



Bundesrepublik Deutschland
Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie
Federal Maritime and Hydrographic Agency



Conformance test report of a

GPS receiver modul
integrated in an
AIS SAR-Transponder

Equipment under test: McMurdo SART
Type: AIS SART
Applying test standards: IEC 61108-1 Ed.2 2003
§5.6.9 Effects of specific interfering signals

Test Report No.: BSH/4615/4321410/09

Applicant: McMurdo
Silver Point, Airport service road
PO3 5PB Portsmouth
UK

by order

Tobias Ehlers
Test engineer

Hamburg, 15th Dec. 2009
Federal Maritime and
Hydrographic Agency

by order

Jochen Ritterbusch
Head of Laboratory

Federal Maritime and Hydrographic Agency
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D-20359 Hamburg
Germany

nach DIN EN 17025
akkreditiertes Prüflaboratorium



DAT-P-086/98

DATEch Deutsche Akkreditierungsstelle Technik in der TGA GmbH
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Akkreditierung

The TGA GmbH, represented by the DATEch Deutsche Akkreditierungsstelle Technik in der TGA GmbH, confirms that the Testing Laboratory

**Federal Maritime and Hydrographic Agency
Department Shipping
Laboratory for Type Approvals
Bernhard-Nocht-Straße 78
20359 Hamburg**

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out testing in the fields of

Marine Equipment (Navigation Equipment, Radio-Communication Equipment, Life-Saving Appliances)

according to the annexed list of standards and specifications.

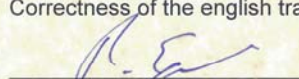
The accreditation is valid until: **2013-12-22**

The annex is deemed part of this certificate and comprises **8** pages.

DAR-Registration No.: **DAT-PL-086/98-02**

Frankfurt/Main, 2008-12-23

Correctness of the english translation confirmed: Frankfurt/Main, 2008-12-23


i.V. Dipl.-Ing. (FH) R. Egner
Head of the Accreditation Body

Member in EA, ILAC, IAF

Translation for information purposes only. The German Accreditation Certificate is authoritative

See notes overleaf

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1 General

Applicant: **McMurdo**

Equipment under test:

Type: AIS SART

Manufacturer: **McMurdo**

**Silver Point, Airport service road
PO3 5PB Portsmouth
UK**

Place of test: BSH test laboratory Hamburg, Room 908

Start of test: 15th December 2009

End of test: 15th December 2009

1.1 Summery

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

Test No.	Reference	Section	Result (passed/ not passed / not applicable / not tested)
1	IEC 61108-1	4.1 Object compliance with IEC 61162-1 compliance with IEC 60945	not tested
2/16	IEC 61108-1	4.2 GPS receiver equipment	not tested
3/17	IEC 61108-1	4.3.1 General	not tested
4/18	IEC 61108-1	4.3.2 Equipment output	not applicable
5/19-23	IEC 61108-1	4.3.3 Accuracy	not tested
6/24-27	IEC 61108-1	4.3.4 Acquisition	not tested
7/28	IEC 61108-1	4.3.5 Protection	not tested
8/29	IEC 61108-1	4.3.6 Antenna design	not tested
9/30-31	IEC 61108-1	4.3.7 Dynamic range	not tested
10/32-33	IEC 61108-1	4.3.8 Effects of specific interfering signals	passed
11/34-35	IEC 61108-1	4.3.9 Position update	not tested
12/36	IEC 61108-1	4.3.10 Differential GPS input	not tested
13/37-40	IEC 61108-1	4.3.11 Failure warnings and status indications	not tested
14/41-42	IEC 61108-1	4.3.12 Output of COG, SOG and UTC	not tested
15/43-44	IEC 61108-1	4.3.13 Typical interference conditions	not tested

1.2 Equipment history

Testunit				
Type	McMurdo SART		Part No.:	S5 Smartfind
Delivery date	2009-12-15		Serial number	---
HW Version:	Delivery date	2009-12-15	Version no	---
	Installation date	2009-12-15		
SW Version:	Delivery date	2009-12-15	Version no	---
	Installation date	2009-12-15		
SW Version:	Delivery date	---	Version no	---
	Installation date	---		

1.3 Test environment

Documentation of equipment tests and dates of tests.

