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 a

GPS receiver module

integrated in an

EPIRB

Equipment under test:	McMurdo GPS EPIRB
Type:	G5 SMARTFIND plus
Applying test standards:	IEC 61108-1:2003
	§4.3.8 Effects of specific interfering signals
Test Report No.:	BSH/46162/4141862/10
Applicant:	TÜV SÜD Product Service Ltd. Octagon House, Concorde Way Segensworth North, Fareham Hampshire PO15 5RL, UK

Hamburg, 15th December 2010

by order

Tobias Ehlers
Test engineer

Federal Maritime and Hydrographic Agency

by order

Jochen Ritterbusch
Head of Laboratory

nach DIN EN 17025
akkreditiertes Prüflaboratorium

Deutscher Akkreditierungs Rat

DAT-PL-086/98-02

Federal Maritime and Hydrographic Agency
Bernhard-Nocht-Str. 78

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Germany

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Federal Maritime and Hydrographic Agency
Department Shipping
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Bernhard-Nocht-Straße 78

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according to the annexed list of standards and specifications.

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Frankfurt/Main, 2008-12-23

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

Member in EA, ILAC, IAF

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See notes overleaf

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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:	McMurdo GPS EPIRB
Type:	G5 Smartfind EPIRB version 2 (uBlox NEO-6M GPS)
Manufacturer:	McMurdo Ltd. Portsmouth, UK
Place of test:	BSH test laboratory Hamburg, Room 908/ Test facility on the roof of BSH
Start of test:	8th December 2010
End of test:	8th December 2010

1.1 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
1-3	IEC 61108-1	4.3.8 Effects of specific interfering signals	**passed**
--	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
--	IEC 61108-1	4.3.13 Typical interference conditions	not tested

1.2 Equipment history

Equipment No. 1				
Type	**GPS EPIRB**		**Part No.:**	**G5 SMARTFIND plus**
Delivery date	**1st December 2010**		**Serial number**	**---**
HW Version:	**Delivery date**	**2010/12/01**	**Version no**	**75911555-TSR0004**
	Installation date	**2010/12/08**		
SW Version:	**Delivery date**	**2010/12/01**	**Version no**	**---**
	Installation date	**2010/12/01**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		
SW Version:	**Delivery date**	**---**	**Version no**	**---**
	Installation date	**---**		

1.3 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 (S3301)**
Location	**Hamburg**

Equipment no	**Start of test**	**End of test**	**Test engineer**
1	**8th Dec. 2010**	**8th Dec. 2010**	**T. Ehlers (S3301)**

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.

[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	**4.3.8**	**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 3W/m² at a frequency of 1636.5MHz for 10min. 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 5min 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 10pulses, each 1.0µs to 1.5µs long on a duty cycle of 1600:1 at a frequency lying between 2.9GHz and 3.1GHz at power density of about 7.5kW/m². The condition shall be maintained for 10min with the bursts of pulses repeated every 3s. 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 5min 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 B) This condition is approximately equivalent to exposing the antenna to radiation from a 60kW 'S' band marine radar operating at a nominal 1,2µs pulse width at 600 pulses/s using a 4m slot antenna rotating at 20r/min with the GPS antenna placed in the plane of the bore site of the radar antenna at a distance of 10m from the centre of rotation.	**Passed** **Passed**

No. of test	IEC 61108-1	Requirement/Condition	Remark	Result
	5.6.9 (4.3.8)	**Effects of specific interfering signals**		
2	**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 3W/m² at a frequency of 1636.5MHz for 10min. The signal shall be removed and a successful performance check shall be carried out within 5min.	For test results see Annex B of this report **Note** EUT is a battery powered GPS EPIRB, GPS module is active for the first 15 Minutes of operation and afterwards powered for position calculation every 20 Minutes, only.	**Passed**
3	**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 1.0µs to 1.5µs long on a duty cycle of 1600:1 at a frequency in the range of 2.9GHz to 3.1GHz at power density of approximately 7.5kW/m². This condition shall be maintained for 10min with the bursts of pulses repeated every 3s. NOTE The peak power density is 7.5kW/m² to be measured at the EUT, this is approximately 4.7W/m² average power at a fixed transmitting antenna. The signal shall be removed and a successful performance check shall be carried out within 5min.		**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'	L- and S-Band interference
MiniCircuits RF- Amplifier	ZHL-5W-2G-S+	Function tests performed successfully	L-Band interference
Radar-Device Furuno FR 2135S	FR-2105 Series	N/A	S-Band interference
Signal Generator R&S SMJ100	S/N: 100858	2010/10/07	Interference tests IEC 61108-1 Ed.2, §5.6.9.1; §5.7
Narda Broadband Field Meter	B-1059/NBM550	Calibrated	Induced Power of L/S-Band
Horn Antenna Schwarzbeck BBHA 9120A	BBHA 9120A 535	2009/11/26	L-Band Interference transmission

