

## 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>	AIS300-141005
<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>	253637
<b>Tested in period</b>	2014-02-11 and 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 [Bjørn Nordset]           </div> <div style="text-align: center;">               Approved by [G.Suhanthakumar]           </div> </div>	

## CONTENTS

<b>1</b>	<b>GENERAL INFORMATION .....</b>	<b>3</b>
<b>2</b>	<b>TEST INFORMATION.....</b>	<b>3</b>
2.1	Tested Item .....	3
2.2	Test Environment .....	4
2.2.1	Normal test condition .....	4
2.2.2	Extreme test conditions.....	4
2.3	Test Period .....	4
2.4	Test Engineer .....	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>8</b>
4.1	MEASUREMENTS.....	8
4.1.1	Transmit to receive switching time Clause 15.2.7.....	8
4.1.2	Immunity to out of band energy Clause 15.2.8 .....	9
4.1.3	Spurious emissions from the transmitter Clause 15.3.1 .....	10
4.1.4	Spurious emissions from the receiver Clause 9.3.11 .....	19
<b>5</b>	<b>PHOTOGRAPHS OF THE EUT.....</b>	<b>24</b>
<b>6</b>	<b>TEST EQUIPMENT USED.....</b>	<b>27</b>

## 1 GENERAL INFORMATION

### 1.1 Revision history

Revision #	Date	Order #	Description
00	2014-02-11	253637	First issued
01	2016-11-23	253637	Corrected spurious plot page 17

## 2 Test Information

### 2.1 Tested Item

Name :	AIS-300
Model/version :	AIS-300
Serial number :	AIS300-141005
Hardware identity and/or version:	P/N A300-01
Software identity and/or version :	FPGA-driver v0.3.4 Ais_algo v0.3.6
Frequency Range :	156 – 163 MHz
Tunable Bands :	/
Number of Channels :	2 (156.025MHz and 162.025MHz)
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:	24VDC

The values are the limit registered during the test period.

### 2.2.2 Extreme test conditions

*Not applicable for the performed tests.*

## 2.3 Test Period

Item received date:	2014-02-10 and 2016-11-22
Test period :	2014-02-11 and 2016-11-23

## 2.4 Test Engineer

Bjørn Nordset

## 2.5 Test Equipment

See list of test equipment in clause 7.

## 2.6 Other Comments

The manufacturer's representative was present during all tests to monitor the PER (Packet error rate), to select the frequencies and to set-up communication.

### 3 TEST REPORT SUMMARY

#### 3.1 General

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

**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.

Radiated tests were performed in accordance with Comlab 1003. Radiated emissions are made in a 3m anechoic chamber.

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".

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### 3.2 Test Summary

According to the client the AIS part of the AIS-300 is unchanged from the AIS B600 Base station which was tested in the **Nemko Test report 191625-3** covering to the IEC 62320 Ed 1.1. Accordingly these tests are still valid for the AIS-300 product as well. Some of these tests are comparable to the IEC 61993-2 covered in the current report. These tests are:

IEC 62320 Clause	Relevant IEC 61993 Clause	IEC 62320 Test discription	Verdict
15.1 TDMA Transmitter			
9.2.1	15.1.1	Frequency error at 25 kHz operation	P*
9.2.3	15.1.2	Carrier power	P*
9.2.4	15.1.3	Modulation spectrum, slotted transmission for 25 kHz channel separation	P*
9.2.6	15.1.4	Transmitter test sequence and modulation accuracy verification for 25 kHz operation	P*
9.2.8	15.1.5	Transmitter output power versus time function	P*
15.2 TDMA receivers			
9.3.1	15.2.1	Sensitivity for 25 kHz operation	
9.3.3	15.2.2	Error behaviour at high input levels for 25 kHz operation	P*
9.3.4	15.2.3	Co-channel rejection for 25 kHz operation	P*
9.3.6	15.2.4	Adjacent channel selectivity for 25 kHz operation	P*
9.3.8	15.2.5	Spurious response rejection for 25 kHz operation	P*
9.3.10	15.2.6	Intermodulation response rejection for 25kHz operation	P*

\*NOTE: These tests are not covered here but refer to the test report Nemko 191625-3.

The current report covers these tests:

IEC 61993 Clause	IEC 61993 Test discription	Verdict
15.2 TDMA receivers		
15.2.7	Transmit to receive switching time	P
15.2.8	Immunity to out of band energy	P
15.3 Conducted spurious emissions		
15.3.1	Spurious emission the transmitter	P
15.3.2	Spurious emission from the receiver	P

**Note:**

- P** Passed, the equipment fulfils the requirement
- F** 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 MEASUREMENTS

IEC 61993-2

#### 4.1.1 *Transmit to receive switching time*

*Clause 15.2.7*

Operating frequency	Packet Error Rate (%)
156.025MHz	0
162.025MHz	0
Measurement uncertainty	± 1%

#### 15.2.7.3 Required result

The PER shall not exceed 20%.

#### Test Equipment Used: 1

The Packet Error Rate was demonstrated by the Test SW GUI V0.57 provided by the client.



**IEC 61993-2**

**4.1.2 Immunity to out of band energy**

**Clause 15.2.8**

Transmitter modulated with test signal number 5.

Power level at which the measurement has been performed: 12.5W

<b>Operating frequency</b>	<b>Packet Error Rate (%)</b>
<b>156.025MHz</b>	<b>0</b>
<b>162.025MHz</b>	<b>0</b>
<b>Measurement uncertainty</b>	<b>± 1%</b>

**15.2.8.3 Required results**

The PER shall not exceed 20%.

**Test Equipment Used: 1-10**

The Packet Error Rate was demonstrated by the Test SW GUI V0.57 provided by the client.

