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

integrated GPS receiver

Equipment under test:	Ocean Signal AIS
Type:	ATA100
Applying test standards:	IEC 61108-1:2003
Sections:	4.3.13/ 5.7 Typical interference conditions
Test Report No.:	BSH/454.GNSS/TuevSued_Ltd/ PO2600010516:1
Applicant:	TÜV SÜD Product Service Ltd. Octagon House, Concorde Way Segensworth North, Fareham Hampshire PO15 5RL, UK

Hamburg, 5th September 2019
For the federal Maritime and Hydrographic Agency

Tobias Ehlers
Test engineer

Jochen Ritterbusch
Head of Laboratory

nach DIN EN 17025
akkreditiertes Prüflaboratorium

Federal Maritime and Hydrographic Agency
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ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12084-01-00

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Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

Bundesamt für Seeschifffahrt und Hydrographie
Bernhard-Nocht-Straße 78, 20359 Hamburg

die Kompetenz nach DIN EN ISO/IEC 17025:2018 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Schiffsausrüstung (Navigationsausrüstung, Funkausrüstung, Rettungsmittel

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Registrierungsnummer der Urkunde: **D-PL-12084-01-00**

Frankfurt am Main, 22.08.2019

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

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1 General

Applicant:	TÜV SÜD Product Service Ltd. Octagon House, Concorde Way Segensworth North, Fareham Hampshire PO15 5RL, UK
Equipment under test:	Ocean Signal AIS
Type:	ATA100
Manufacturer:	Ocean Signal Ltd.
Place of test:	BSH test laboratory Hamburg, Room 015, GNSS Lab
Start of test:	4th September 2019
End of test:	4th September 2019

1.1 Document history, change log

Date of change	Section	Changed content
5th September 2019	All	**Full report**
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1.2 Summary

Test standard: IEC 61108-1 Ed. 2, 2003

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
--	IEC 61108-1	4.1 Object compliance with IEC 61162-1 compliance with IEC 60945	not tested
--	IEC 61108-1	4.2 GPS receiver equipment	not tested
--	IEC 61108-1	4.3.1 General	not tested
--	IEC 61108-1	4.3.2 Equipment output	not tested
--	IEC 61108-1	4.3.3 Accuracy	not tested
--	IEC 61108-1	4.3.4 Acquisition	not tested
--	IEC 61108-1	4.3.5 Protection	not tested
--	IEC 61108-1	4.3.6 Antenna design	not tested
--	IEC 61108-1	4.3.7 Dynamic range	not tested
--	IEC 61108-1	4.3.8 Effects of specific interfering signals	not tested
--	IEC 61108-1	4.3.9 Position update	not tested
--	IEC 61108-1	4.3.10 Differential GPS input	not tested
--	IEC 61108-1	4.3.11 Failure warnings and status indications	not tested
--	IEC 61108-1	4.3.12 Output of COG, SOG and UTC	not tested
1-3	IEC 61108-1	4.3.13 Typical interference conditions	**passed**

Note

This test report is based on the delivered sample. Sampling is not part of this test report.

1.3 Equipment history

Main Unit – Processing and Display Unit				
Type	**ATA100 AIS**	**Model**	**ATA100**	
Delivery date	**30th August 2019**	**S/N** **Tüv Süd ID**	**1234567Q** **75936860-TSR0023**	
HW Version:	**Delivery date**	**30th August 2019**	**Version no**	**---**
	Installation date	**30th August 2019**		
SW Version:	**Delivery date**	**30th August 2019**	**Version no**	**00.2.04**
	Installation date	**30th August 2019**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		

GNSS Antenna Unit				
Type	**Marine GPS Antenna**		**Prod. Name**	**763S-02845**
Delivery date	**30th August 2019**		**S/N** **Tüv Süd ID**	**A7K221614** **75936860**
HW Version:	**Delivery date**	**30th August 2019**	**Version no**	**---**
	Installation date	**30th August 2019**		
SW Version:	**Delivery date**	**30th August 2019**	**Version no**	**---**
	Installation date	**30th August 2019**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		

1.4 Test environment

Documentation of equipment tests and dates of tests.
Test environment is completely equipped as described in Annex A.

Room	**BSH room 908 / 015**
Test engineer	**T. Ehlers (S3301)**
Location	**BSH, Hamburg (Germany)**

Overview Listing:

- **lab spatial conditions,**
- **equipment under test conditions and type,**
- **test periodes and tested equipment.**

The test environment is completely equipped as described in Annex A.

Location		
Lab room no.	**BSH room 908 / 015**	
Lab room air temperature	**N/A**	**°C**
Lab room air pressure	**N/A**	**hPa**
Lab room relative air humidity	**N/A**	**%**
---	**---**	

Equipment under test	
Position in lab room	
☒ **relevant**	☐ not **relevant**
Mounting at test bed	
☒ **relevant**	☐ not **relevant**
Type of equipment	
1	**Refer to 1.2 Equipment history**
Refer to Annex C – Photos of Equipment under Test	
Remarks	
Test environment and EUT are suitable for operating under normal indoor conditions, in a non-condensating atmosphere.	

Test engineer	
T. Ehlers (S3301)	**---**
---	**---**

Equipment no	**Start of test**	**End of test**	**Test engineer**
1 (at BSH)	**04th September 2019**	**04th September 2019**	**T. Ehlers (S3301)**

1.5 Legend

Result marking (in the "result" column)[2]:

Passed	Item was OK, test successful No colour marking
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

1.6 General observations

General observations unrelated to any paragraphs of applied test standards.

EUT reports position data for 1° N as 60minutes of arc, see recorded data from the interface below:
$GPRMC,121934.000,A,0060.0000,N,00100.0002,E,,,040919,,,A,V*18
$GPVTG,,T,,M,,N,,K*4E
$GPGGA,121934.000,0060.0000,N,00100.0002,E,1,9,0.89,26.7,M,17.9,M,,*61

[2] Test items maybe colour marked in draft versions of the report as follows:

Passed	no colour marking
Not passed	yellow
N/T	blue
N/A	no colour marking
REC	green

