




## Test Report

<b>Product</b>	AIS-300
<b>Name and address of the applicant</b>	Kongsberg Seatex, Pirsenteret NO-7462 Trondheim, Norway
<b>Name and address of the manufacturer</b>	Kongsberg Seatex, Pirsenteret NO-7462 Trondheim, Norway
<b>Model</b>	AIS-300
<b>Rating</b>	12-24 VDC
<b>Trademark</b>	AIS-300
<b>Serial number</b>	AIS300-141020
<b>Additional information</b>	-
<b>Tested according to</b>	<b>Parts of:</b> <b>IEC61993-2: 2012-10, ed 2.0 Ch 15 Physical radio tests</b> Maritime navigation and radiocommunication equipment and systems - Automatic identification system (AIS) -Part 2: Class A shipborne equipment of the automatic identification system (AIS) Operational and performance requirements, methods of test and required test results
<b>Order number</b>	274308
<b>Tested in period</b>	2014-11-25 – 2014-11-26; 2015-03-04;2016-11-23
<b>Issue date</b>	2016-11-23
<b>Name and address of the testing laboratory</b>	  Instituttveien 6 Kjeller, Norway TEL: (+47) 22 96 03 30 FAX: (+47) 22 96 05 50
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">             Prepared by [Jan G Eriksen]         </div> <div style="text-align: center;">             Approved by [ G.Suhanthakumar]         </div> </div>	

## CONTENTS

<b>1</b>	<b>GENERAL INFORMATION .....</b>	<b>3</b>
1.1	Revision history .....	3
<b>2</b>	<b>TEST INFORMATION.....</b>	<b>3</b>
2.1	Tested Item .....	3
2.2	Test Environment .....	4
2.3	Test Period .....	4
2.4	Test Engineers .....	4
2.5	Test Equipment .....	4
2.6	Other Comments .....	4
<b>3</b>	<b>TEST REPORT SUMMARY .....</b>	<b>5</b>
3.1	General.....	5
3.2	Test Summary .....	6
<b>4</b>	<b>TEST RESULTS .....</b>	<b>7</b>
4.1	Frequency Error                      Clause 15.1.1 .....	7
4.2	Carrier Power                        Clause 15.1.2.....	9
4.3	Modulation Accuracy                Clause 15.1.4 .....	10
4.4	Sensitivity                            Clause 15.2.1 .....	11
4.5	Error behaviour at high input signal level                      Clause 15.2.2 .....	12
4.6	Co-channel rejection                Clause 15.2.3.....	13
4.7	Adjacent-channel selectivity        Clause 15.2.4 .....	14
4.8	Spurious response rejection        Clause 15.2.5.....	15
4.9	Intermodulation response rejection and blocking                Clause 15.2.6 .....	16
4.10	Spurious emissions from the receiver                      Clause 15.3.2 .....	17
4.11	Maximum sensitivity                Clause D.2.1 .....	18
4.12	Error behaviour at high input signal level                      Clause D.2.2.....	19
4.13	Co-Channel rejection                Clause D.2.3 .....	20
4.14	Adjacent channel selectivity        Clause D.2.4 .....	21
4.15	Spurious response rejection        Clause D.2.5 .....	22
4.16	Intermodulation response rejection                      Clause D.2.6.....	23
4.17	Blocking or desensitisation        Clause D.2.7 .....	24
4.18	Spurious emissions from the receiver                      Clause D.2.8.....	25
<b>5</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>26</b>
<b>6</b>	<b>PHOTOGRAPHS OF THE EUT.....</b>	<b>27</b>
<b>7</b>	<b>TEST EQUIPMENT USED.....</b>	<b>30</b>
<b>8</b>	<b>ANNEX 1 – MEASUREMENT PLOTS .....</b>	<b>31</b>
8.1	Receiver Spurious emissions.....	31

## 1 GENERAL INFORMATION

### 1.1 Revision history

Revision #	Date	Order #	Description
00	2014-02-11	253637	First issued
01	2014-11-26	253637	Corrections
02	2016-11-26	253637	Added frequency error checks for extreme temperatures

## 2 Test Information

### 2.1 Tested Item

Name :	AIS-300
Model/version :	AIS-300
Serial number :	AIS300-141020
Hardware identity and/or version:	P/N A300-01
Software identity and/or version :	FPGA-driver v0.4.4 Ais_algo v0.4.7
Frequency Range :	156 – 163 MHz
Tunable Bands :	/
Number of Channels :	2 (156.025MHz and 162.025MHz), DSC (156.525 MHz)
Operating Modes :	Transceiver
Type of Modulation :	GMSK/FSK
Emissions Designator :	/
User Frequency Adjustment :	None
Rated Output Power :	100mW, 1W & 12.5W
Type of Power Supply :	12-24 VDC
Antenna Connector :	Yes
Antenna Diversity Supported :	/
Desktop Charger :	/

#### Description of Tested Device(s)

AIS terminal.