**IEC 61993-2**

**4.1.3 Spurious emissions from the transmitter**

**Clause 15.3.1**

The Transmitter was unmodulated

Power level at which the measurement has been performed: 12.5W

Spurious Emissions					
Transmitter frequency 156.025 MHz			Transmitter frequency 162.025 MHz		
Freq. MHz	Bandw. kHz	Level dBm	Freq. MHz	Bandw. kHz	Level dBm
-	-	-	-	-	-
-	-	-	All others	-	*
<b>Measurement uncertainty</b>			Frequency ≤ 4 GHz: ±0.9 dB		

\*no significant spurious signals were detected in the frequency area 9 kHz – 4 GHz

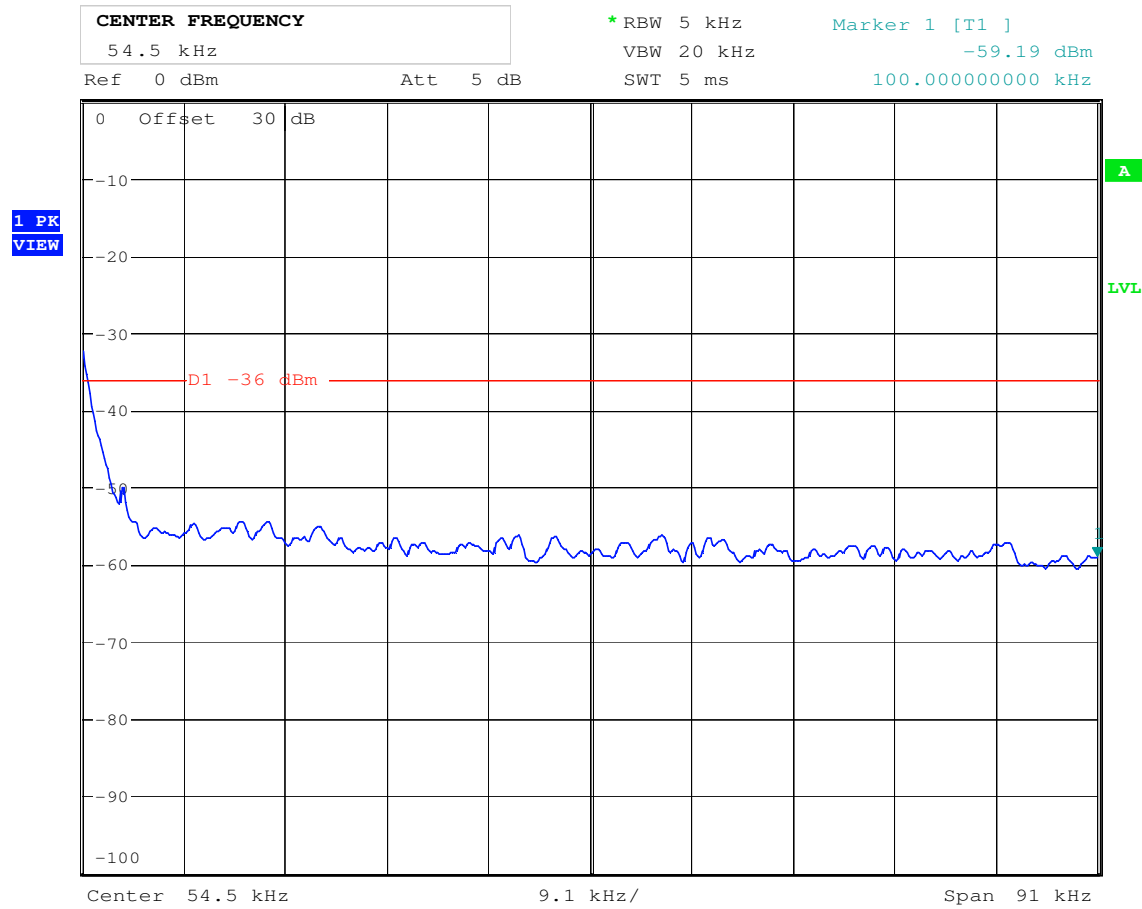
See the plots below. The plots show the operating frequencies attenuated with a client provided notch filter.

Power Source: 24VDC

**9.4.2.3 Required results**

Frequency range	9 kHz to 1 GHz	1 to 4GHz
<b>Tx operating</b>	0,25 μW (-36,0 dBm)	1,00 μW (-30,0 dBm)