2 Functional Tests

2.1 IEC 61108-1

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
1	**4.3.13**	**Typical interference conditions** (M.112/A3.16) The GPS receiver equipment shall be capable of operating satisfactorily in typical interference conditions. For clarification of this requirement see 5.7.1 and for the associated tests see 5.7.2.	See test results under test no. 2 and 3.	**PASSED**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.7	**Typical interference conditions**		
	5.7.1	**Requirements**		
	5.7.1.1	**Typical interference conditions** The GPS receiver equipment shall be capable of operating in typical interference condition. Operational situations include static accuracy and reacquisition within 30 s after satellite signals have been masked for 60 s or less by an obstruction, for example a bridge. Typical GPS interference effects can be characterised as being broadband noise-like interference, Continuous Wave Interference (CWI), or pulsed interference. Much work has been done in the aviation community to define interference levels in these three categories as reported in the Minimum Operational Performance Standards (MOPS) for Global Positioning System/Wide Area Augmentation System (GPS/WAAS) Airborne Equipment (RTCA/DO-229B October 6, 1999). The levels defined in this subclause are based upon the interference masks developed within RTCA. These masks are described in ITU-R Recommendation M.1477.	**NOTE** This test was performed by using a simulator (see Annex A).	**For results see test No. 2**
	5.7.1.2	**Broadband interference levels** The interference mask for broadband noise-like interference varies as a function of the bandwidth of the interfering signal. This interference effect can be represented by broadband noise centred at 1575.42 MHz. The bandwidth dependent interference mask can be seen in Figure 1.		**For results see test No. 2**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.7.1.3	**Continuous wave interference (CWI)** Continuous wave interference interacts with the individual C/A code spectral lines found in the GPS signal structure. GPS receivers are typically more susceptible to CWI than to any other type of interference. For the corresponding CWI mask see Figure 2.		**For results see test No. 2**
	5.7.1.4	**Pulsed interference** Pulsed interference can occur due to proximity to radars or other RF devices using pulsed waveforms. GPS receivers typically are fairly robust when exposed to low duty cycle pulsed interference. The interference mask for pulsed interference will consist of a pulse modulated carrier (CW) at 1575.42 MHz, with peak carrier level of –20 dBm and duty factor of 10 % while using a 1 ms pulse width.		**For results see test No. 2**
	5.7.2	**Testing**		
	5.7.2.1	**The interference test procedures presented in** this sub-clause follow closely the procedures used by aviation receiver manufacturers in the self-certification process used to show compliance with RTCA/DO-229B. The procedures have been adapted as necessary to meet the requirements of the IMO GPS requirements.		**For results see test No. 2**
	5.7.2.2	**Simulator conditions** The simulator conditions are as follows: five GPS satellites; one satellite at a maximum level of –120 dBm plus antenna gain at 90 elevation; one satellite at a minimum level of –130 dBm plus antenna gain at 5 elevation; three satellites at a level of –127 dBm plus antenna gain at 45 elevation.		**For results see test No. 2**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.7.2.3	**Navigation solution accuracy test** The normalised error associated with the navigation solution, which will be compared with the 10 m, 95 % horizontal accuracy requirement shall be computed using the formula shown below: $NE=[4(d_i)]/[HDOP_i]$ where NE is the normalised error; d_i is the instantaneous 2-D horizontal position error (meters); $HDOP_i$ is the instantaneous horizontal dilution of precision. Scaling the instantaneous 2-dimensional position error (d_i) by $4/HDOP_i$ provides a means of normalising the tests to a constant HDOP = 4 and accounts for fluctuation in the satellite coverage due to changing geometry. $HDOP_i$ may be obtained from the receiver under test or calculated. Only those satellites used in the position solution shall be included in the $HDOP_i$ calculation.		**For results see test No. 2**
	5.7.2.4	**Navigation solution accuracy test procedures**		
	5.7.2.4.1	**Interference conditions** Interference conditions, including broadband noise centred at 1575.42 MHz, continuous wave interference (CWI), and pulsed interference shall be simulated. For the pulsed interference tests, a pulse-modulated carrier (CW)with peak carrier level of –20 dBm and duty factor of 10 % shall be used. The interference values are shown in the Three tables below. Broadband interference values Noise bandwidth: 1 MHz Total RMS power: -110.5 dBm Pulsed interference values Frequency: 1575.42 MHz Pulse width: 1 ms Continuous wave interference (CWI) values Frequency: 1575.42 MHz Power: -120.5 dBm Frequency: 1626.0 MHz Power: +8.0 dBm		**For results see test No. 2**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.7.2.4.2	**Test procedures** The EUT is subjected to one of the interference sources. The simulator scenario shall be engaged and the satellite signals turned on. The EUT shall be powered and initialised. While the EUT is providing position solutions, the interference shall be applied to the EUT, and the level of the interference shall be adjusted to the required value. When steady-state accuracy is reached, record a minimum of 100 position and HDOP values as reported by the EUT at a rate of one sample every 2 min. Repeat this cycle for any remaining interference source.		**For results see test No. 2**
2	**5.7.2.4.3**	**Required results** Pass/fail determination If the EUT reports a position with a normalised error greater than 10 m or fails to report a position in more than 5 % of the samples, a test failure is declared.	For results refer to Annex B	**Passed**
	5.7.2.5	**Reacquisition test** Method of test The reacquisition test is designed to simulate a temporary loss of signal, such as passing under a bridge. To determine the re-acquisition pass/fail criteria, consider a single trial where the EUT provides a valid position fix that is within required accuracy at 30 s from restoration of the satellite signals, and maintains a tracking status for at least the next 60 s. This unit is considered to have Passed one trial.		**For results see test No. 3**
	5.7.2.5.1	**Re-acquisition test procedures**		
	5.7.2.5.2	**Interference conditions** The interference condition to be tested is shown below. This is a broadband noise value centred at 1575.42 MHz. Noise bandwidth: 1 MHz Total RMS power: -110.5 dBm		**For results see test No. 3**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.7.2.6	**Re-acquisition scenarios**		
	5.7.2.6.1	**Test procedures** The EUT is subjected to the broadband interference source. The simulator scenario shall be engaged and the satellite signals turned on. The EUT shall be powered and initialised. The EUT shall be allowed to reach steady-state accuracy before the satellites are to be switched off. The simulator RF output shall be removed for 30 S. The simulator RF output shall be restored to the EUT. After 30 s record a position and HDOP value as reported by the EUT. If after 30 s, no position report has been sent from the receiver, record a trial failure and go to step i). Ensure that the receiver continues position reporting for the next 60 s. Go to step d) and repeat as required (note that if the simulator scenario is reset, some receiver may require purging of all previous data to enable proper operation. This is due to the persistence of time data in the receiver and the inability of the receiver's software to deal with a backward transition in time).		**For results see test No. 3**
3	**5.7.2.6.2**	**Required results** Pass/fail criteria A failure by the EUT to provide a position output after 30 s, reporting a position with normalised error greater than 10 m, or failing to continue position reporting for 60 s after sampling indicated a failure mode, and results in declaring a trial failure. To determine the reacquisition time pass/fail criteria, the test disposition table shall be used.	For results refer to Annex B	**Passed**

Annex A - Test equipment

A.1 Test equipment summary

Model / Program	*Serial No. / Version No.*	*Calibrated / Function test*	*Used for*
Reference position roof of BSH building		Lat: 53 32.8136481666' Lon:9 58. 1016981666'	All test using real satellite signals
GNSS Simulation Unit GPS L1 and Galileo E1, E5	SPIRENT Communications Hardware:Typ: GSS8000, S/N: 8628/9 Software: PosApp Ver. 3.5	Function tests performed successfully according documented test procedures before performance of tests	Simulated GPS and Galileo testing
GNSS Simulation Unit GPS L1, L2, L5 GLONASS L1, L2 Galileo E1, E5	IFEN Typ: NCS TITAN S/N: Software:	Calibration date 2017/05/12 Function tests performed successfully according documented test procedures before performance of tests	Simulated multi-GNSS testing
Trimble Net R9 GNSS reference receiver	5112K74564	Function tests performed successfully	Reference and differential data source for GLONASS and GPS
MiniCircuits RF- Amplifier	ZHL-5W-2G-S+	Function tests performed successfully	L-Band interference
MiniCircuits RF- Amplifier	ZHL-16W-43-S+	Function tests performed successfully	S-Band interference
Signal Generator R&S SMJ100	S/N: 100858	Function tests performed successfully	Interference tests IEC 61108-1 Ed.2, §5.6.9; §5.7
Agilent spectral analizer E4440A	S/N: MY44022884	2017/11/13	Calibration of GPS measurement inside RF-chamber
Narda Broadband Field Meter	NBM520	2017/08/09	Induced Power of L/S-Band
Horn-Antenna Schwarzbeck BBHA 9120A	BBHA 9120A 535	2009/11/26	Calibration of GPS measurement inside RF-chamber and high power interference transmitting antenna