## 2.2 Test Environment

### 2.2.1 Normal test condition

Temperature:	20.8 – 21.9 °C
Relative humidity:	29.3 – 43 %
Normal test voltage:	18 VDC and 24 VDC

The values are the limit registered during the test period.

### 2.2.2 Extreme test conditions

*The EUT has been tested under the following extreme test conditions:*

*Temperature: -20 to +50, -15 and +55 degrees Centigrade*

*Voltage: 27.6, 20.4, 10.8 and 32.2 Volts DC*

## 2.3 Test Period

Item received date: 2014-11-25

Test period : 2014-11-25 – 2014-11-26 and 2015-03-08 and 2016-11-23

## 2.4 Test Engineers

Jan G Eriksen

Bjørn Nordset

## 2.5 Test Equipment

See list of test equipment in clause 7.

The Rohde & Schwarz spectrum analyser (No 1 in list) has been used for all level, frequency, and deviation measurements.

## 2.6 Other Comments

The manufacturer's representative was present during all tests to monitor BER (Bit Error Rate) and PER (Packet error rate), to select the frequencies, to set-up communication, and perform reading of system performance.

### 3 TEST REPORT SUMMARY

#### 3.1 General

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with the following specification:

**IEC 61993-2: 2012-10, Edition 2.0:** Maritime navigation and radiocommunication equipment and systems – Automatic identification systems (AIS) Part 2: Class A shipborne equipment of the automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results .

The test methods have been in accordance with Comlab 1003 where applicable.  
All tests have been performed conducted.

- Production Unit
- Pre-production Unit



**THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.**

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

Nemko Group authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report.

### 3.2 Test Summary

The tests listed below had been tested according to IEC 61993-2 (2012).

Relevant IEC 61993-2 Clause	IEC 61993-2 Test description	Verdict
15.1 TDMA Transmitter		
15.1.1	Frequency error	Pass
15.1.2	Carrier power	Pass
15.1.4	Transmitter modulation accuracy	Pass
15.2 TDMA Receivers		
15.2.1	Sensitivity	Pass
15.2.2	Error behaviour at high input levels	Pass
15.2.3	Co-channel rejection for	Pass
15.2.4	Adjacent channel selectivity	Pass
15.2.5	Spurious response rejection	Pass
15.2.6	Intermodulation response rejection and blocking	Pass
15.3.2	Spurious emissions from the receiver	Pass
D.2.1	Maximum Sensitivity	Pass
D.2.2	Error behaviour at high input levels	Pass
D.2.3	Co-Channel rejection	Pass
D.2.4	Adjacent channel selectivity	Pass
D.2.5	Spurious response rejection	Pass
D.2.6	Intermodulation response rejection	Pass
D.2.7	Blocking or desensitization	Pass
D.2.8	Conducted spurious from receiver	Pass

**Note:**

**Pass** Passed, the equipment fulfils the requirement

**Fail** Failed, the equipment does not fulfil the requirement

**NA** Not applicable, the requirement is not applicable

**NT** Not tested, the test is not performed even though the requirement is relevant

## 4 Test Results

### 4.1 Frequency Error

#### Clause 15.1.1

The transmitter was set to 156.025 and 162.025 MHz respectively. The output power was set to nominal power level.

**Required results:**      **Normal test conditions:**  $\pm 0.5$  kHz  
**Extreme test conditions:**  $\pm 1.0$  kHz

	Measured Frequency (MHz)		Error (kHz)		Verdict
	156.025	162.025	156.025	162.025	
<b>Nominal Frequency</b>					
<b>Test conditions</b>					
	<b>Normal test conditions</b>				
<b>+24dC, 18V DC</b>	156.025003	162.024993	0.003	-0.007	Pass
	<b>Extreme test conditions</b>				
<b>-15 dC, 10.8V DC</b>	156.024995	162.024995	-0.005	-0.005	Pass
<b>-15 dC, 31.2V DC</b>	156.024995	162.024995	-0.005	-0.005	Pass
<b>+55 dC, 10.8V DC</b>	156.025000	162.024994	0.000	-0.006	Pass
<b>+55 dC, 31.2V DC</b>	156.025000	162.024994	0.000	-0.006	Pass

**Nominal Frequency 156.025 MHz**

Test conditions	Measured Frequency (MHz)	Error (Hz)	Error (ppm)	Verdict
+20 °C, 24V DC +15%	156.0250154	15.4	0.099	Pass
+20 °C, 24V DC -15%	156.0250126	12.6	0.081	Pass
-20 °C, 24V DC	156.0250007	0.7	0.004	Pass
-10 °C, 24V DC	156.0249985	-1.5	-0.010	Pass
0 °C, 24V DC	156.0250090	9.0	0.058	Pass
+10 °C, 24V DC	156.0250155	15.5	0.099	Pass
+20 °C, 24V DC	156.0250140	14.0	0.090	Pass
+30 °C, 24V DC	156.0250067	6.7	0.043	Pass
+40 °C, 24V DC	156.0250039	3.9	0.025	Pass
+50 °C, 24V DC	156.0250035	3.5	0.022	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**



## 4.2 Carrier Power

### Clause 15.1.2

The transmitter was set to 156.025 and 162.025 MHz respectively. The output power was set to nominal power level.