Reference position

Made by FREIE UND HANSESTADT HAMBURG
Vermessungsamt –VA311-

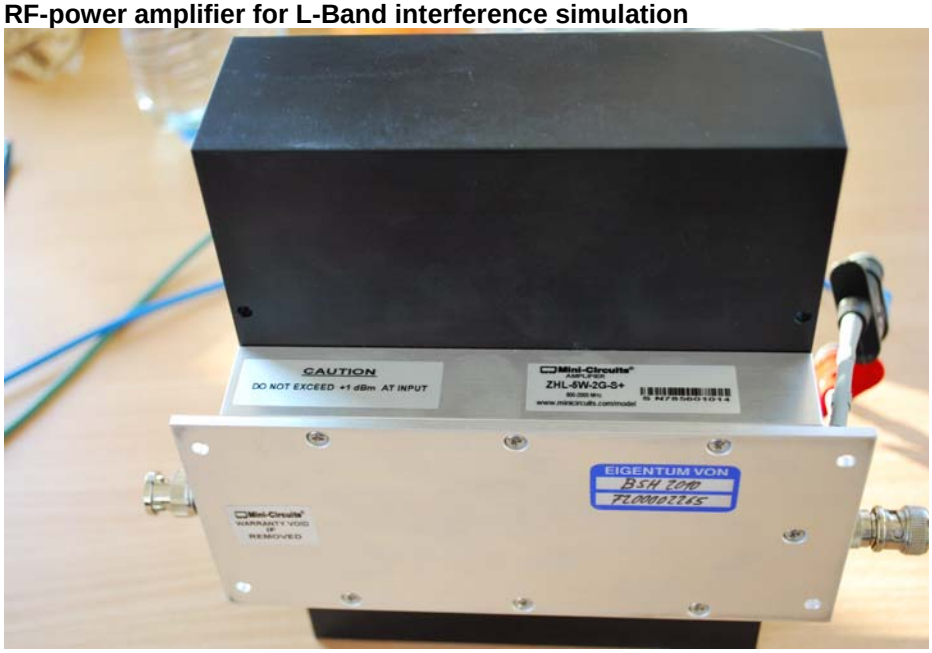
Description of point	geocentrically co-ordinates (WGS84)		geodetical geographical co-ordinates (WGS84)		Gauß-Krüger (Bessel)	
North	x(m)	3740601.680	N	53° 32' 49''.49049	x(m)	5935502.790
	y(m)	657439.492	E	9° 58' 6''.10408	y(m)	3 564257.804
	z(m)	5107029.673	Height over Ellipsoid	95.900 m	Altitude above 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)	3 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 L-Band interference testing