Reference position

Made by FREIE UND HANSESTADT HAMBURG
Vermessungsamt –VA311-

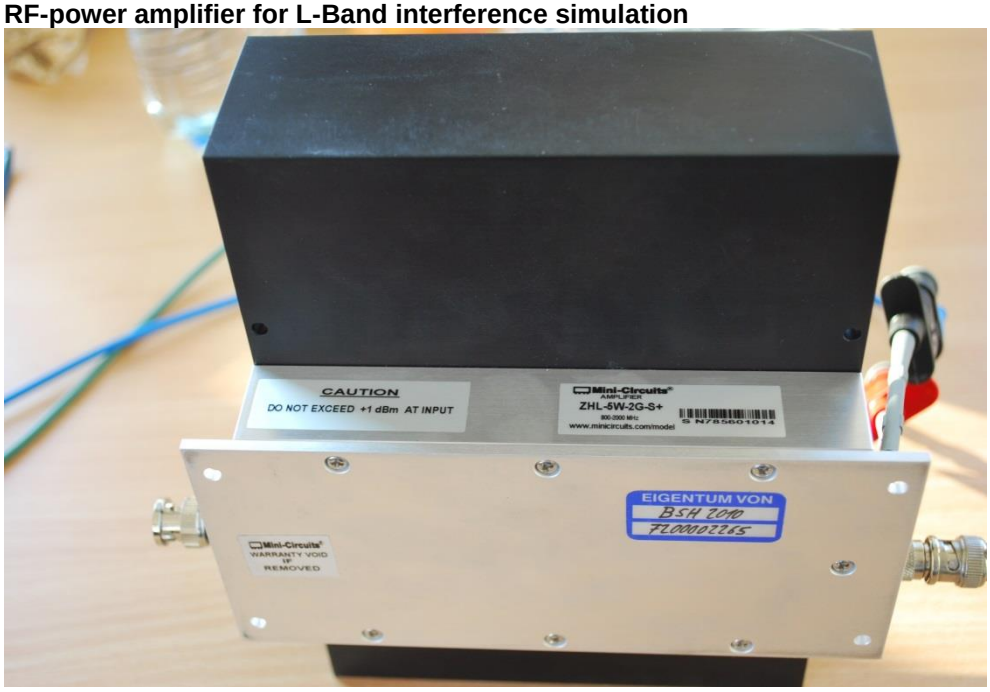
Description of point	geocentrically co-ordinates (WGS84)		geodetical geographical co-ordinates (WGS84)		Gauß-Krüger (Bessel)	
North	x(m)	3740601.680	N	53°32’ 49’’.49049	x(m)	5935502.790
	y(m)	657439.492	E	9°58’ 6’’.10408	y(m)	3564257.804
	z(m)	5107029.673	Height over Ellipsoid	95.900 m	Altitude above sea level	55.969 m
South	x(m)	3740618.106	N	53°32’ 48’’.81889	x(m)	5935482.027
	y(m)	657442.338	E	9°58’ 6’’.10189	y(m)	3564258.046
	z(m)	5107017.296	Height over Ellipsoid	95.849 m	Altitude above sea level	55.917