**Required results:**      **Normal test conditions:**     $\pm 1.5$  dB from Nominal Power Level  
                                  **Extreme test conditions:**     $\pm 3.0$  dB from Nominal Power Level

Test conditions	Nominal Frequency (MHz)		Verdict
	156.025	162.025	
<b>41 dBm Nominal Power Level</b>			
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	41.0	40.2	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	38.8	40.1	Pass
<b>-15 dC, 31.2V DC</b>	40.8	40.1	Pass
<b>+55 dC, 10.8V DC</b>	38.9	39.6	Pass
<b>+55 dC, 31.2V DC</b>	40.4	39.6	Pass
<b>30 dBm Nominal Power Level</b>			
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	30.1	29.4	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	29.9	29.2	Pass
<b>-15 dC, 31.2V DC</b>	29.9	29.2	Pass
<b>+55 dC, 10.8V DC</b>	29.5	28.8	Pass
<b>+55 dC, 31.2V DC</b>	29.5	28.8	Pass

**Result: PASS**

**Test Equipment Used: 1 - 10**

### 4.3 Modulation Accuracy

#### Clause 15.1.4

The transmitter was set to 156.025 and 162.025 MHz respectively, and was modulated with test signals TS2 and TS3 on both frequencies. The output power was set to nominal power level.

**Required results:**

**Normal test conditions:** TS2: 1740 ± 175 Hz  
TS3: 2400 ± 240 Hz

**Extreme test conditions:** TS2: 1740 ± 350 Hz  
TS3: 2400 ± 480 Hz

	Measured Deviation (MHz)		Verdict
<b>Nominal Frequency</b>	<b>156.025</b>	<b>162.025</b>	
<b>Test conditions</b>	<b>Test Signal TS2</b>		
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	+1813 / -1804	+1748 / -1770	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	+1806 / -1819	+1760 / -1772	Pass
<b>-15 dC, 31.2V DC</b>	+1885 / -1787	+1747 / -1785	Pass
<b>+55 dC, 10.8V DC</b>	+1850 / -1796	+1776 / -1812	Pass
<b>+55 dC, 31.2V DC</b>	-1797 / +1819	+1758 / -1802	Pass
	<b>Test Signal TS3</b>		
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	+2600 / -2559	+2452 / -2471	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	+2570 / -2600	+2430 / -2480	Pass
<b>-15 dC, 31.2V DC</b>	+2560 / -2620	+2480 / -2430	Pass
<b>+55 dC, 10.8V DC</b>	+2550 / -2360	+2390 / -2410	Pass
<b>+55 dC, 31.2V DC</b>	+2570 / -2560	+2380 / -2410	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**

#### 4.4 Sensitivity

#### Clause 15.2.1

The transmitter was set to 156.025 and 162.025 MHz respectively.

Tests shall be performed on two channels with a input signal level of -107 dBm at nominal frequency and -104 dBm at nominal frequency  $\pm 500$  Hz. The test shall be repeated with -101 dBm under extreme test conditions.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>PER &lt; 20%</b>	
	<b>Extreme test conditions:</b>	<b>PER &lt; 20%</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-107 dBm</b>
	<b>Extreme test conditions:</b>	<b>wanted signal:</b>	<b>-101 dBm</b>

	Transmitted Frequency (MHz)		Verdict
	156.025	156.025 $\pm$ 500 Hz	
	Measured PER (%)		
<b>Test conditions</b>			
	Normal test conditions		
+24dC, 18V DC	0	0	Pass
	Extreme test conditions		
-15 dC, 10.8V DC	0	0	Pass
-15 dC, 31.2V DC	0	0	Pass
+55 dC, 10.8V DC	0	0	Pass
+55 dC, 31.2V DC	0	0	Pass
	162.025	162.025 $\pm$ 500 Hz	
+24dC, 18V DC	0	0	Pass
	Extreme test conditions		
-15 dC, 10.8V DC	0	0	Pass
-15 dC, 31.2V DC	0	0	Pass
+55 dC, 10.8V DC	0	0	Pass
+55 dC, 31.2V DC	0	0	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**

#### 4.5 Error behaviour at high input signal level

#### Clause 15.2.2

The transmitter was set to 156.025 and 162.025 MHz respectively and modulated with test signal number 5. The input signal level at receiver shall be -7 dBm, and the test shall be repeated with a input signal level of -77 dBm.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>PER &lt; 1%</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-7 dBm</b>
		<b>wanted signal:</b>	<b>-77 dBm</b>

**Result: PASS**

**Test Equipment Used: 1 – 10**



## 4.7 Adjacent-channel selectivity

### Clause 15.2.4

The transmitter was set to 156.025 and 162.025 MHz respectively.