Test environment is completely equipped as described in Annex A.

Room	BSH room 908
Test engineer	T. Ehlers (S3310)
Location	Hamburg, Germany

Equipment no	Start of test	End of test	Test engineer
1	2009-12-15	2009-12-15	T. Ehlers (S3310)
---	---	---	---

1.4 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

1.5 General observations

General observations unrelated to any paragraphs of applied test standards.

None

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
10	4.3.8	Effects of specific interfering signals The GPS receiver equipment shall meet the following requirements: a) In a normal operating mode, i.e. switched on and with antenna attached, it is subject to radiation of 3 W/m² at a frequency of 1 636.5 MHz for 10 min. When the unwanted signal is removed and the GPS receiver antenna is exposed to the normal GPS satellite signals, the GPS receiver equipment shall calculate valid position fixes within 5 min without further operator intervention. b) In a normal operating mode, i.e. switched on and with antenna attached, it is subject to radiation consisting of a burst of 10 pulses, each 1.0 µs to 1.5 µs long on a duty cycle of 1600:1 at a frequency lying between 2.9 GHz and 3.1 GHz at power density of about 7.5 kW/m². The condition shall be maintained for 10 min with the bursts of pulses repeated every 3 s. When the unwanted signal is removed and the GPS receiver antenna is exposed to the normal GPS satellite signals, the receiver shall calculate valid position fixes within 5 min without further operator intervention. Advice shall be given in the manual for adequate installation of the antenna unit, to minimise interference with other radio equipment such as marine radars, Inmarsat SES's, etc.	NOTE (Condition A) is equivalent to exposing the antenna to radiation from an INMARSAT-A or B transmitter at 10 m distance along the bore sight. See test results under test no. 32. NOTE (Condition B) This condition is approximately equivalent to exposing the antenna to radiation from a 60 kW 'S' band marine radar operating at a nominal 1,2 µs pulse width at 600 pulses/s using a 4 m slot antenna rotating at 20 r/min with the GPS antenna placed in the plane of the bore site of the radar antenna at a distance of 10 m from the centre of rotation.	Passed Passed

	5.6.9 (4.3.8)	Effects of specific interfering signals		
32	5.6.9.1 (4.3.8 a)	L Band Interference In a normal operating mode, using an appropriate signal source, the EUT shall be subjected to radiation of 3 W/m ² at a frequency of 1 636.5 MHz for 10 min. The signal shall be removed and a successful performance check shall be carried out within 5 min.	For test results see Annex B of this report	Passed
33	5.6.9.2 (4.3.8 b)	S Band Interference In a normal operating mode, using an appropriate signal source, the EUT shall be subjected to radiation consisting of a burst of 10 pulses, each 1.0 µs to 1.5 µs long on a duty cycle of 1600:1 at a frequency in the range of 2.9 GHz to 3.1 GHz at power density of approximately 7.5 kW/m ² . This condition shall be maintained for 10 min with the bursts of pulses repeated every 3 s. NOTE The peak power density is 7.5 kW/m ² to be measured at the EUT, this is approximately 4.7 W/m ² average power at a fixed transmitting antenna. The signal shall be removed and a successful performance check shall be carried out within 5 min.	For test results see Annex B of this report	Passed

Annex A Test equipment

A.1 Test equipment summary

Model / Program	Serial No. / Version No.	Calibrated / Function test	Used for
INMARSAT- M communication device	QUFC 911 901/1 SN 00354	Function test before usage	L-Band interference
Radar-Device Furuno FR 2135S	FR-2105 Series	Function test before usage	S-Band interference
Narda Electromagnetic Radiation Monitor	Model 8616	Calibration Certificate E-38743-02-10	Induced Power of L-Band