Accuracy of survey = 0.02 m - last survey dated 2009-05-04

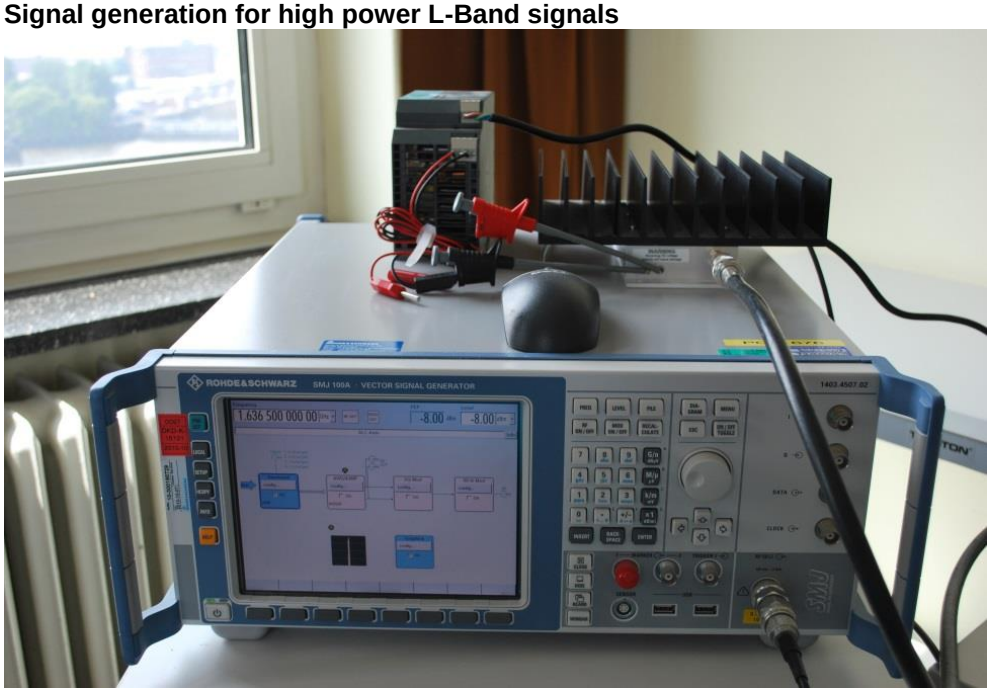
A.2 Documentation of test equipment

A.2.1 L-Band interference signal amplifier

RF-power amplifier for L-Band interference simulation

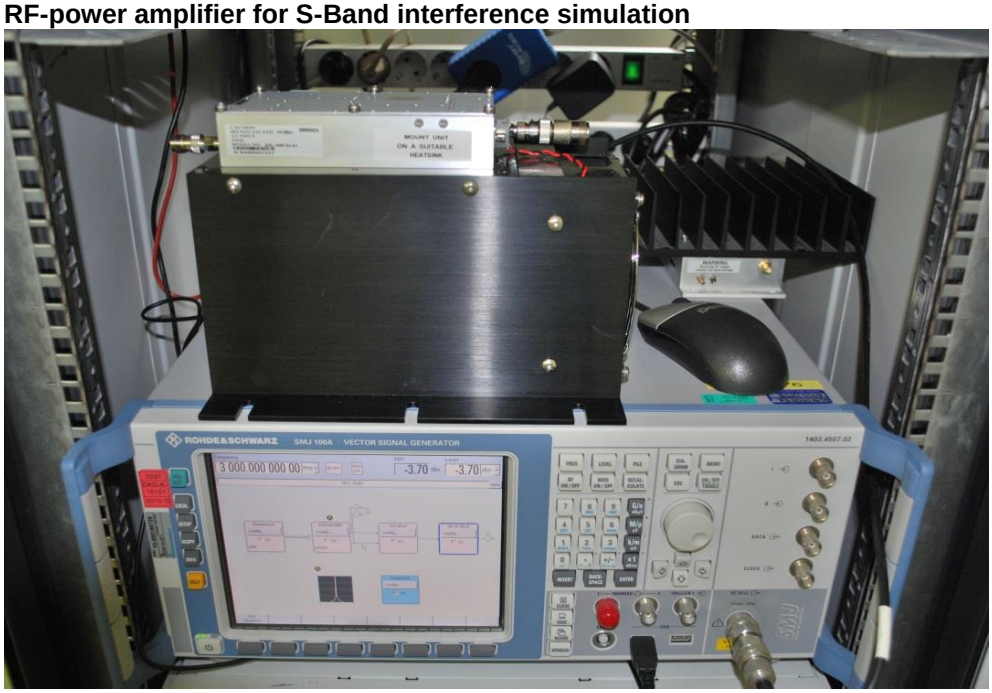


Signal generation for high power L-Band signals



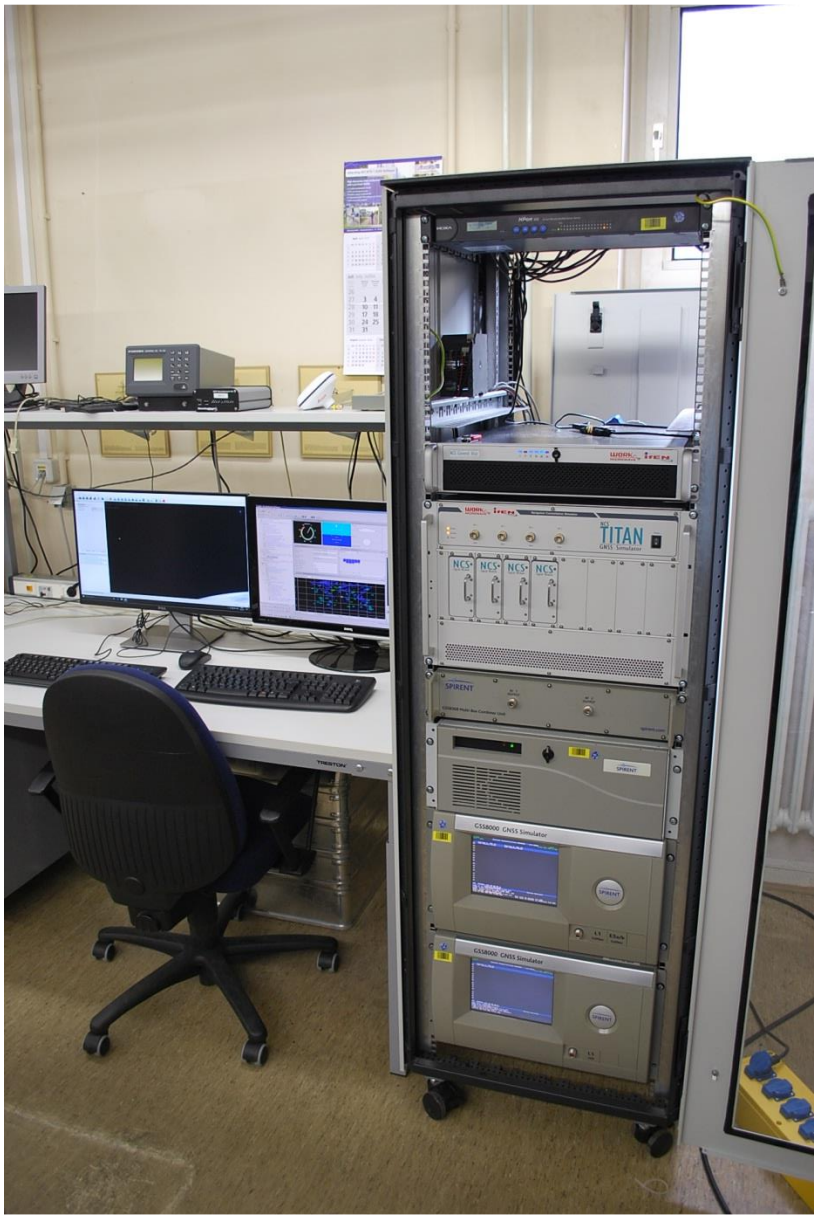
A.2.2 S-Band interference signal amplifier

Signal generation for high power S-Band signals
RF-power amplifier for S-Band interference simulation