The measurement configuration for co-channel rejection (15.2.3) shall be used. 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. The unwanted signal, provided by generator B, shall be frequency modulated with a 400 Hz sine wave giving a deviation of  $\pm 3$  kHz. Generator B shall be at a frequency 25 kHz above that of the wanted signal.

The level of the wanted signal from generator A shall be adjusted to a level of  $-104$  dBm at the receiver. The level of the unwanted signal from generator B shall be adjusted to  $-34$  dBm. The message measuring test set shall be monitored and the packet error rate observed. Repeat the above measurement with the unwanted signal 25 kHz below the wanted signal. The test shall be performed on 2 channels (156,025 MHz, 162,025 MHz) and repeated under extreme conditions with generator A adjusted to  $-98$  dBm and generator B adjusted to  $-38$  dBm

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>PER &lt; 20%</b>	
	<b>Extreme test conditions:</b>	<b>PER &lt; 20%</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-104 dBm</b>
		<b>unwanted signal:</b>	<b>-34 dBm</b>
	<b>Extreme test conditions:</b>	<b>wanted signal:</b>	<b>-98 dBm</b>
		<b>unwanted signal:</b>	<b>-38 dBm</b>

	Transmitted Frequency (MHz)		Verdict
	156.025	162.025	
	<b>Measured PER (%)</b>		
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	0	0	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	0	0	Pass
<b>-15 dC, 31.2V DC</b>	0	0	Pass
<b>+55 dC, 10.8V DC</b>	0	0	Pass
<b>+55 dC, 31.2V DC</b>	0	0	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**







#### 4.10 Spurious emissions from the receiver

#### Clause 15.3.2

The receiver was set to 162.025 MHz.

No significant spurious signals were detected in the frequency area 9 kHz – 4 GHz

See the plots in Annex.

##### Required results:

Frequency range	9 kHz to 1 GHz	1 to 4GHz
Limit of measured spurious	2 nW (-57,0 dBm)	20 nW (-47,0 dBm)

##### Measured Results

Frequency range	Measured level (dBm)	Limit (dBm)
9 – 150 kHz	-83.4 @ 134.010 kHz	-57
0.150 – 30 MHz	-78.2 @ 150.000 kHz	-57
30 – 1000 MHz	-67.4 @ 987.890 MHz	-57
1000 – 4000 MHz	-60.3 @ 3222.00 MHz	-47

**Result: PASS**

**Test Equipment Used: 1 - 10**

#### 4.11 Maximum sensitivity

#### Clause D.2.1

The transmitter was set to 156.525 MHz, and 156.525 MHz ± 1500 Hz.

The signal level at the receiver input shall be -107 dBm under normal test conditions and -101 dBm under extreme test conditions.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>BER &lt; 0.010</b>	
	<b>Extreme test conditions:</b>	<b>BER &lt; 0.010</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-107 dBm</b>
	<b>Extreme test conditions:</b>	<b>wanted signal:</b>	<b>-101 dBm</b>

	Transmitted Frequency (MHz)		Verdict
	156.525	156.525 ± 1500 Hz	
	<b>Measured PER (%)</b>		
<b>Test conditions</b>			
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	0	0	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	0	NA *	Pass
<b>-15 dC, 31.2V DC</b>	0	NA *	Pass
<b>+55 dC, 10.8V DC</b>	0	NA *	Pass
<b>+55 dC, 31.2V DC</b>	0	NA *	Pass

**Note:** \* NA (Not Applicable)

**Result: PASS**

**Test Equipment Used: 1 – 10**

#### 4.12 Error behaviour at high input signal level

#### Clause D.2.2

The transmitter was set to 156.525 MHz with test signal number 1.

The signal level shall be -7 dBm.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>BER &lt; 0.010</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-7 dBm</b>

**Result: PASS**

**Test Equipment Used: 1 – 10**



#### 4.14 Adjacent channel selectivity

#### Clause D.2.4

The adjacent channel selectivity characterises 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 that differs in frequency from the wanted signal by 25 kHz.

The signal level of the wanted signal shall be -104 dBm (-98 dBm at extreme conditions), and the signal level of the unwanted signal shall be -34 dBm (-38 dBm at extreme conditions).

The transmitter was set to 156.525 MHz.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>BER &lt; 0.010</b>	
	<b>Extreme test conditions:</b>	<b>BER &lt; 0.010</b>	
<b>Input signal levels</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-104 dBm</b>
		<b>unwanted signal:</b>	<b>-34 dBm</b>
	<b>Extreme test conditions:</b>	<b>wanted signal:</b>	<b>-98 dBm</b>
		<b>unwanted signal:</b>	<b>-38 dBm</b>

	Transmitted Frequency (MHz)		Verdict
	156.500	156.550	
	<b>Measured PER (%)</b>		
<b>Test conditions</b>			
	<b>Normal test conditions</b>		
<b>+24dC, 18V DC</b>	0	0	Pass
	<b>Extreme test conditions</b>		
<b>-15 dC, 10.8V DC</b>	0	0	Pass
<b>-15 dC, 31.2V DC</b>	0	0	Pass
<b>+55 dC, 10.8V DC</b>	0	0	Pass
<b>+55 dC, 31.2V DC</b>	0	0	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**

#### 4.15 Spurious response rejection

#### Clause D.2.5

The transmitter was set to 156.525 MHz.