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) 564257.804
	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) 564258.046
	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 Inmarsat communication device

Specification of Inmarsat-M used for L-Band Test

Manufacturer:	NERA
Model:	Saturn Mm Marine
Specifications:	
System :	
Tx Freq.	1626.5 – 1646.5 MHz
EIRP	27/21 dBW
Rx Freq.	1525.0 – 1545.0 MHz
Channel spacing	10 kHz
G/T	-10 dB/K
Antenna	Stabilized flat plane array



Electromagnetic compatibility:

Radiated	EN 55022 class B
Conducted	EC 801
Interfaces:	
Ext. tel/fax outlets	5 x RJ11, 2-wire with echo cancelling and touch-tone dialling
Fax	CCITT G3 at 2400 bps
Data	D-sub, 25-pin fem., 2400 bps, RS-232
Hayes AT compatible	
PC	D-sub, 9-pin fem., RS-232
Printer	D-sub, 9-pin male, RS-232
Gyro	Synchro, step-by-step

(Basic system incorporates built-in fluxgate compass)

Navigator	NMEA 0183	
Power Supply	10 - 34 VDC	(90-276 VAC optional)
Power Consumption	75 W	

A.2.2 Radar device

Specification of RADAR used for S-Band Test



Manufacturer: **Furuno Electric Co., LTD.**
Model: **FR-2105 Series**
Specifications:

Antenna radiator:
Type: Slotted waveguide array
Bandwidth: S-Band
Radiator Type: SN7AF
Length: 12 ft
Beamwidth (H): 1.9°
Beamwidth (V): 20°
Sidelobes ±10°: -28 dB
Polarization: Horizontal
RF Transceiver:
Frequency: X-Band, 3050 MHz ± 30 MHz
Output power: FR-2135S/SW: 35 KW

Pulse lengths and PRR (<RF aloft>)

Range scales	P/L (µs)	PRR (Hz)
0.125 / 0.25	0.07	3000
0.5	0.07 / 0.15	3000
0.75 / 1.5	2 from 0.07 / 0.15 / 0.3	3000 / 1500
3	2 from 0.15 / 0.3 / 0.5 / 0.7	3000 / 1500
6	2 from 0.3 / 0.5 / 0.7 / 1.2	1500 / 1500
12 / 24	2 from 0.5 / 0.7 / 1.2	1000 / 600
48 / 96	1.2	600

A.2.3 Narda electromagnetic radiation monitor

Specification of Radiation Monitor



Manufacturer:	narda	
Model:	Electromagnetic Radiation Monitor Model 8616	
Specifications:		
Dynamic range	30 dB	
Full scale ranges (mW/cm²)	0-0.2; 0-2; 0-20, and 0-1; 0-10; 0-100	
Accuracy:	6 3 %	
Response Time (approx.)	1 sec in fast position, 3 sec in slow position	
Model:	Probe 8621B	
Specifications:		
Frequency sensitivity	13 to 200 MHz	0.5 dB
	10 to 300 MHz	2 dB maximum total deviation
	1 to 12 GHz	6 0.75 dB
	0.85 to 16 GHz	+ 0.75 dB – 1 dB
	0.3 to 18 GHz	+ 0.75 dB – 3 dB
	0.3 to 2 GHz	+ 0.75 dB – 4.5 dB
CW overload rating	300 mW/cm²	
Peak Power	60 W/cm²	

Annex B - Test diagrams

B.1 § 5.6.9 Effects of specific interfering signals

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)
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	y(m) 657442.338	E 9° 58' 6".10189	y(m) 564258.046
	z(m) 5107017.296	Height over Ellipsoid 95.849 m	Altitude above sea level 55.917

Accuracy of survey = $\pm 2\text{cm}$

B.1.1 § 5.6.9.1 L-Band interference

In a normal operating mode, using an appropriate signal source, the EUT shall be subjected to radiation of 3 W/m^2 at a frequency of 1636.5 MHz for 10 min. The signal shall be removed and a performance check shall be carried out.