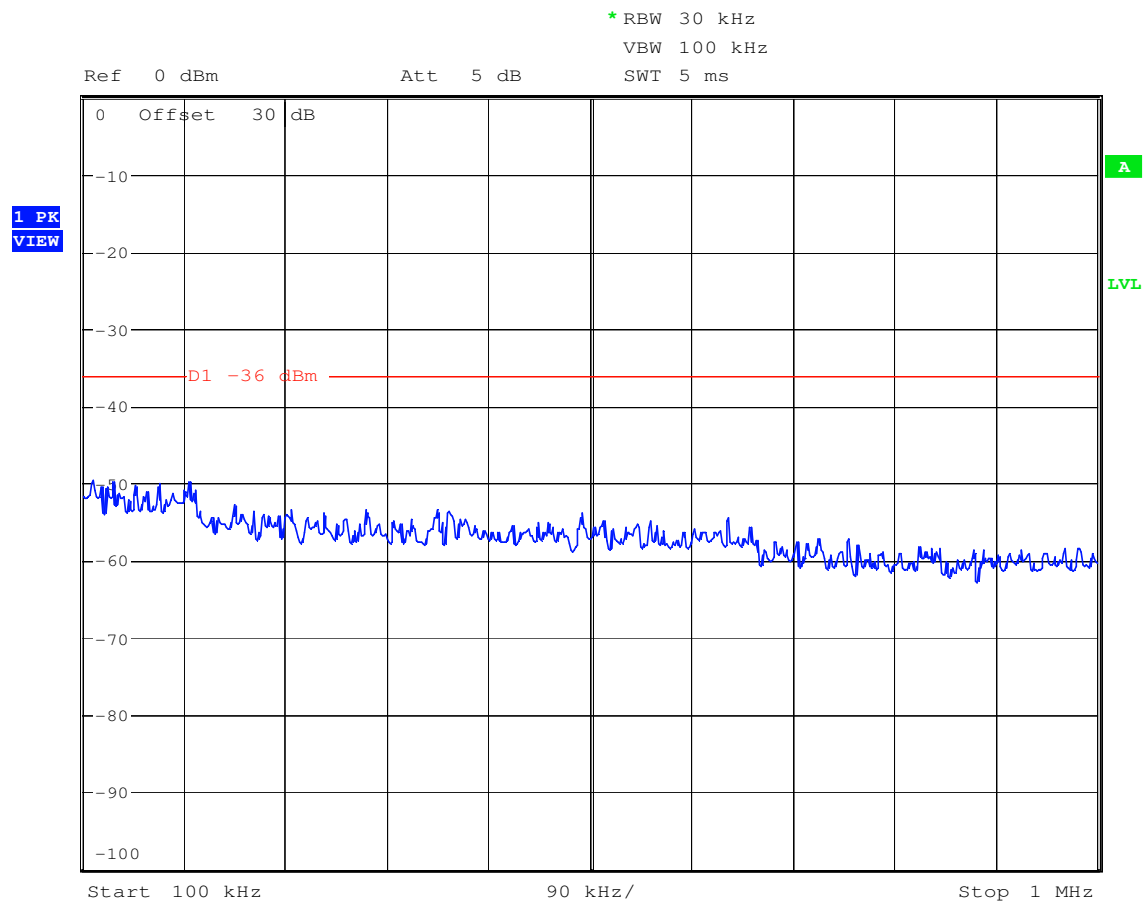
**Test Equipment Used: 1-10**



Date: 11.FEB.2014 14:52:39

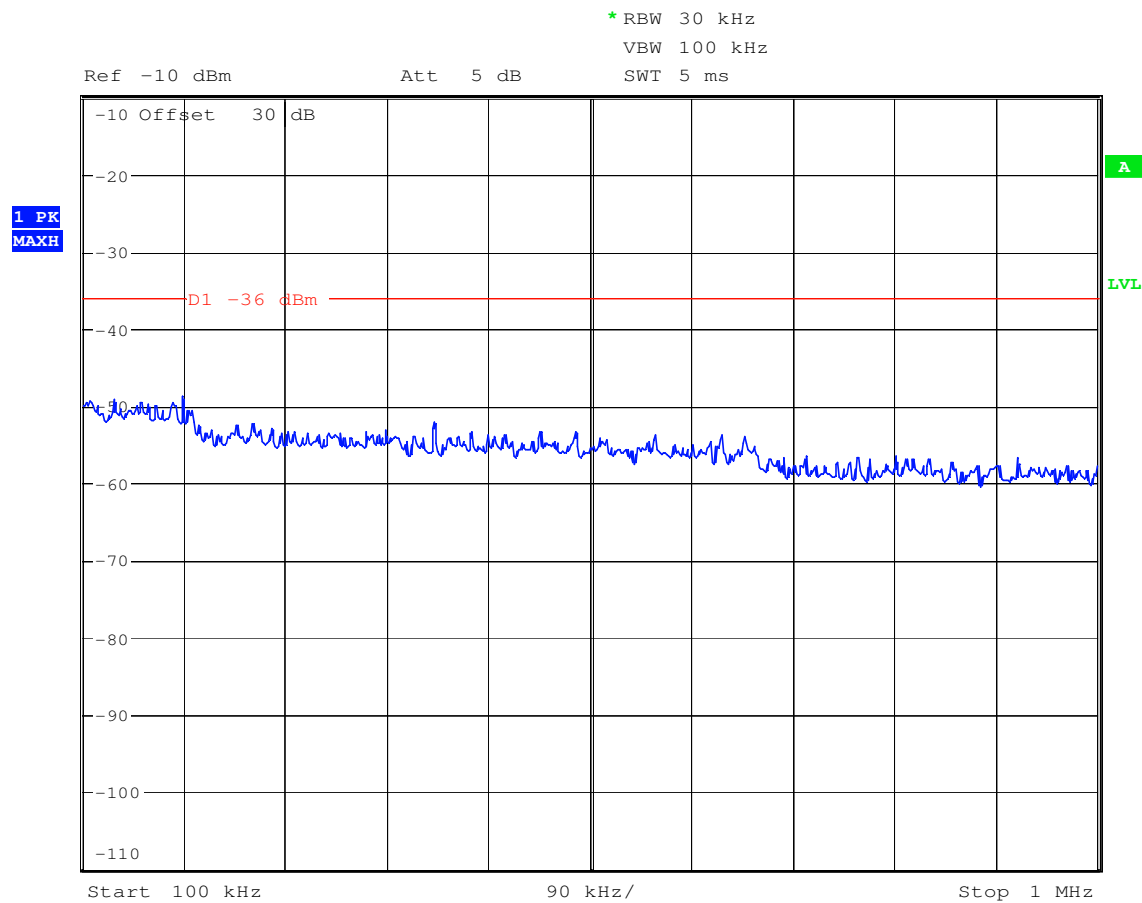
**A prescan from 9 kHz to 100 kHz with the operating frequency of 156.025 MHz**