RF-power amplifier for L-Band interference simulation



Horn antenna and Narda Field Meter for L-Band interference simulation

A.2.2 Radar device – S-Band interference

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

Annex B - Test diagrams

B.1 § 5.6.9 Effects of specific interfering signals

B.1.1 § 5.6.9.1 L-Band interference GPS

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 – Real GPS signal

Frequency:	1636.5 MHz
Radiation:	3 W/m^2
Duration of test:	15 min

Test results

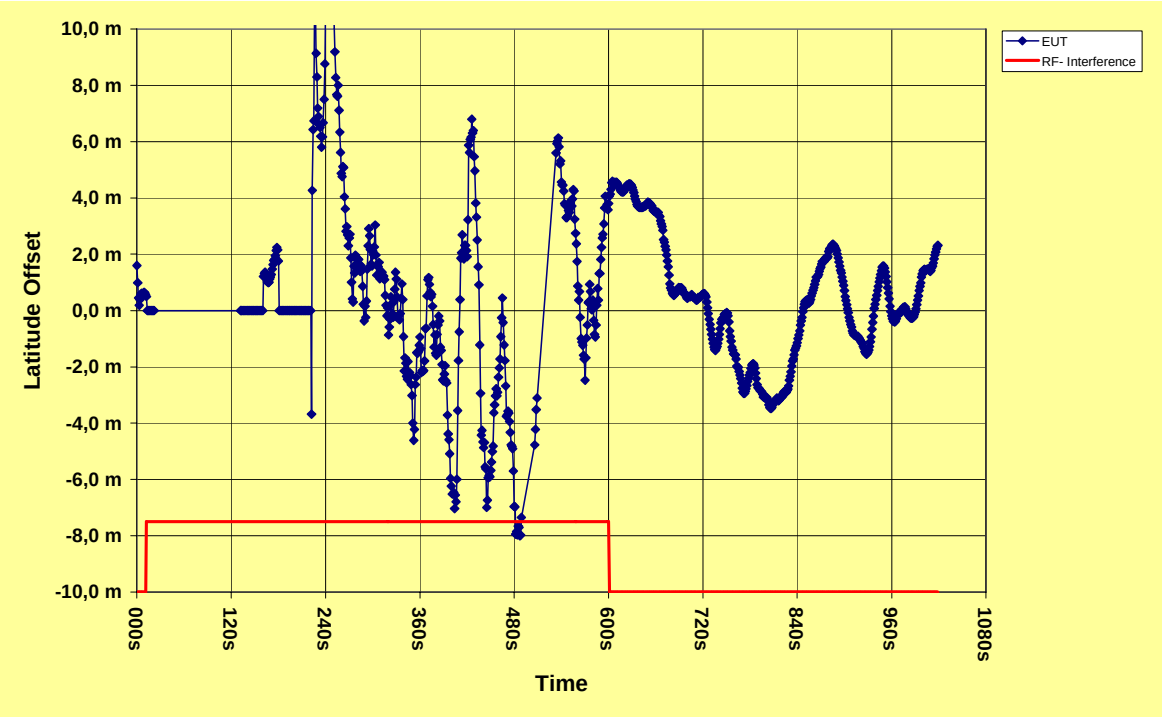
After removing the signal, the performance of the EUT was checked and found operating properly.

Position accuracy: 7.62m (2 sigma)