Conditions of tests performed

Frequency:	1636.5 MHz
Radiation:	3 W/m^2
Duration of test:	10 min
Number of position samples	253

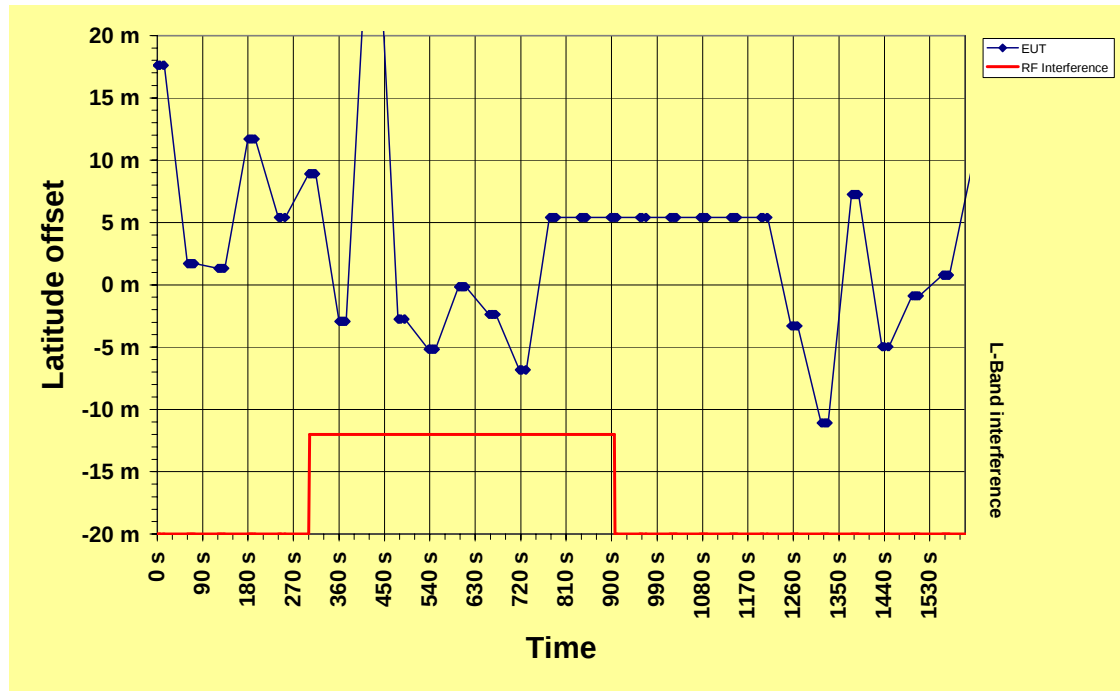
Test results

After removing the signal, the performance of the EUT was checked and found operating properly.