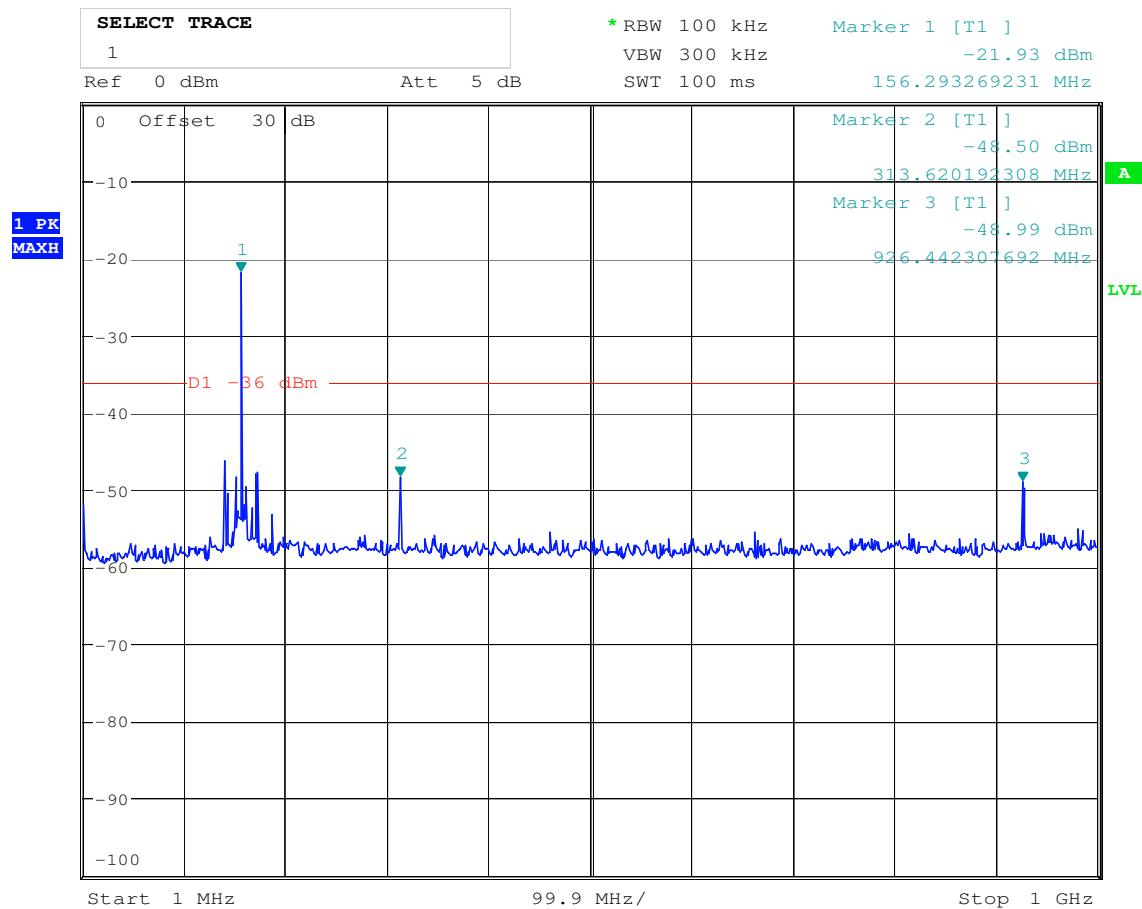
Date: 11.FEB.2014 14:54:07

**A prescan from 100 kHz to 1 MHz with the operating frequency of 156.025 MHz**



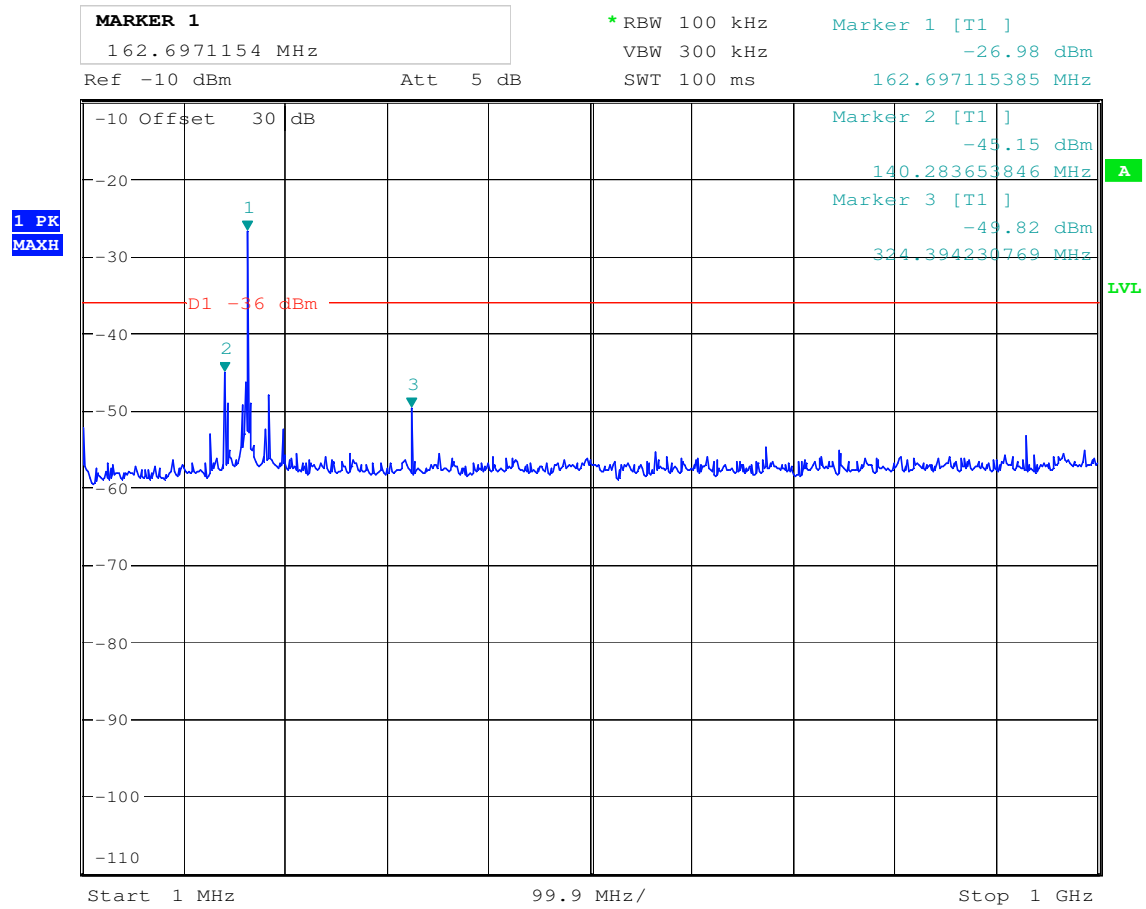
Date: 11.FEB.2014 15:15:43