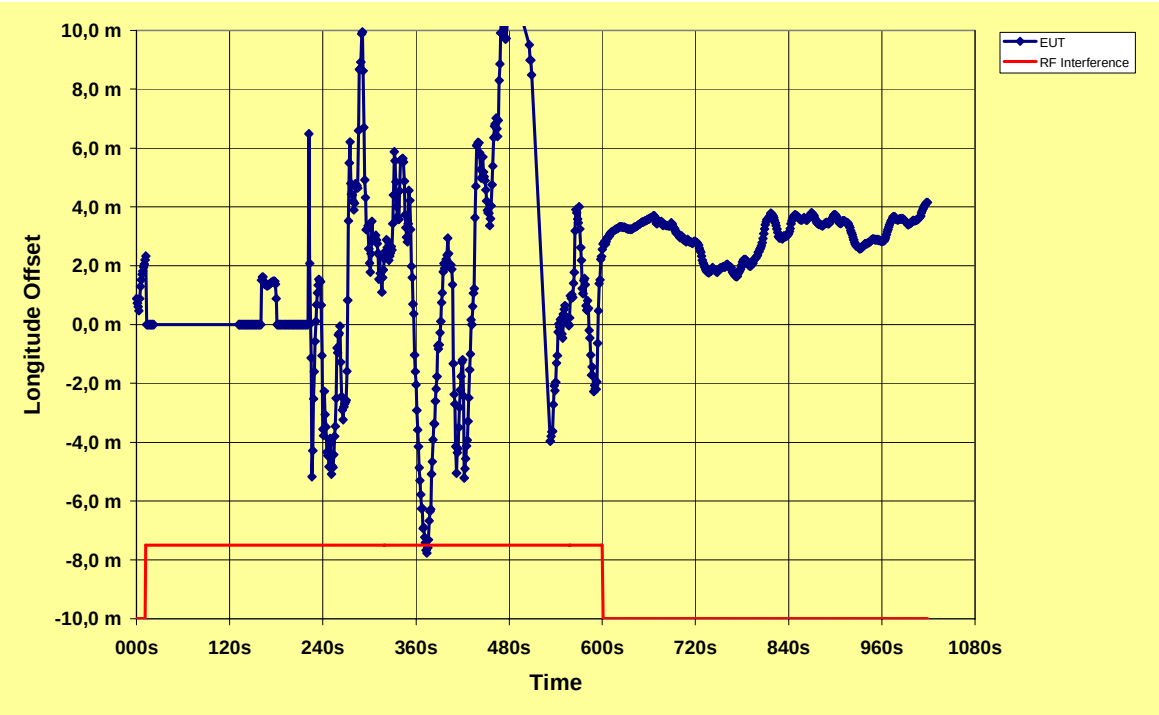
Test result: Passed

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

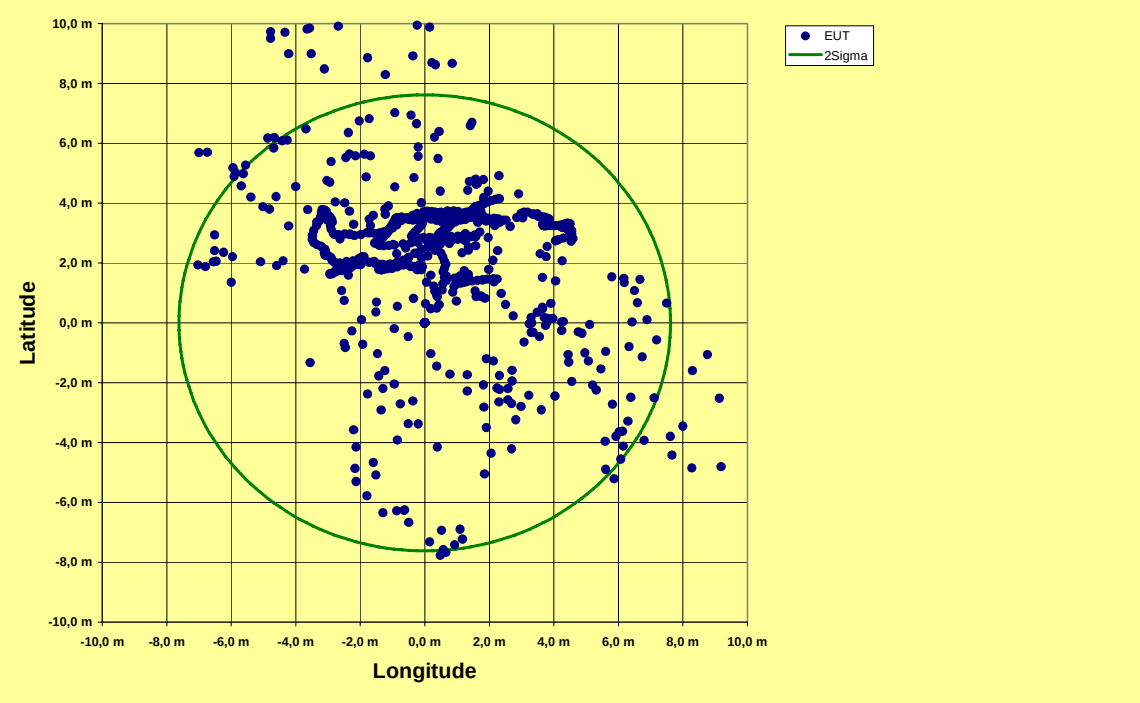
Latitude offset vs. time



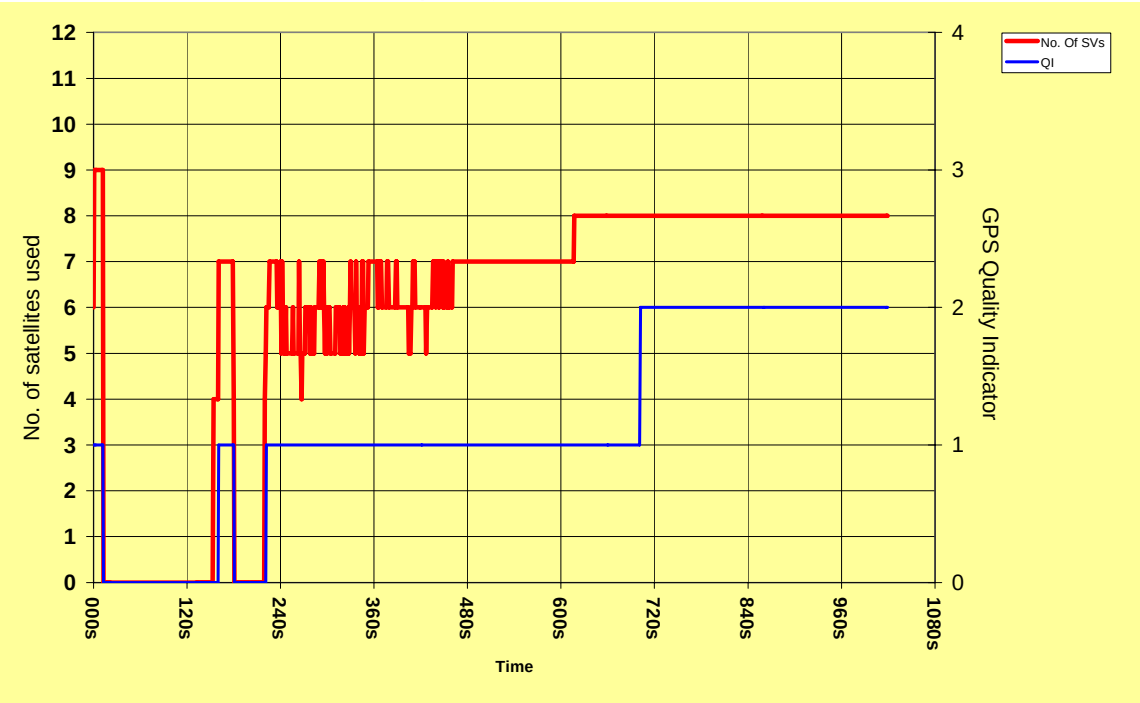
Longitude offset vs. time



Position



Satellites in view and GPS quality indicator



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/ m^2. 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- Real GPS signal