The signal level of the wanted signal shall be -104 dBm, and the signal level from the unwanted signal shall be -34 dBm.

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.

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).

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>BER &lt; 0.010 at any frequency separated from the nominal frequency of two channel bandwidths or more.</b>	
<b>Input signal levels:</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-104 dBm</b>
		<b>unwanted signal:</b>	<b>-34 dBm</b>

Intermediate and Local oscillator frequencies as declared by the manufacturer:

Intermediate Frequency:	45.0 MHz
Local Oscillator Frequency:	156.525 MHz      201.525 MHz

This corresponds to "specific frequencies of interest" of:

Reception frequency 156.525 MHz:  
358.050, 448.050, 559.575, 649.575, 761.100, and 851.100 MHz

**Result: PASS**

**NOTE: The EUT has only been subject to this particular test at the frequencies "Specific frequencies of interest".**

**Test Equipment Used: 1 – 10**

#### 4.16 Intermodulation response rejection

#### Clause D.2.6

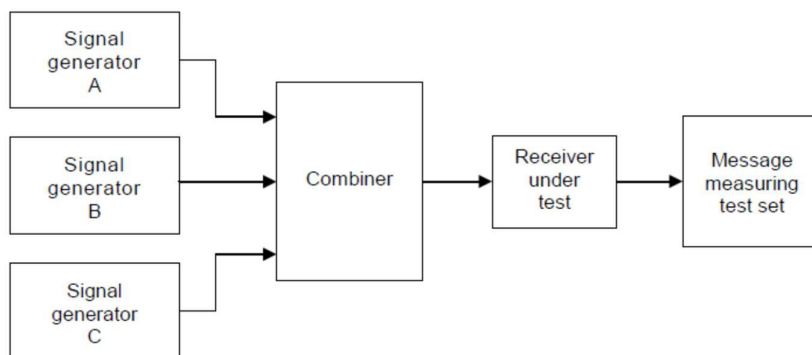
The transmitter was set to 156.525 MHz.

The level of the wanted signal shall be -104 dBm, and the signal level of the unwanted signal shall be -39 dBm.

The intermodulation response ratio characterises the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

The wanted signal represented by signal generator A (see figure below) shall be at the nominal frequency of the receiver and shall be standard test signal number 1. The level of the wanted signal shall be -104 dBm.

The unwanted signal from signal generator B (see Figure D.1) shall be unmodulated and adjusted to a frequency 50 kHz above the nominal frequency of the receiver. The second unwanted signal from signal generator C (see Figure D.1) shall be modulated by 400 Hz with a deviation of  $\pm 3$  kHz and adjusted to a frequency 100 kHz above the nominal frequency of the receiver. The input level of each unwanted signal shall be -39 dBm. The test shall be repeated with the frequency of the unwanted signals below the nominal frequency of the receiver.



**Required results:**

**Normal test conditions:**

**BER < 0.010**

**Input signal levels:**

**Normal test conditions:**

**wanted signal:**

**-104 dBm**

**unwanted signal:**

**-39 dBm**

	Unwanted signal (MHz)		Verdict
	156.525 ± 50 kHz	156.525 ± 100 kHz	
	Measured BER (%)		
	Normal test conditions		
+24dC, 18V DC	0	0	Pass

**Result: PASS**

**Test Equipment Used: 1 – 10**

#### 4.17 Blocking or desensitisation

#### Clause D.2.7

The transmitter was set to 156.525 MHz.

The level of the wanted signal shall be -104 dBm, and the signal level of the unwanted signal shall be -20 dBm.

The blocking immunity characterises 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 with frequencies outside the band of the receiver.

The wanted signal shall be standard test signal number 1. The level of the wanted signal shall be -104 dBm. The unwanted signal shall be unmodulated. The frequency shall be at -10 MHz and -1 MHz and also at +1 MHz and +10 MHz relative to the nominal frequency of the wanted signal. The level of the unwanted signal shall be -20 dBm.

<b>Required results:</b>	<b>Normal test conditions:</b>	<b>BER &lt; 0.010</b>	
<b>Input signal levels:</b>	<b>Normal test conditions:</b>	<b>wanted signal:</b>	<b>-104 dBm</b>
		<b>unwanted signal:</b>	<b>-20 dBm</b>

Measured BER:

BER 0.002 at unwanted signal of +1 MHz, 0 at all other unwanted signals.

**Result: PASS**

**Test Equipment Used: 1 – 10**



#### **4.18 Spurious emissions from the receiver**

#### **Clause D.2.8**

See clause 4.10 of this report. See plots in Annex.