**A prescan from 100 kHz to 1 MHz with the operating frequency of 162.025 MHz**



Date: 11.FEB.2014 14:58:52

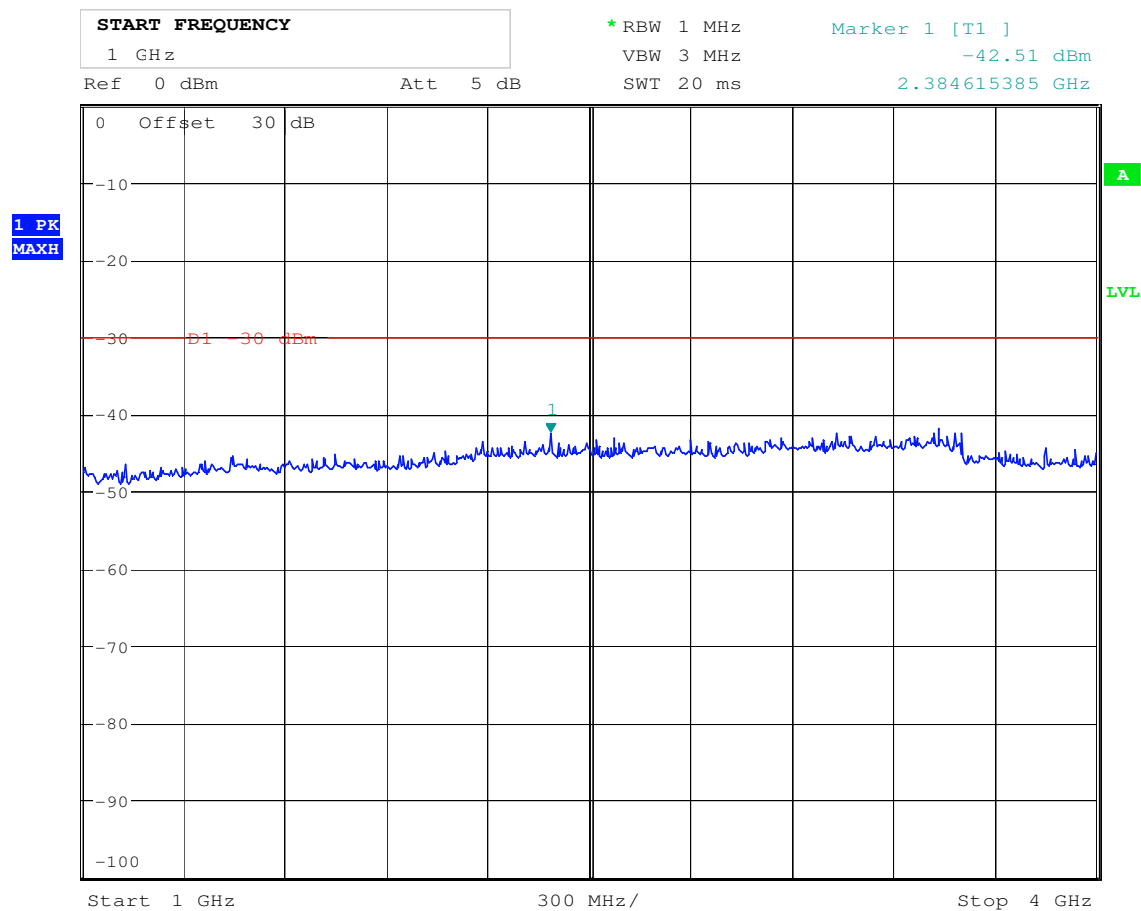
**A prescan from 1 MHz to 1 GHz with the frequency 156.025MHz (used a customer provided notch filter to attenuate the operating frequency)**