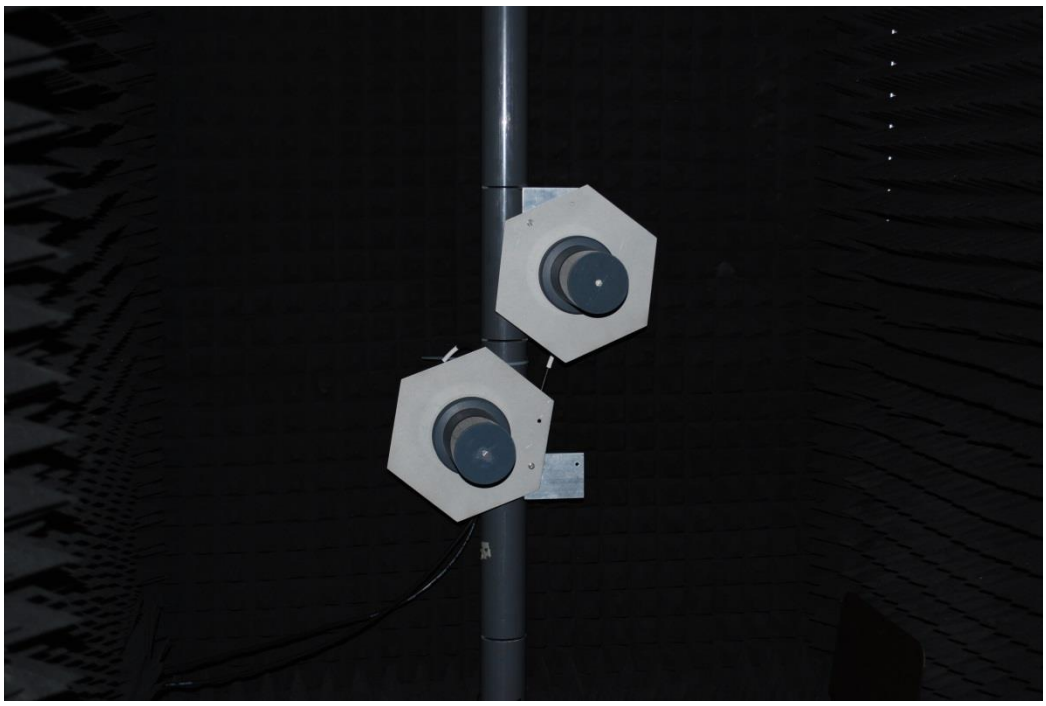


A.2.3 GNSS Simulation

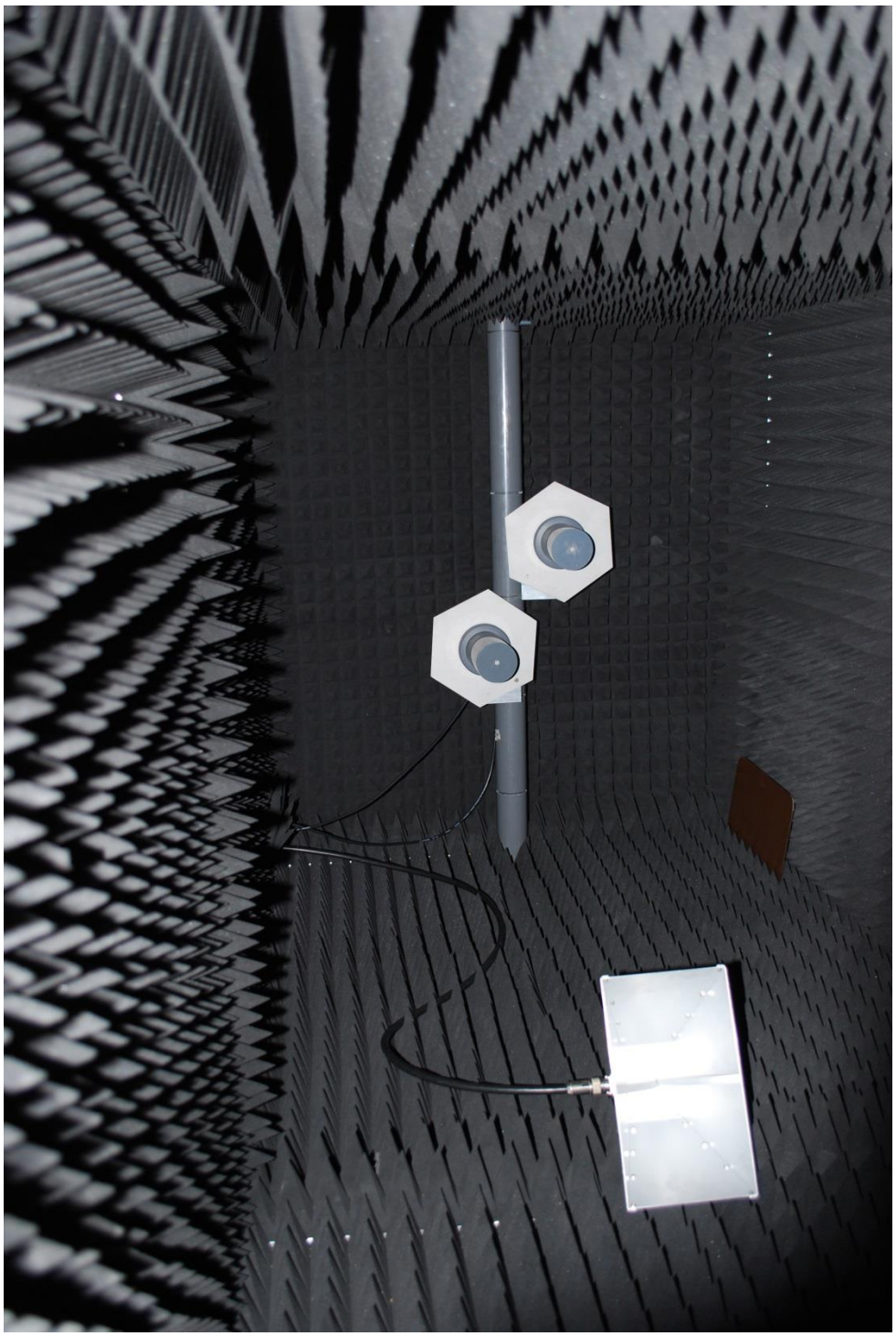
GNSS Simulation at BSH



Arrangement of GPS- and noise/ interference transmitting antennas

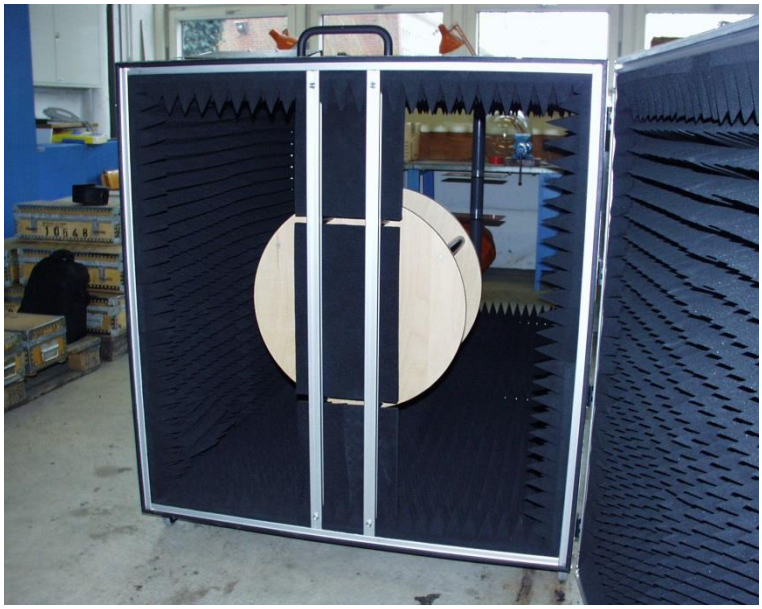


Arrangement of GPS-, interference- and high power (horn-antenna) transmitting antennas



GPS test box, exterior view

GPS test box, interior view



A.3 Calibration protocol of RF- Chamber

Calibration protocol

Date	26th February 2019
Test eng.	Ehlers
Place of test	BSH, Room 015

Equipment

R&S SMJ100A Signalgenerator
Helixantenna H1116R6, No. 3 → GNSS- Antenna
Schwarzbeck BBHA 9120 Hornantenna
Agilent spectral analyser E4440A

Ifen NCS Titan RF-Multi-Constellation-Simulation

Pdef.	-130	dBm	ICD GPS200 defines -130dBm as minimum received power at 3dBi antenna
			IEC61108-1:2003 defines -125dBm for typ. interference testing up to -120dBm
G trans. Ant.	7	dBi	Gain of GPS- transmitting antenna
Prec.	**-125,32**	dBm	Needed received power @ Schwarzbeck BBHA9120
Grec.ant.	9	dBi	Gain of calibrated Schwarzbeck BBHA 9120 @ 1575MHz
Adapt. Factor	5	dB	Adaption factor of Schwarzbeck BBHA9120 vs. 3dB antenna incl. 1.5dB Cable loss
			--> Spirent Attenuation for needed power level of -130dBm at EUT antenna position
Power level	**33.6**	**dBW**	--> Ifen NCS Titan adjusted power level for needed power level of -130dBm at EUT antenna position

Calibration of interference

Date	**26th February 2019**
Test eng.	Ehlers
Place of test	BSH, Room 015

Equipment

R&S SMJ100A Signalgenerator

Schwarzbeck BBHA 9120 Hornantenna
Helixantenna H1116R6, No. 2
Agilent spectral analyser E4440A

Ifen NCS Titan GPS, GLONASS, Galileo Simulation

Noise 1MHz -110,5dBm

Pdef.	-110,5	dBm	Needed interference power
Prec	-105,5	dBm	Needed measured power at Schwarzbeck BBHA9120 Antenna
G trans. Ant.	7	dBi	Gain of interference trans. ant.
Adapt. Factor	**5**	dB	Adaption factor of Schwarzbeck BBHA9120 vs. 3dB antenna incl. 1.5dB Cable loss
Power adj.	**-78**	**dBm**	adjusted power level at SMJ100A

Pulsed -20dBm

Pdef.	-20	dBm	Needed interference power
Prec	-15	dBm	Needed measured power at Schwarzbeck BBHA9120 Antenna
G trans. Ant.	7	dBi	Gain of interference trans. ant.
Adapt. Factor	**5**	dB	Adaption factor of Schwarzbeck BBHA9120 vs. 3dB antenna incl. 1.5dB Cable loss
Power adj.	**13**	**dBm**	adjusted power level at SMJ100A

CW @ 1575,42; -120,5dBm

Pdef.	-120,5	dBm	Needed interference power
Prec	-115,5	dBm	Needed measured power at Schwarzbeck BBHA9120 Antenna
G trans. Ant.	7	dBi	Gain of interference trans. ant.
Adapt. Factor	**5**	dB	Adaption factor of Schwarzbeck BBHA9120 vs. 3dB antenna incl. 1.5dB Cable loss
Power adj.	**-88**	**dBm**	adjusted power level at SMJ100A

CW @ 1626,0; +8,0dBm alternativ CW@1596,0MHz; -80dBm for single GNSS
Multi GNSS CW@1630MHz ;-20dBm

Pdef.	-80	dBm	Needed interference power
Prec	-25	dBm	Needed measured power at Schwarzbeck BBHA9120 Antenna
G trans. Ant.	7	dBi	Gain of interference trans. ant.
Adapt. Factor	**5**	dB	Adaption factor of Schwarzbeck BBHA9120 vs. 3dB antenna incl. 1.5dB Cable loss
Power adj.	**-48**	**dBm**	adjusted power level at SMJ100A

Annex B - Test diagrams

B.1 § 5.7.2 Testing interference

B.1.1 § 5.7.2.4.1 Interference conditions

Interference conditions, including broadband noise centred at 1575.42 MHz, continuous wave interference (CWI), and pulsed interference shall be simulated. For the pulsed interference tests, a pulse-modulated carrier (CW) with peak carrier level of −20 dBm and duty factor of 10 % shall be used. The interference values are shown in the three tables below.