Frequency range:	2.9 to 3.1 GHz
Radiation:	7.5 kW/m^2
Duration of test:	15 min

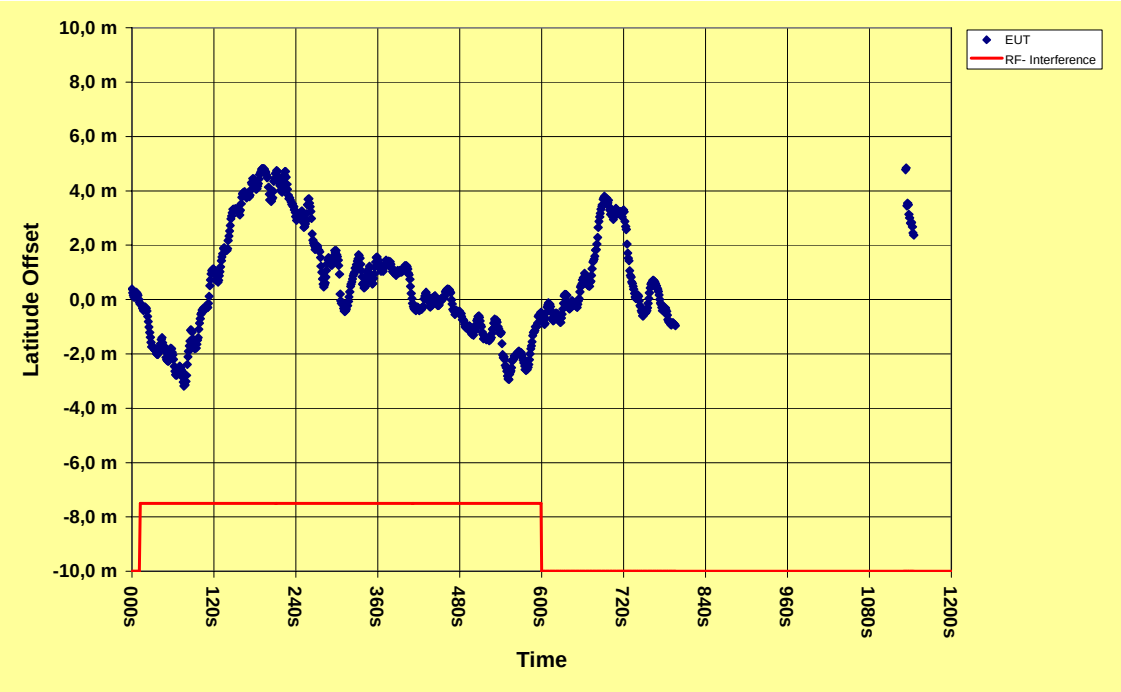
Test results

After removing the signal, the performance of the EUT was checked and found operating properly.
Position accuracy: 4.27m (2 sigma)