Date: 11.FEB.2014 15:13:56

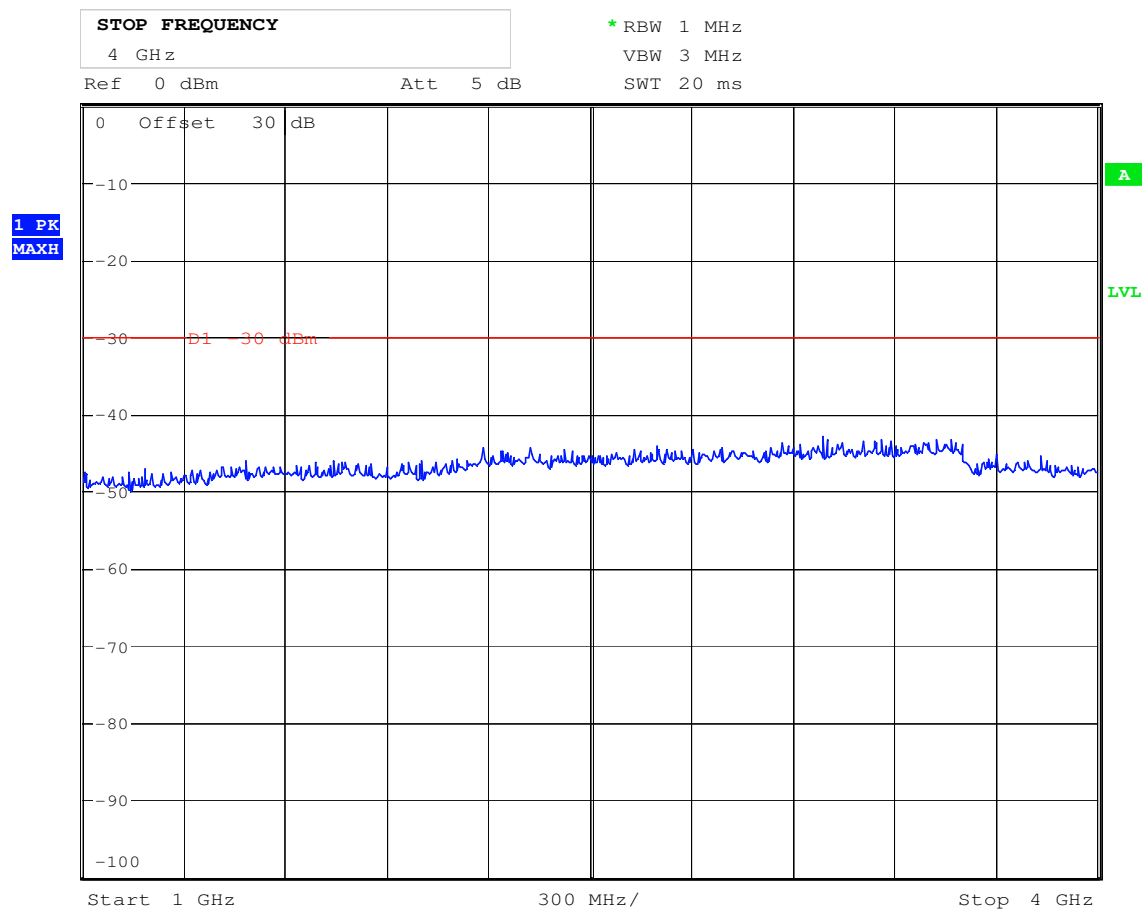
**A prescan from 1 MHz to 1 GHz with the frequency 162.025MHz (used a customer provided notch filter to attenuate the operating frequency)**





Date: 23.NOV.2016 08:43:38

**A prescan from 1 to 4 GHz with the operating frequency of 156.025 MHz**



Date: 11.FEB.2014 15:11:16

**A prescan from 1 to 4 GHz with the operating frequency of 162.025 MHz**

**IEC 61993-2**

**4.1.4 Spurious emissions from the receiver**

**Clause 9.3.11**

The receiver was set to 162.025 MHz.

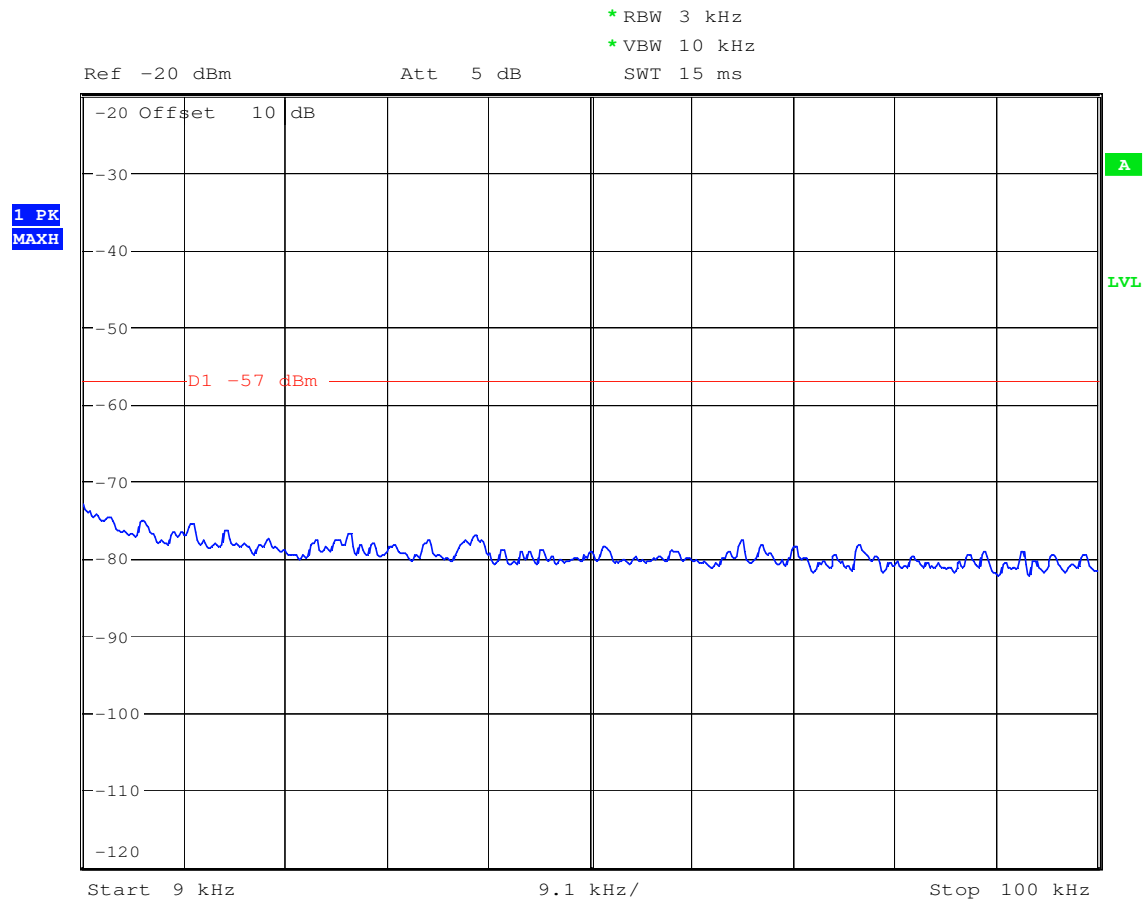
No significant spurious signals were detected in the frequency area 9 kHz – 4 GHz

See the plots below.

