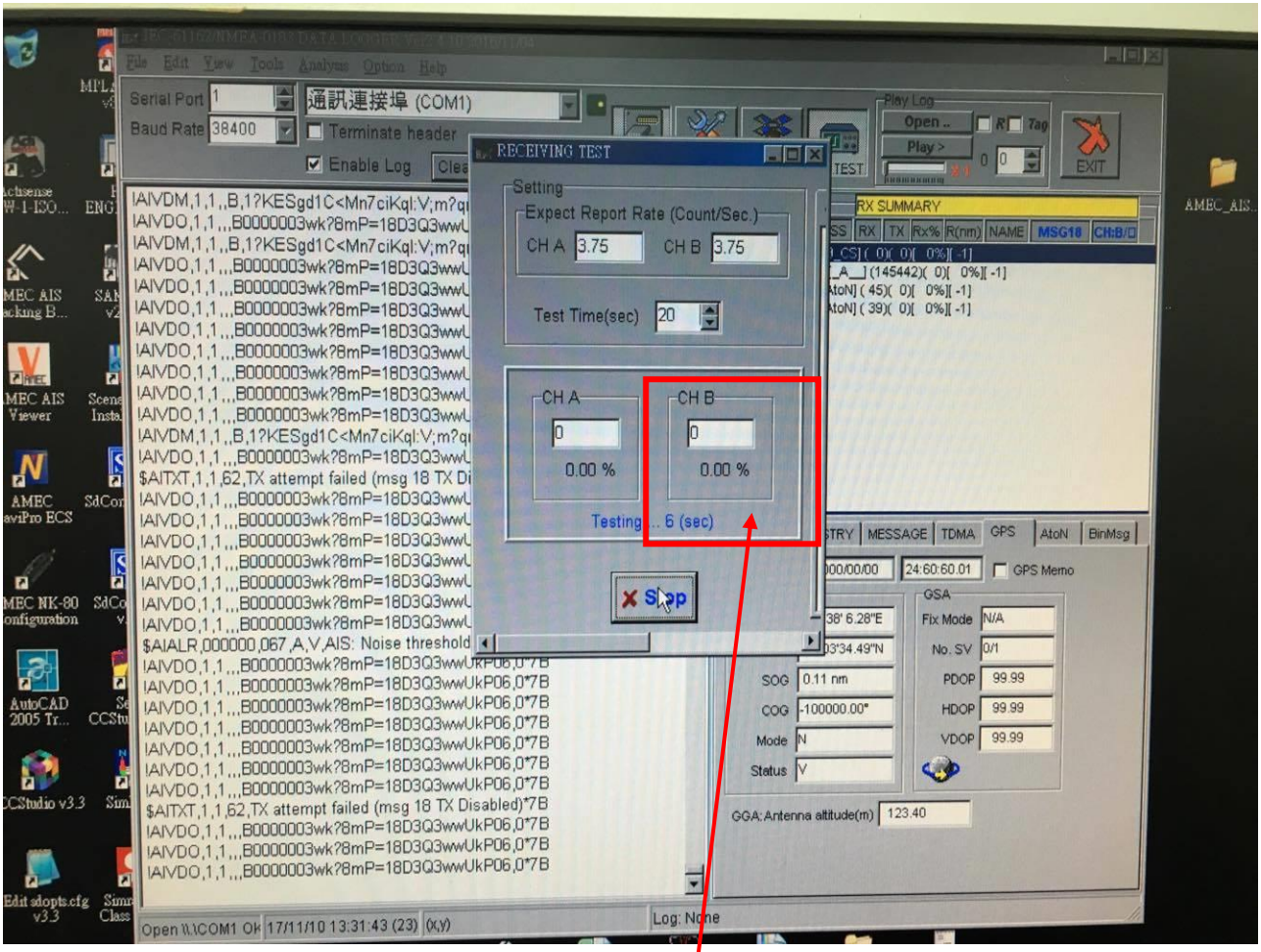


RX2 (CH B) PER = 100%-18.67% = 81.33%

7.3) Test conducted on EUT-2 (Em-trak B100 Class B)



7.4) Test result screenshot of EUT-2 (Em-trak B100) testing



8) **Test equipment list**

Equipment	Model	Remark
RF signal Generator	Rohde & Schwarz SMC100A 9KHz to 3.2G	
AIS Message simulator		
RF signal Generator	Rohde & Schwarz SMB100A 9KHz to 3.2G	
Power combiner	Mini-circuit ZA3CS-400-3W-S	
DC power supply	GW INSTAK GPC-3060D	