**Result: PASS**

## 5 Measurement uncertainty

The following measurement uncertainty figures have been extracted from the Nemko Quality document "TM-NO-WLS-204A, Measurement uncertainty calculations for radio measurements".

	U95 Uncertainty	Unit
TX measurements:		
Transmitter frequency	+36 / -36	Hz
Transmitter power	+0.70 / -0.73	dB
Transmitter modulation	+17 / -17	Hz
RX measurements:		
All signal level measurements at receiver	1.78 / -1.88	dB

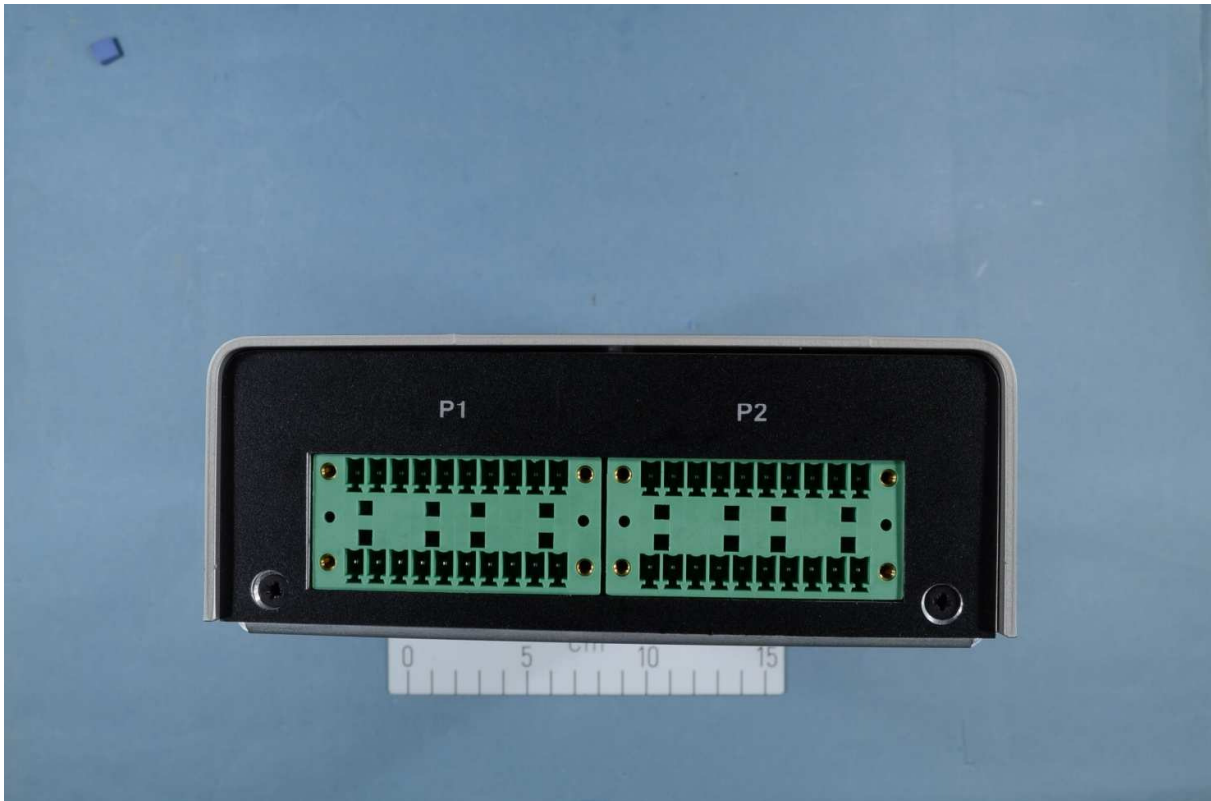
6 PHOTOGRAPHS OF THE EUT



AIS module of AIS300



Front view – AIS300



Rear view – AIS300



Bottom view – AIS300

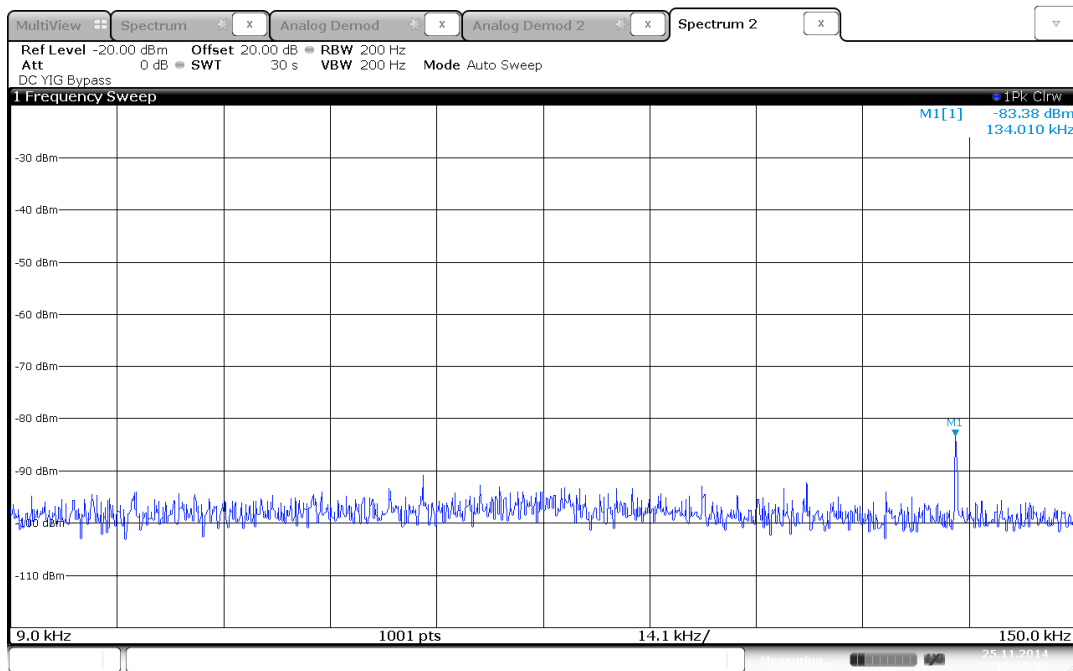