**15.3.2.3 Required results**

<b>Frequency range</b>	<b>9 kHz to 1 GHz</b>	<b>1 to 4GHz</b>
<b>Tx operating</b>	2 nW (-57,0 dBm)	20 nW (-47,0 dBm)

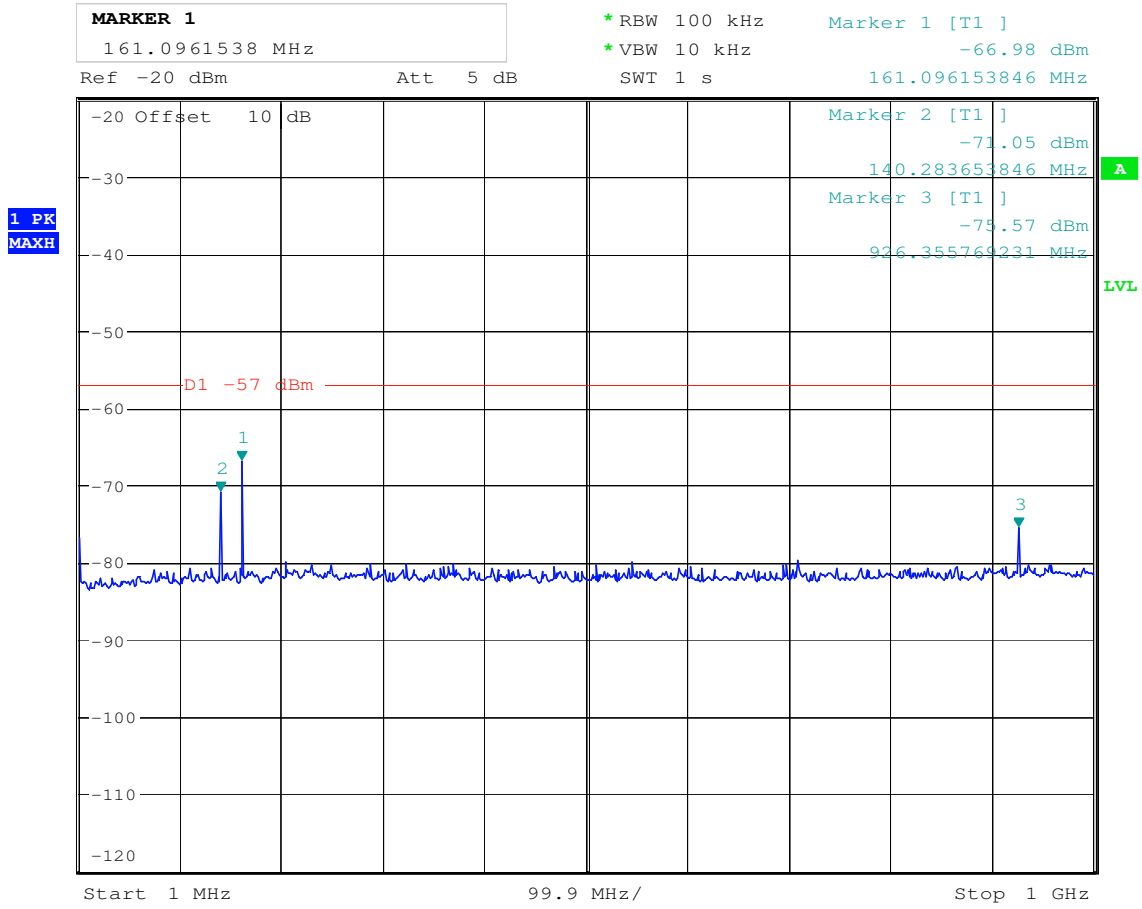
**Test Equipment Used: 1 - 10**



Date: 11.FEB.2014 15:22:32

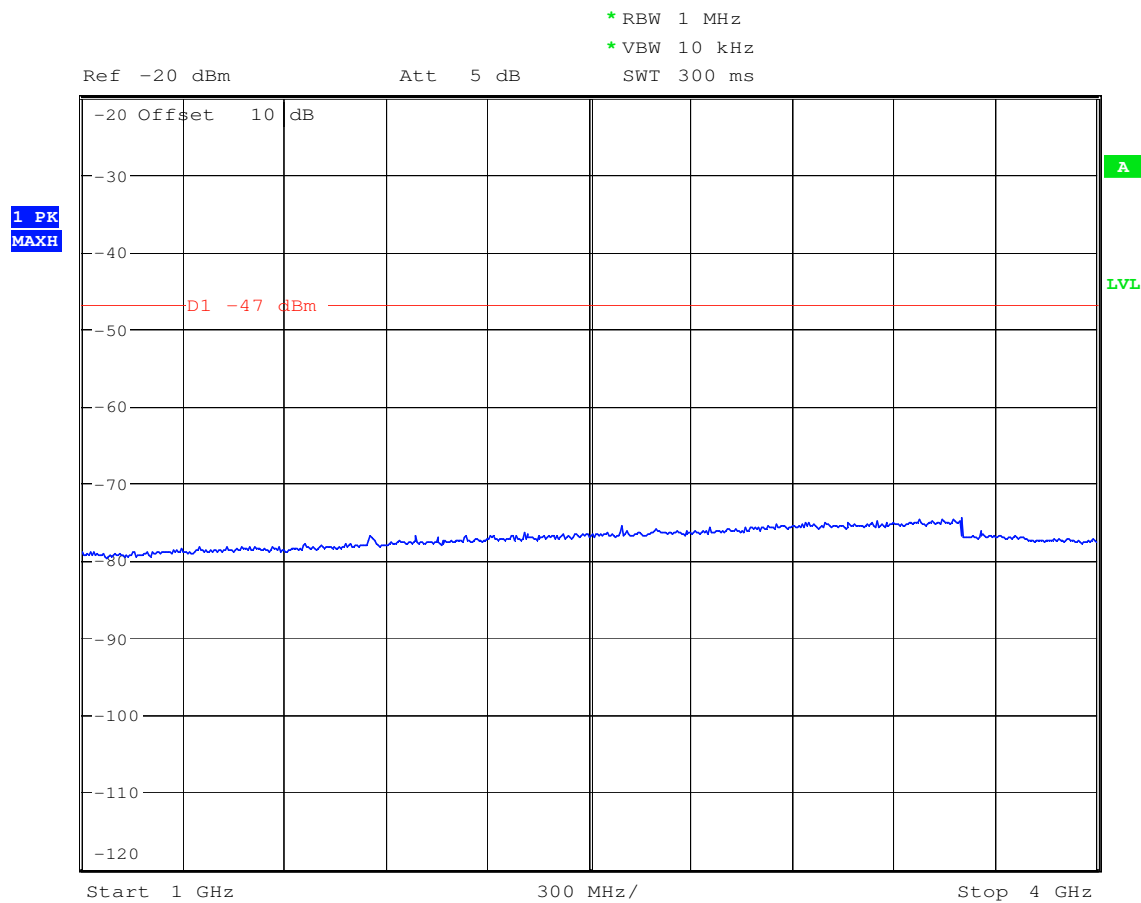
**RX spurious signals at 9 kHz – 100 kHz**