Broadband interference values		
Noise bandwidth (MHz)	Requested total RMS power (dBm)	Applied interference
1	-110.5	-110.5 dBm at 1MHz

Pulsed interference values		
Frequency (MHz)	Pulse width (ms)	Applied interference
1575.42	1	1 ms at 1575.42 MHz

Continuous wave interference (CWI) values		
Frequency (MHz)	Requested power (dBm)	Applied interference
1575.42	-120.5	-120 dBm at 1575.42 MHz
1626.0	+8.0	-80 dBm at 1596.0 MHz

Test times of interference condition testing, IEC61108-1:2003, §5.7

EUT	TüvSüd Ocean Signal AIS
Place of test	BSH, Room 015, GNSS lab
Test engineer	T. Ehlers, S3301
Date of test	4th September 2019

Interference type	Test start time	Time of interference start	Time of interference end	Reaq. Test time	Test end time	Result	Retest
	12:50:00						---
Noise		13:00:00	13:10:00			**Passed**	---
Pulsed		13:15:00	13:25:00			**Passed**	---
CW - 120,5dBm		13:30:00	13:40:00			**Passed**	---
CW -80dBm		13:45:00	13:55:00			**Passed**	---
Noise				14:02:00	14:10:00	**Passed**	---

§ 5.7.2.4.2 Test procedures

a) The equipment under test is subjected to one of the interference sources.
b) The simulator scenario shall be engaged and the satellite signals turned on.
c) The equipment under test shall be powered and initialised.
d) While the EUT is providing position solutions, the interference shall be applied to the equipment under test, and the level of the interference shall be adjusted to the required value.
e) When steady-state accuracy is reached, record a minimum of 100 position and HDOP value as reported by the EUT at a rate of one sample every 2 min.
f) Repeat this cycle for any remaining interference source.

§ 5.7.2.4.3 Required results

Pass/fail determination

If the EUT reports a position with a normalised error greater than 10 m or fails to report a position in more than 5 % of the samples, a test failure is declared.

Remark:
Due to normalizing of the position error in reference to an HDOP of 4, values for normalized error can show wide ranges in case of measured HDOP values around 1.0 or even below. Test passed, if the calculated position is well within GPS position accuracy level defined by IEC61108-1 Ed. 2 (for standard GPS= 13.0m).

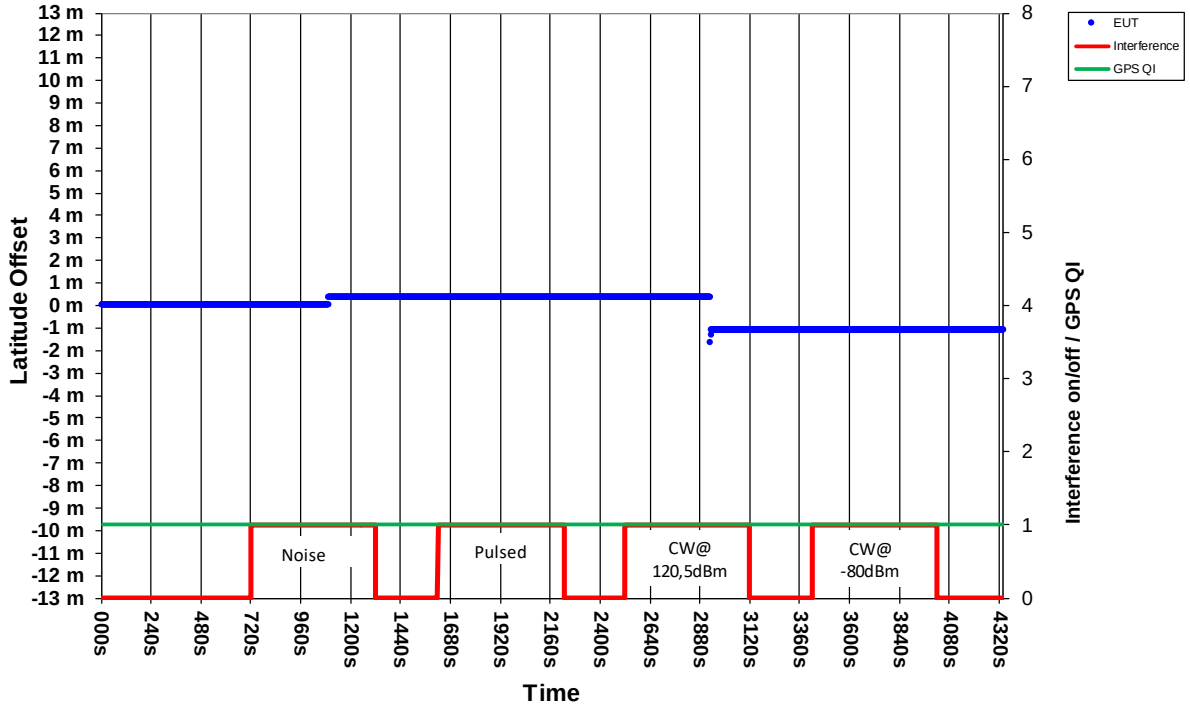
Conditions of tests performed – Simulated signal**.**

§5.7.2.4.3 Required results

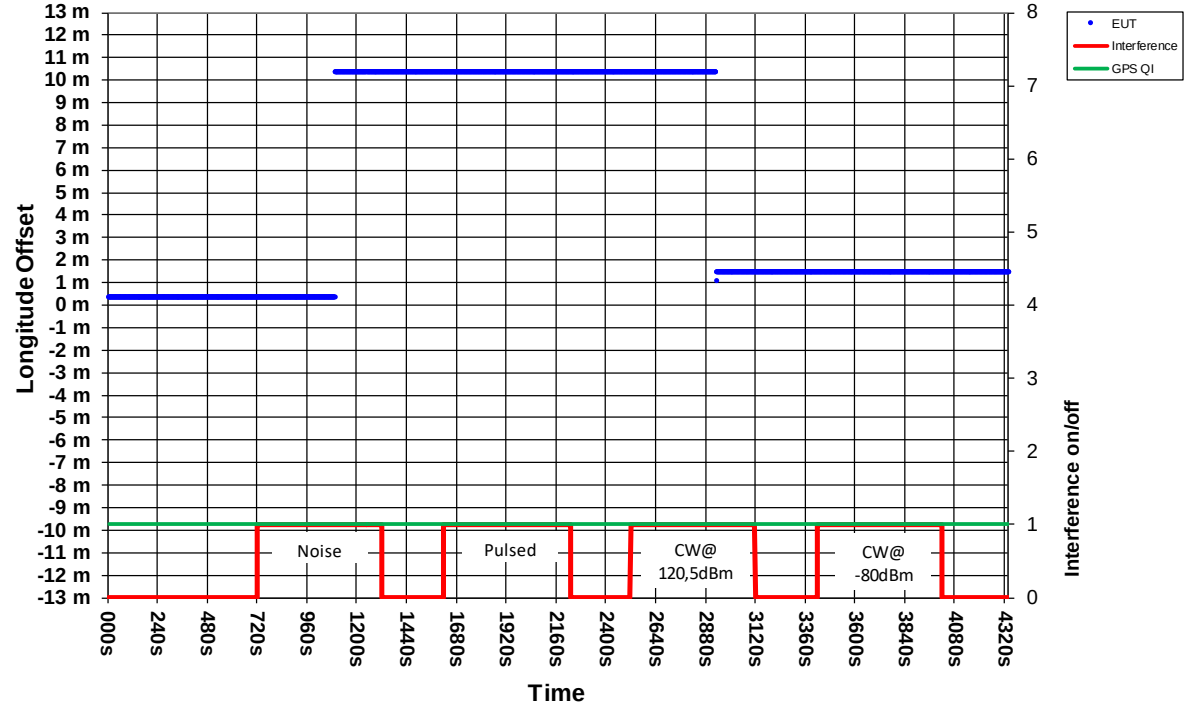
Test result: Passed

For details of validation of recorded data see the following pages.