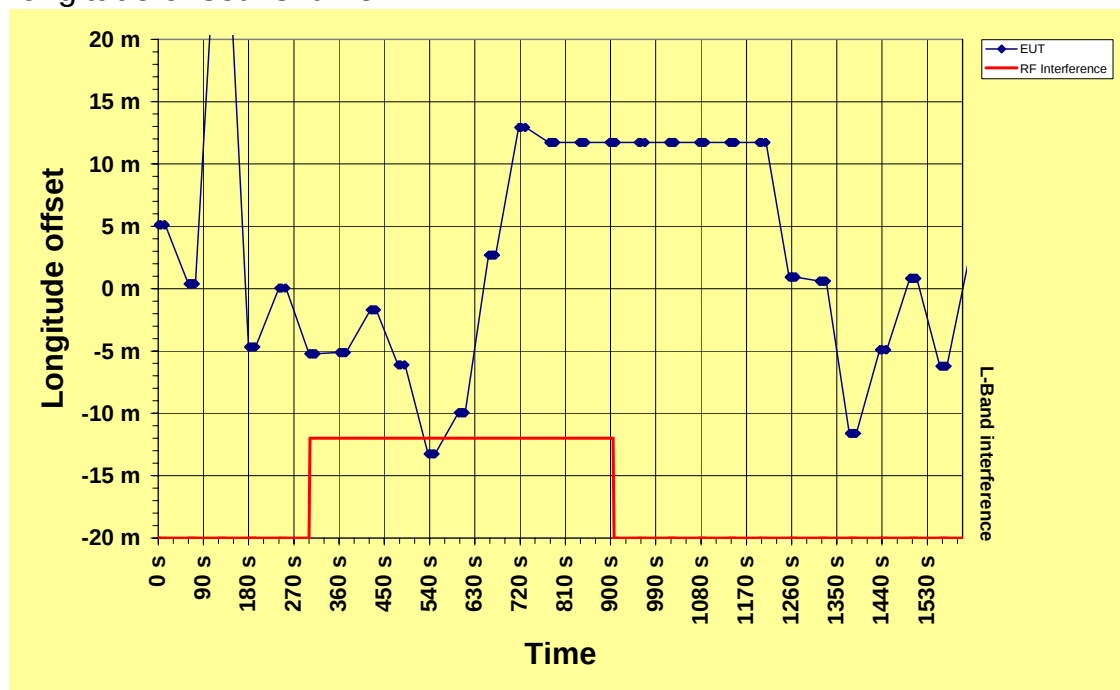
Test result: Passed

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

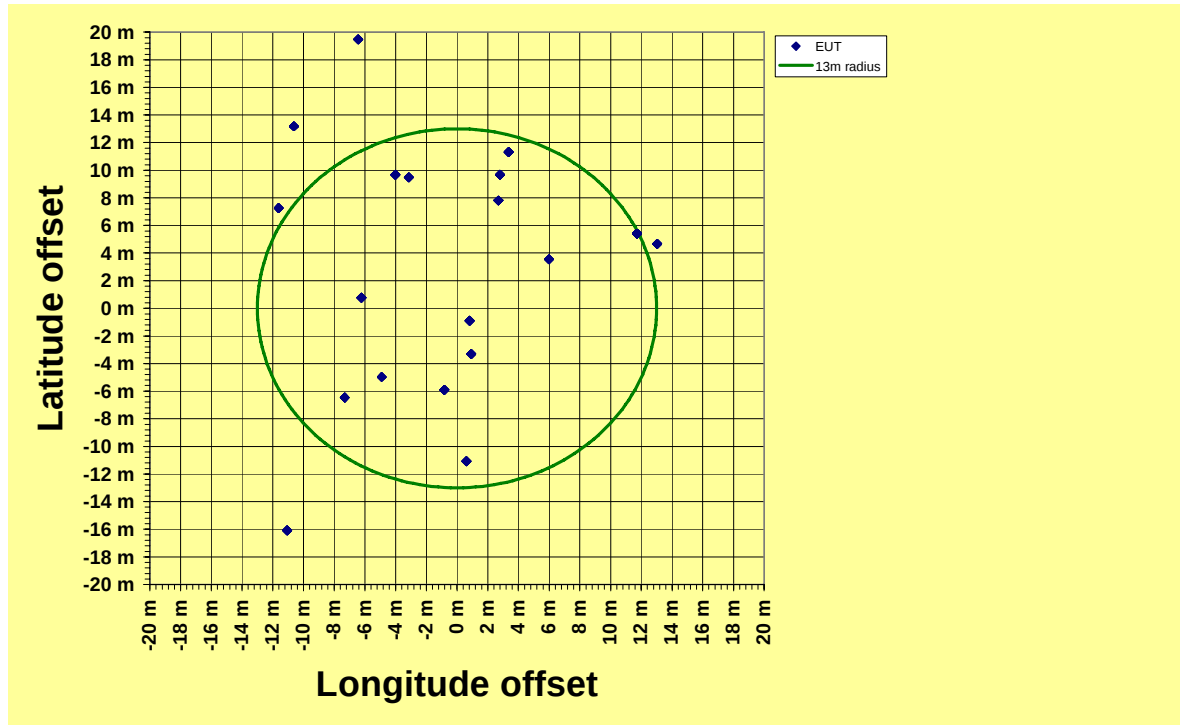
Latitude offset vs. time



Longitude offset vs. time



Position



B.1.2 §5.6.9.2 S- Band interference

In a normal operating mode, using an appropriate signal source, the EUT shall be subjected to radiation consisting of a burst of 10 pulses, each 1.0 to 1.5 μs long on a duty cycle of 1600:1 at a frequency in the range of 2.9 to 3.1 GHz at a