Date: 11.FEB.2014 15:24:33

**RX spurious signals at 1 MHz – 1 GHz**



Date: 11.FEB.2014 15:25:53

**RX spurious signals at 1 - 4 GHz**

5 PHOTOGRAPHS OF THE EUT

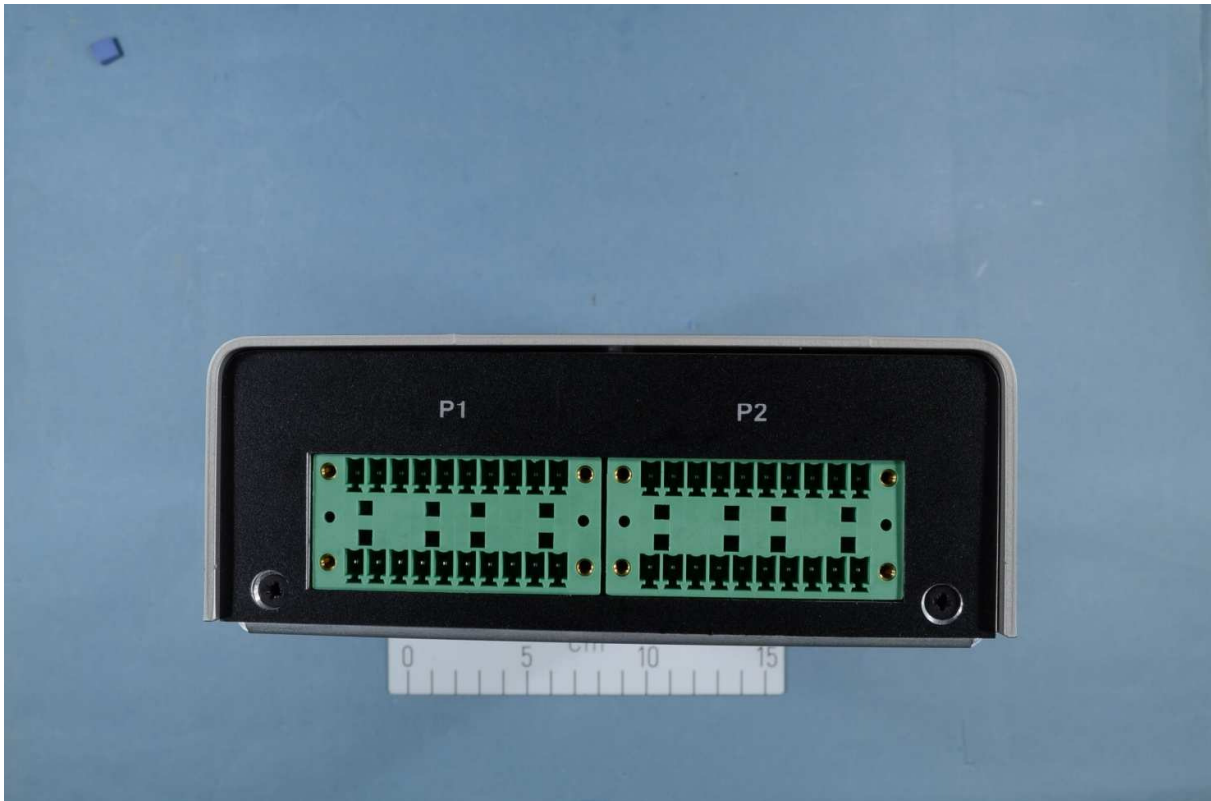


AIS module of AIS300





Front view – AIS300



Rear view – AIS300



Bottom view – AIS300

## 6 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	Manufacturer	Type	Cal. date	Cal. Due
1.	1504	EMI Receiver	R&S	FSU26	28.11.2015	28.11.2017
2.	LT5487	Spectrum analyzer	R&S	FSA	29.11.2012	29.11.2015
3.	130	Attenuator	R&S	DPU	NA	NA
4.	0061	Attenuator 30dB	Tenuline	8321	NA	NA
5.	1212	Attenuator	Suhner	765-10	31.10.2012	31.10.2014
6.	1191	Attenuator	Narda	768-30	31.10.2012	31.10.2014
7.	1117	Generator, AF../UHF	R&S	SMHU58	01.11.2012	01.11.2014
8.	1051	Power Supply	HP	6032A	NA	NA
9.	257	Combiner	Anzac	H-9	11.09.2013	11.09.2015
10.	1601	Multimeter	Fluke	87V	29.10.2012	29.10.2014