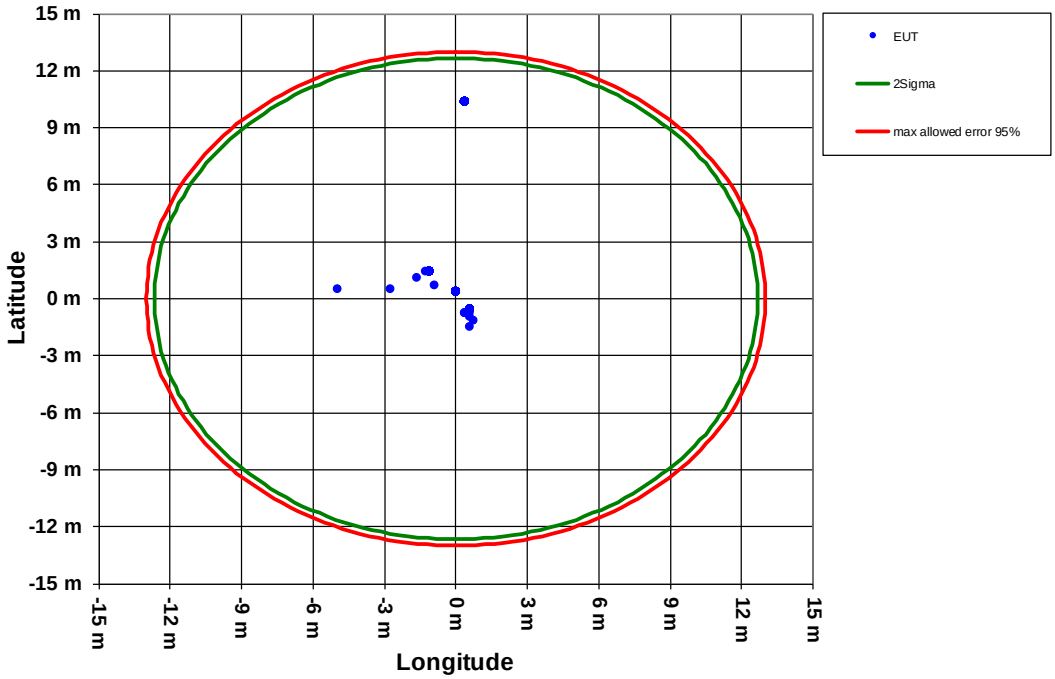
Latitude offset vs. time



Longitude offset vs. time



Position offset during all interference scenarios



B.1.2 §5.7.2.5 Reaquisition test

Method of test

The reacquisition test is designed to simulate a temporary loss of signal, such as passing under a bridge. To determine the re-acquisition pass/fail criteria, consider a single trial where the EUT provides a valid position fix that is within required accuracy at 30 s from restoration of the satellite signals, and maintains a tracking status for at least the next 60 s. This unit is considered to have passed one trial.

§ 5.7.2.5.1 Re-acquisition test procedures
§ 5.7.2.5.2 Interference conditions

The interference condition to be tested is shown below. This is a broadband noise Value centred at 1575.42 MHz.

Noise bandwidth (MHz)	Total RMS power (dBm)
1	−110.5

§ 5.7.2.6 Re-acquisition scenarios
§ 5.7.2.6.1 Test procedures

a) The equipment under test is subjected to the broadband interference source.
b) The simulator scenario shall be engaged and the satellite signals turned on.
c) The equipment under test shall be powered and initialised.
d) The EUT shall be allowed to reach steady-state accuracy before the satellites are to be switched off.
e) The simulator RF output shall be removed for 30 s.
f) The simulator RF output shall be restored to the EUT.
g) After 30 s record a position and HDOP value as reported by the EUT. If after 30 s, no position report has been sent from the receiver, record a trial failure and go to step i).
h) Ensure that the receiver continues position reporting for the next 60 s.
i) Go to Step d) and repeat as required. (note that if the simulator scenario is reset, some receivers may require purging of all previous data to enable proper operation. This is due to the persistence of time data in the receiver and the inability of the receiver's software to deal with a backward transition in time).

§ 5.7.2.6.2 Required results

Pass/fail determination

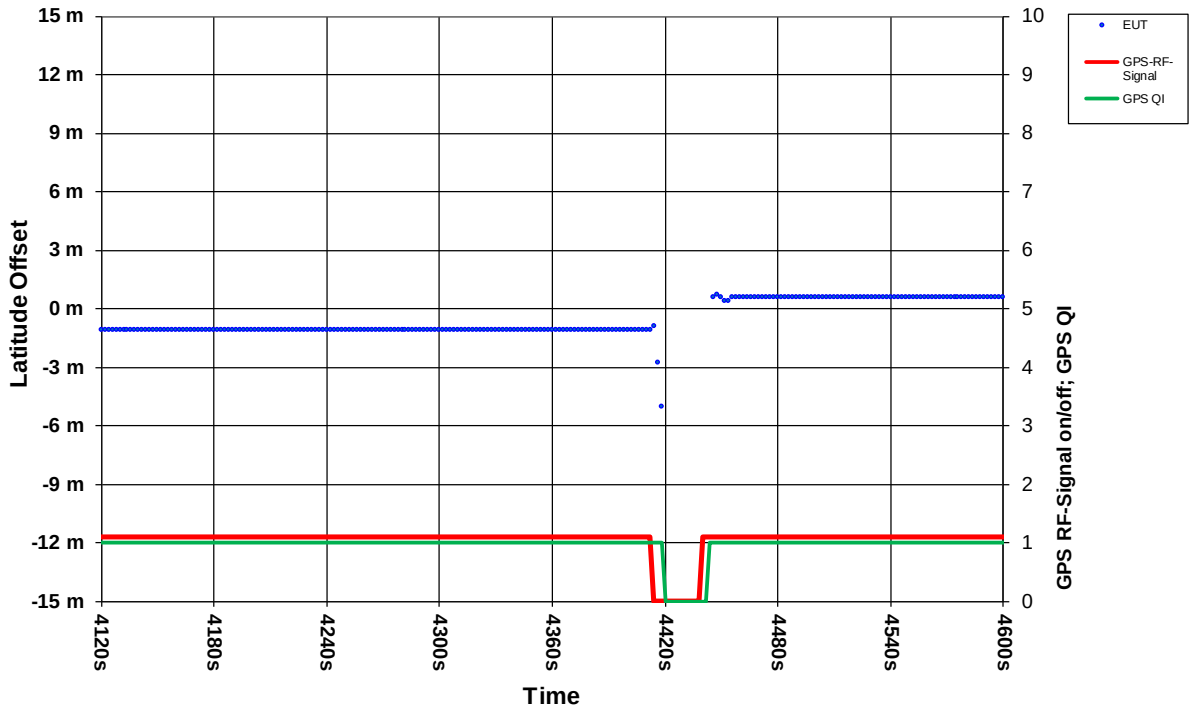
A failure by the EUT to provide a position output after 30 s, reporting a position with normalised error greater than 10 m, or failing to continue position reporting for 60 s after sampling indicates a failure mode, and results in declaring a trial failure. To determine the reacquisition time pass/fail criteria, the test disposition table shall be used.