power density of approximately 7.5 kW/ m². This condition shall be maintained for 10 min with the bursts of pulses repeated every 3 s.

The signal shall be removed and a performance check shall be carried out.

Conditions of tests performed

Frequency range:	2.9 to 3.1 GHz
Radiation:	7.5 kW/m ²
Duration of test:	10 min
Number of position samples	173

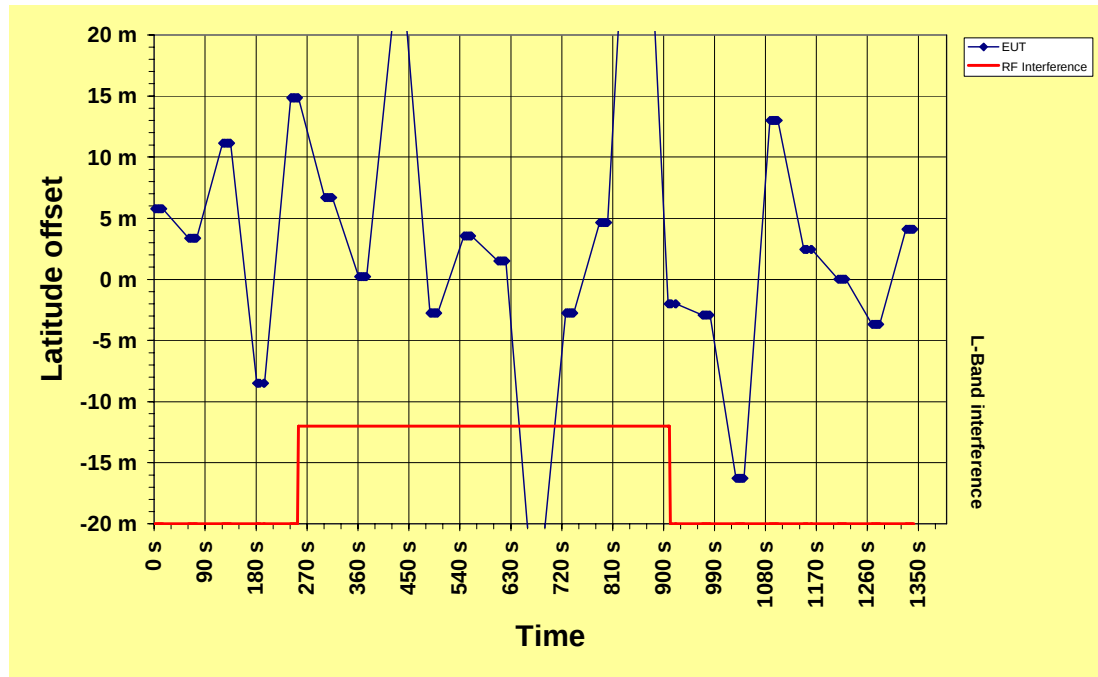
Test results

After removing the signal, the performance of the EUT was checked and found operating properly.