## 7 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

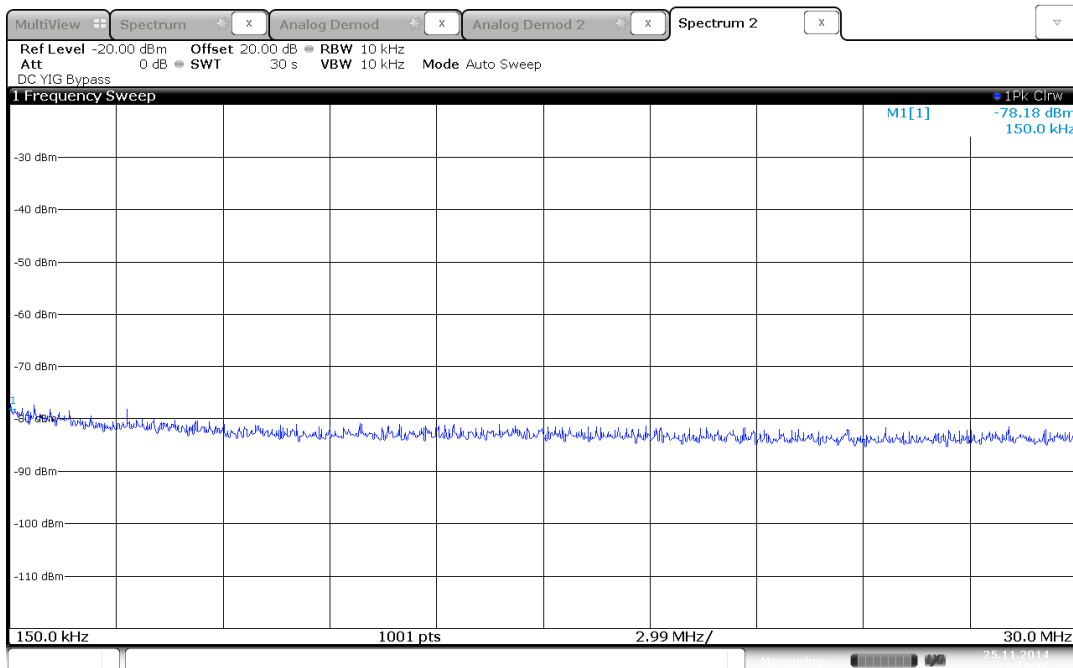
No.	Ref. No	Type of Instrument	Manufacture	Type	Cal. date	Cal. Due
1.	LR1640	Spectrum analyzer	R&S	FSW26	09.2015	09.2017
2.	N-3662	Attenuator 0-11 dB	HP	8494B	09.2013	09.2015
3.	N-3663	Attenuator 0-110 dB	HP	8496B	09.2013	09.2015
4.	LR-1005	Attenuator 10 dB	Narda	765-10	03.2014	03.2016
5.	LR-1007	Attenuator 10 dB	Narda	765-10	03.2014	03.2016
6.	LR-1336	Generator, AF/..UHF	R&S	SMP04	09.2014	09.2016
7.	LR-1117	Generator, AF/..UHF	R&S	SMHU58	10.2014	10.2016
8.	LR-1179	Generator, AF/..UHF	R&S	SMHU58	06.2014	06.2016
9.	LR-1597	Voltmeter	Fluke	87 V	09.2014	09.2016
10.	LR-1194	Attenuator 30dB	Narda	768-30	03.2016	03.2018