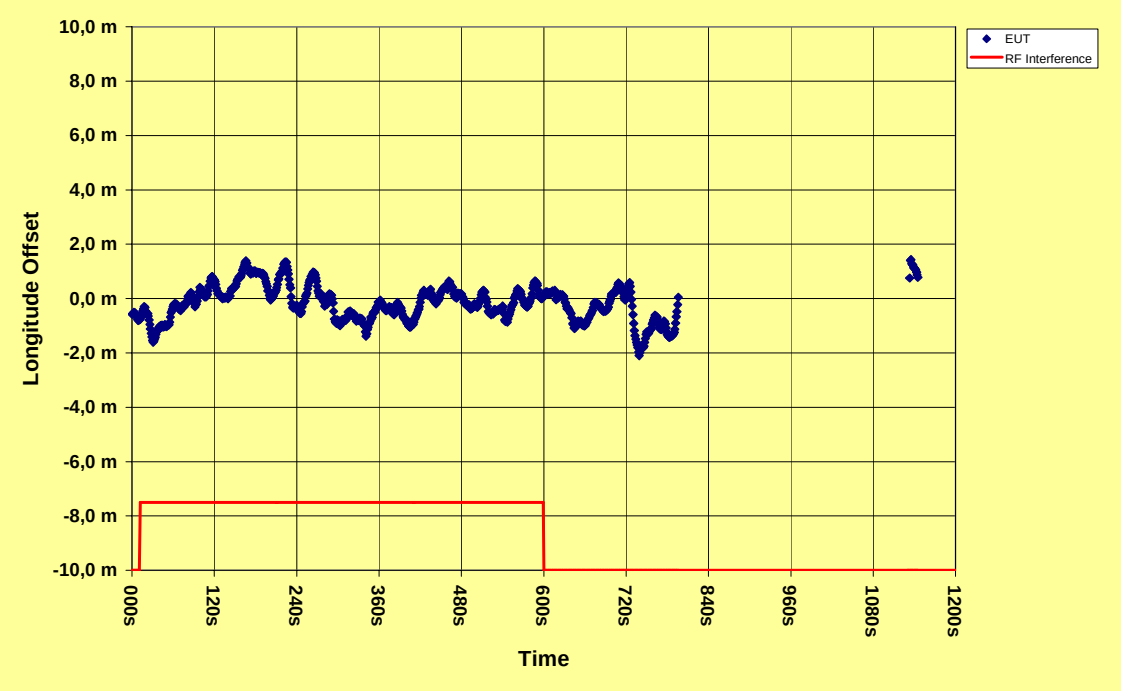
Test result: Passed

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

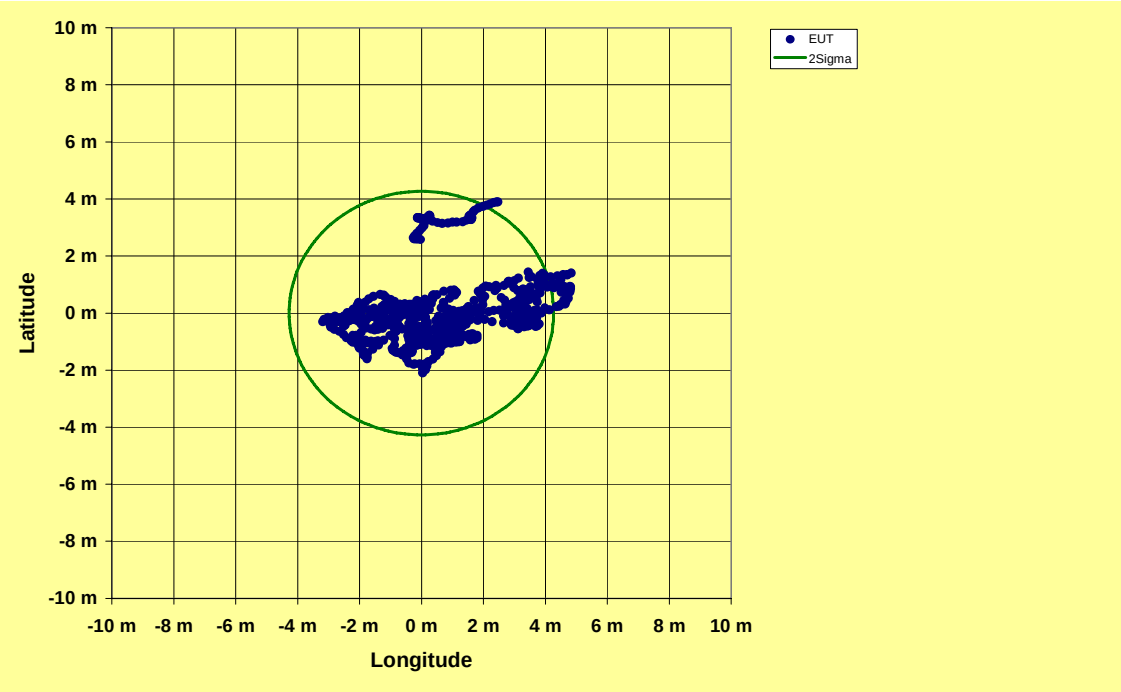
Latitude offset vs. time



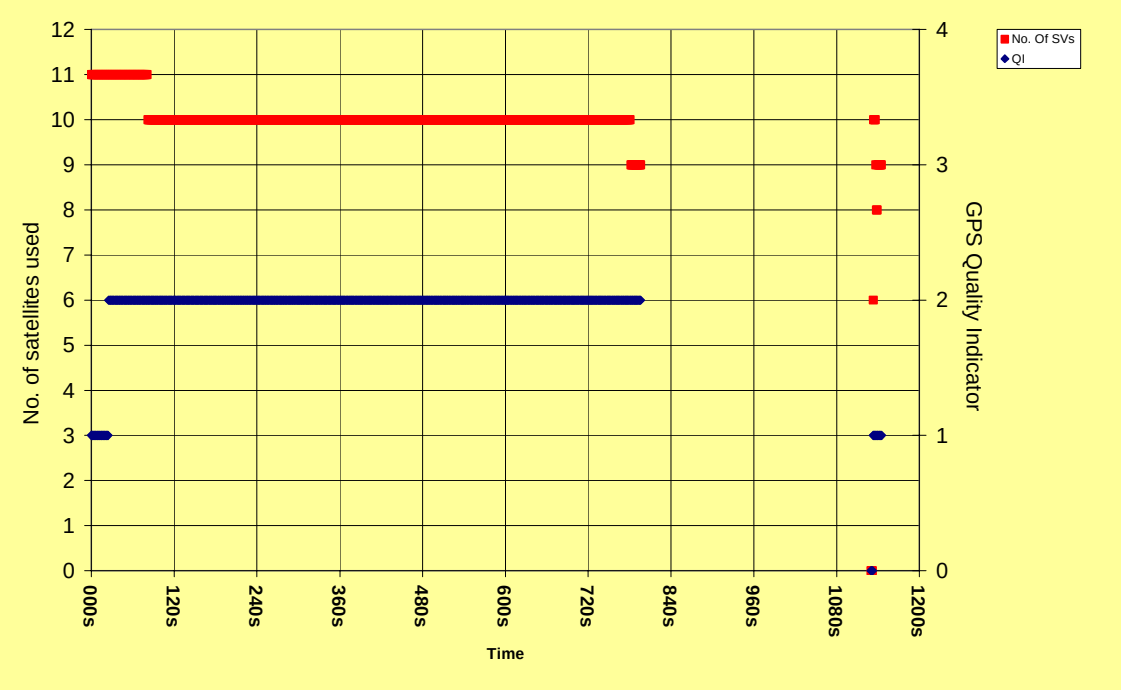
Longitude offset vs. time



Position



Satellites in view and GPS quality indicator



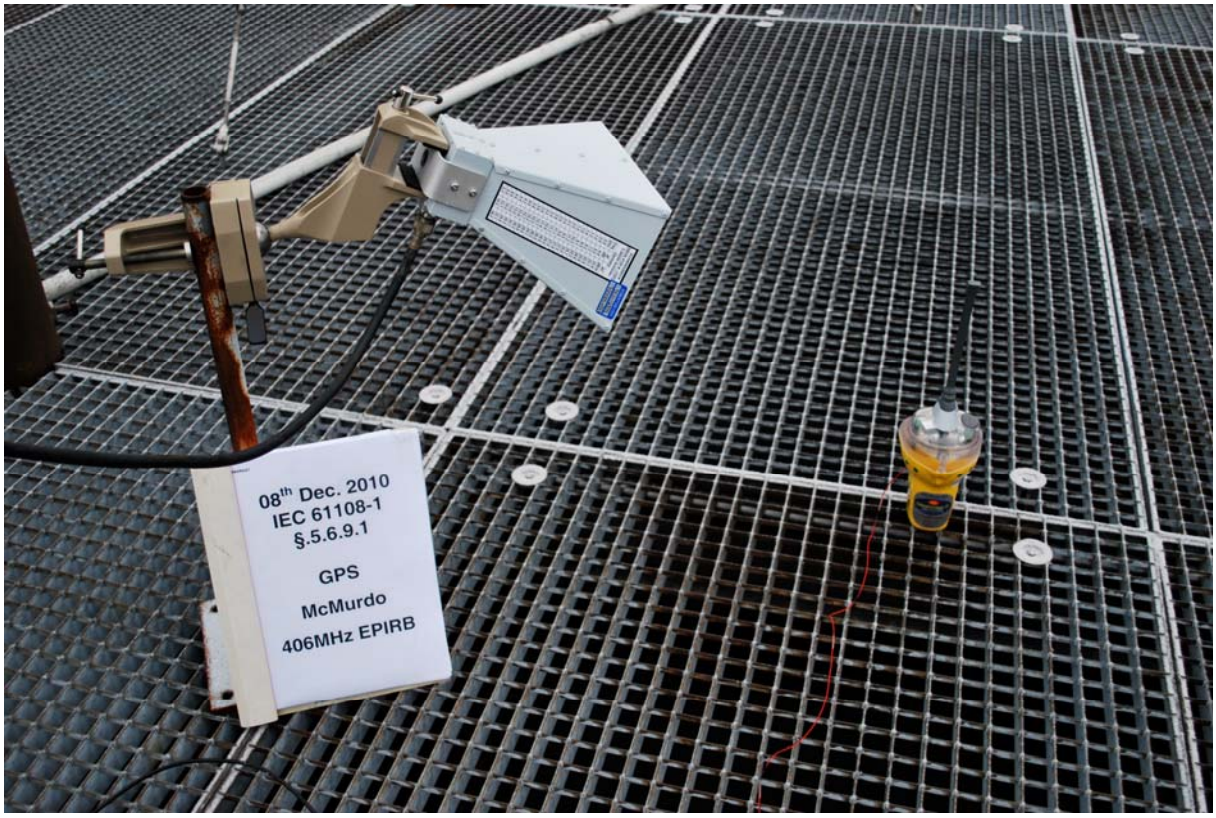
Annex C - Photos of equipment under test

EUT at testside, BSH Hamburg

EUT – id tag

mcmurdo
G5
SMARTFIND PLUS
406 GPS EPIRB
OPERATES ON 406 MHZ AND 121.5 MHZ
WARNING
USE ONLY IN SITUATIONS OF GRAVE AND IMMINENT DANGER.
IMPROPER USE CARRIES A SEVERE PENALTY.
NOTICE TO PUBLIC
IF FOUND, DO NOT MOVE, REPORT POSITION TO COASTGUARD
Compass safe distance 1m.
Do not paint. Do not clean with solvents.
Manufactured by McMurdo Ltd.
Portsmouth, UK.
www.mcmurdo.co.uk

EUT – L–Band interference test



EUT – S–Band interference test