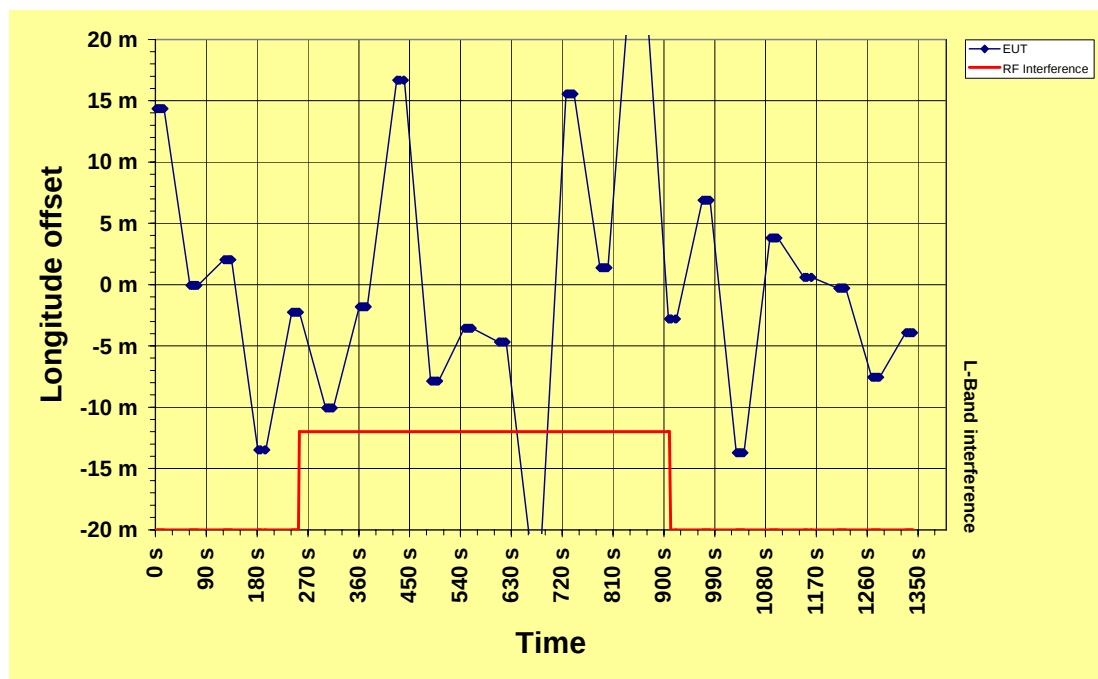
Test result: Passed

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

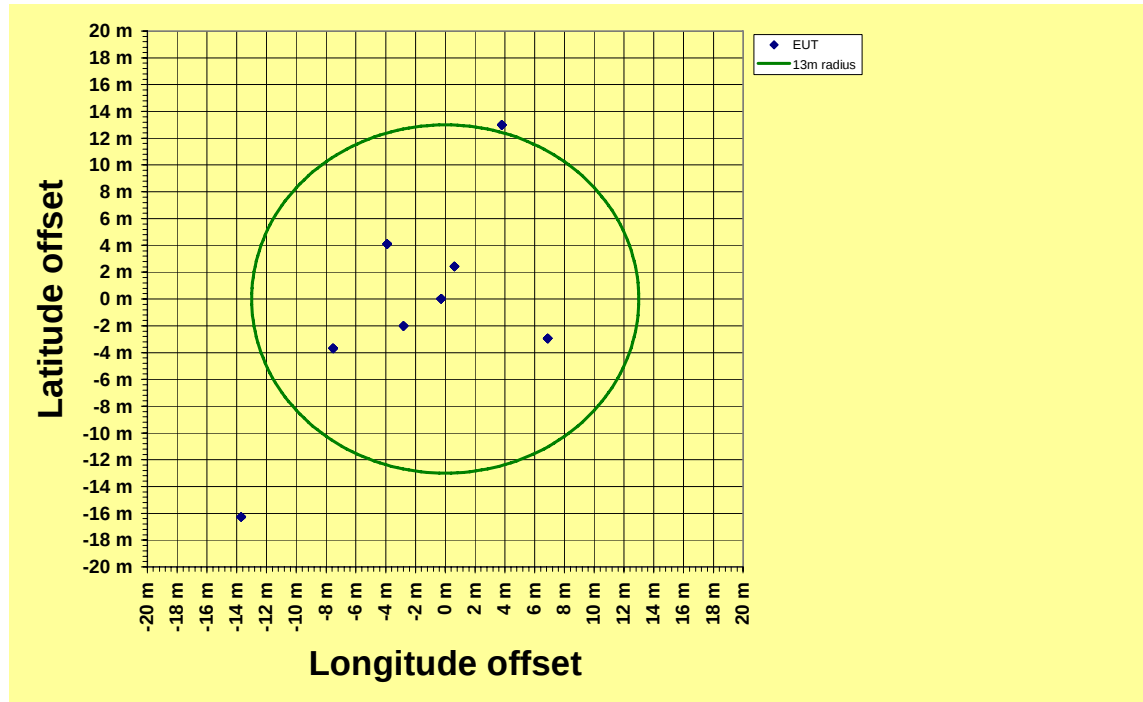
Latitude offset vs. time



Longitude offset vs. time