## 8 Annex 1 – Measurement plots

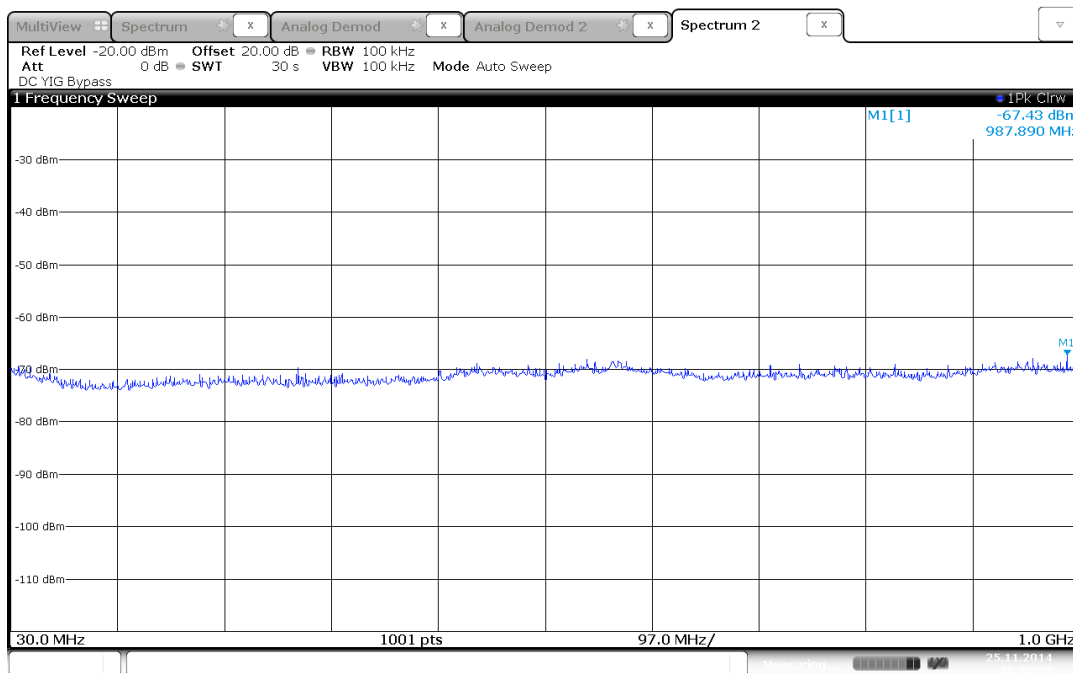
### 8.1 Receiver Spurious emissions



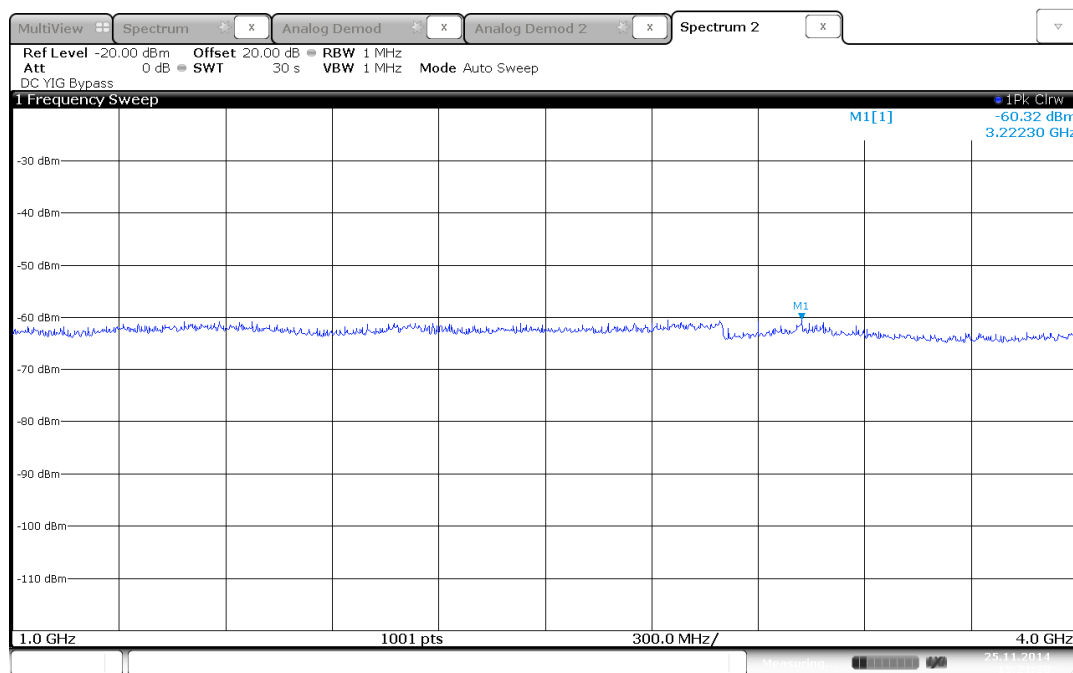
9 – 150 kHz



0.150 – 30 MHz



30 – 1000 MHz



1 – 4 GHz