Conditions of tests performed – Simulated signal

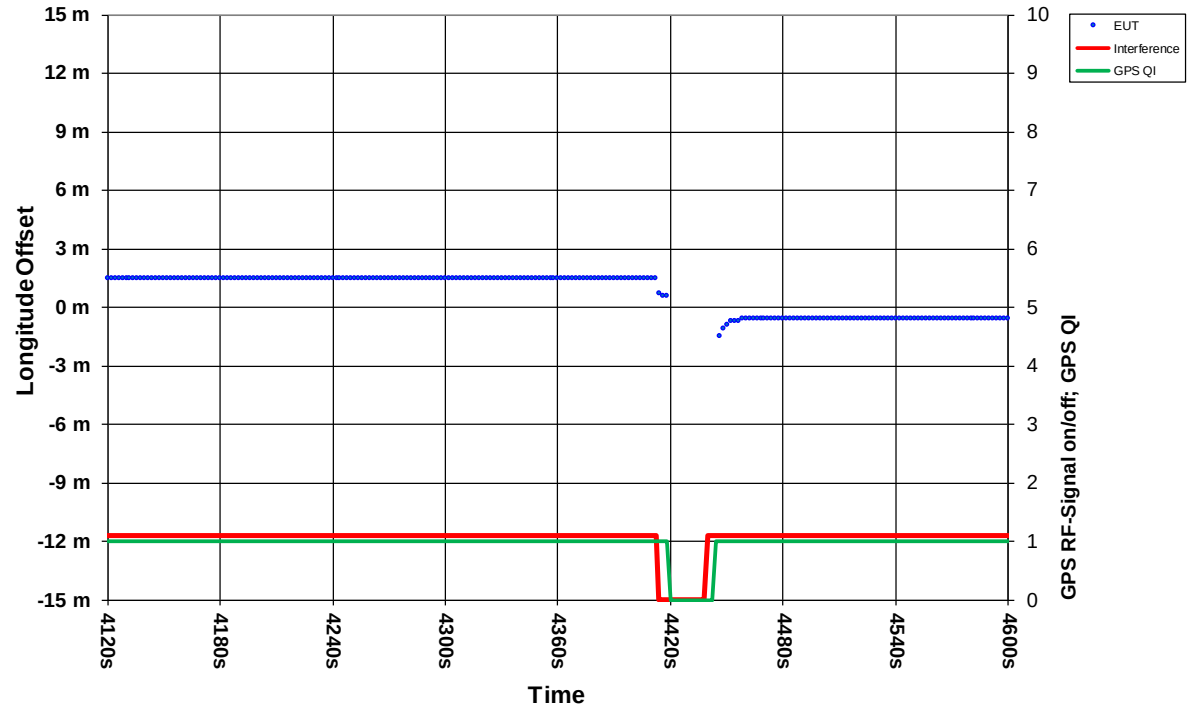
Test result: Passed

For details of validation of recorded data see the following pages.

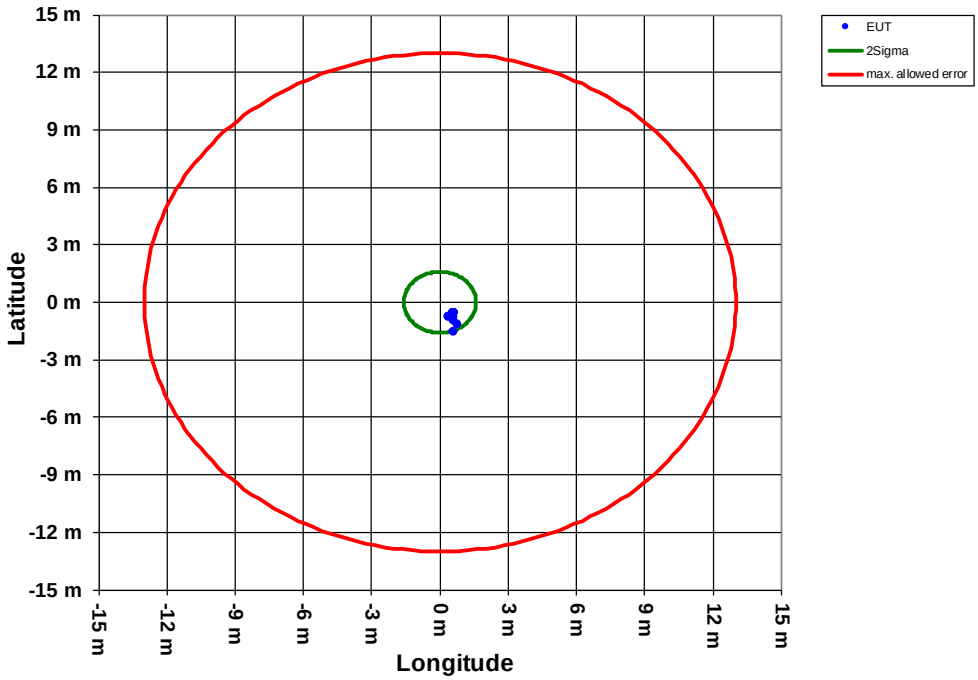
Latitude offset vs. time



Longitude offset vs. time



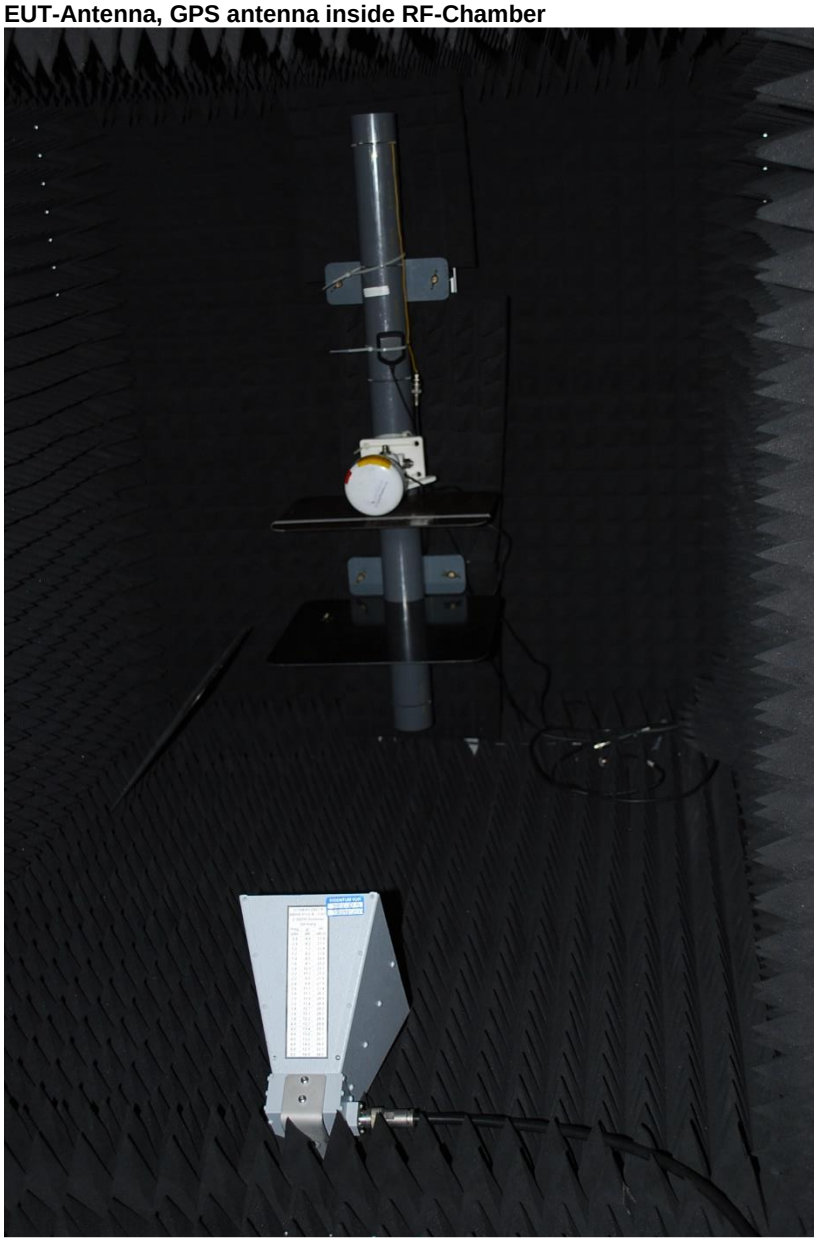
Position offset after time limit of 30 seconds



Annex C - Photos of equipment under test

EUT at testside, BSH Hamburg

EUT-Antenna, GPS antenna inside RF-Chamber



EUT, Main & Display Unit, Versions