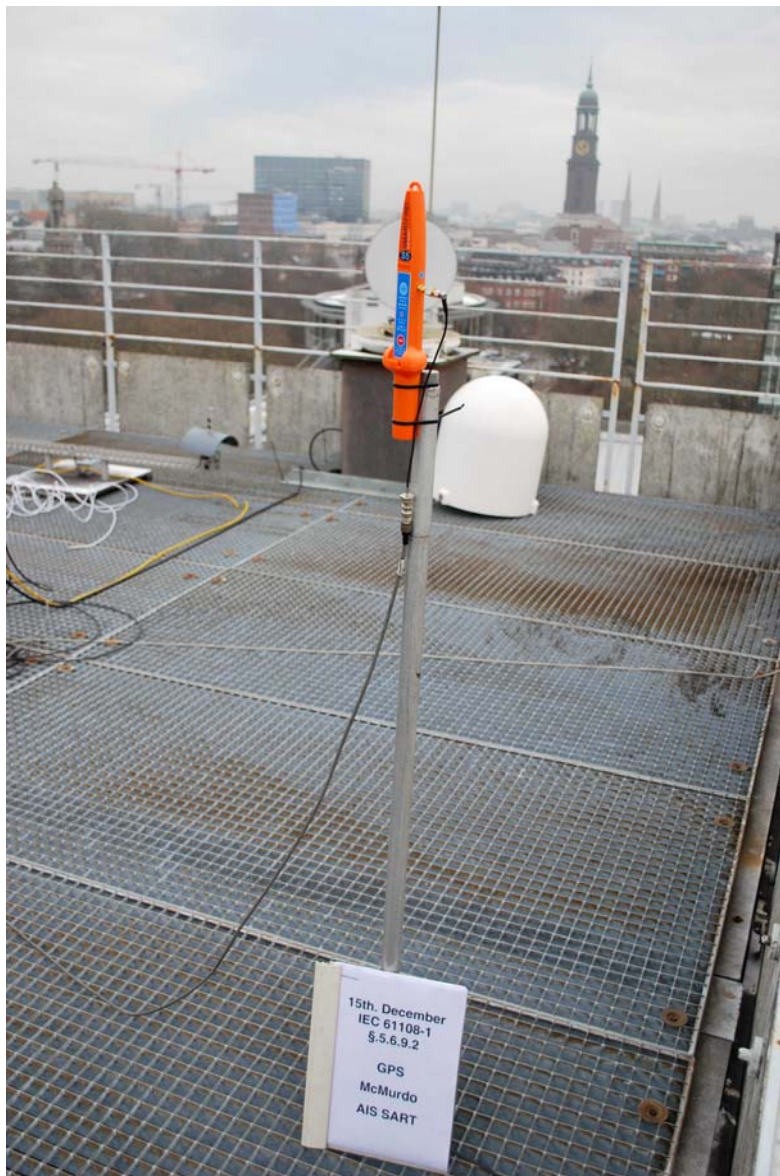
Position



Annex C - Photos of equipment under test

EUT in operation at testside, BSH Hamburg

EUT – L –Band interference test



EUT – S –Band interference test

