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Report On

Type Approval Testing of the
Orolia Limited
Z701 EPIRB
In accordance with IEC 60945

Document 75931946 Report 06 Issue 1 October 2017

Product Service

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REPORT ON

Type Approval Testing of the
Orolia Limited
Z701 EPIRB
In accordance with IEC 60945

Document 75931946 Report 06 Issue 1

October 2017

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DATED 26 October 2017	27 October 2017	31 October 2017

UKAS TESTING
0141

Product Service

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Product Service

SECTION 1

REPORT SUMMARY

Type Approval Testing of the
Orolia Limited
Z701 EPIRB
In accordance with IEC 60945

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Type Approval Testing of the Z701 EPIRB to the requirements of IEC 60945.

Objective	To perform Emergency Beacon Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Orolia Limited
Model Number(s)	Z701
Serial Number(s)	ENV#2002 (TUV Ref TSR0087) - Radiated ENV#2001 (TUV Ref TSR0088) - Conducted RF#02 (TUV Ref TSR0085) - Radiated RF#01 (TUV Ref TSR0089) - Conducted ENV#1001 (TUV Ref TSR0081) - Radiated 404 (TUV Ref TSR0038) - Radiated 401 (TUV Ref TSR0038) - Radiated
Number of Samples Tested	7
Test Specification/Issue/Date	IEC 60945
Date of Receipt of Test Samples	11 April 2016
Order Number Date	PO 4691 15 September 2015
Start of Test	05 June 2017
Finish of Test	10 October 2017
Name of Engineer(s)	R Hampton M Hardy J Tuckwell P Joynson K Bryant J Lunn I Bromley F Van Niekerk A Guy S Mooney C Hedley M Cox C Bowles

1.2 BRIEF SUMMARY OF RESULTS

The information contained in this report is intended to show verification of the Type Approval Testing of the Z701 EPIRB to the requirements of IEC 60945.

Section	IEC 60945 Spec. Clause	Test Description	Sample Ref	Result	Comments
2.1	6	Operational Checks	ENV#1001 (TSR0081) ENV#2001 (TSR0088) ENV#2002 (TSR0087)	-	See section 2.1
2.2	8.2	Dry Heat	ENV#2002 (TSR0087) RF#02 (TSR0085)* RF#01 (TSR0089)	Satisfactory	* with modified float free housing
2.3	8.3	Damp Heat	ENV#2002 (TSR0087) RF#01 (TSR0089)	Satisfactory	-
2.4	8.4	Low Temperature	ENV#2002 (TSR0087) RF#01 (TSR0089)	Satisfactory	-
2.5	8.5	Thermal Shock	ENV#2002 (TSR0087)	Satisfactory	-
2.6	8.6	Drop on Hard Surface	ENV#2002 (TSR0087)	-	See section 2.6 regarding antenna post drop
2.7	8.6.2	Drop into Water (NUA)	ENV#2002 (TSR0087)	Satisfactory	-
2.8	8.7	Vibration	ENV#2002 (TSR0087) RF#02 (TSR0085)* RF#01 (TSR0089)	Satisfactory	* with modified float free housing
2.9	8.9	Immersion	ENV#2002 (TSR0087)	Satisfactory	-
2.10	8.10	Solar Radiation	-	-	Refer to TUV SUD PSB Pte Ltd report 7191166085-CHM17-CCK
2.11	8.11	Oil Resistance	ENV#1003 (TSR0070)	Satisfactory	-
2.12	8.12	Corrosion	404 (TSR0087)	Satisfactory	-
2.13	9.3	Radiated Emissions	Not applicable	-	See section 2.13
2.14	10.4	Immunity to Radiated Radiofrequencies	ENV#2002 (TSR0087) RF#01 (TSR0089)	Satisfactory	-
2.15	10.9	Immunity to ESD	RF#02 (TSR0085)	Satisfactory	-
2.15					
2.16	11.1	Compass Safe Distance	ENV#2002 (TSR0087)	-	See section 2.16
2.17	11.2	Protection Against Accidental Access to Dangerous Voltages	-	-	See section 2.17
2.21	13	Maintenance	-	-	See section 2.1
2.22	14	Equipment Manuals	-	-	See section 2.1
2.23	15	Marking and Identification	-	-	See section 2.1

1.3 DECLARATION OF BUILD

MAIN EUT			
MANUFACTURING DESCRIPTION	EPIRB		
MANUFACTURER	Orolia Ltd		
MODEL NAME/NUMBER	Z701		
PART NUMBER	23-100-001B		
HARDWARE VERSION	23-500-001B Issue A		
SOFTWARE VERSION	23-507Z Issue A		
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	406.04 MHz, 121.5 MHz,161.975 MHz - 162.025 MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	N/A		
COUNTRY OF ORIGIN	UK		
INTERMEDIATE FREQUENCIES	N/A		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)			
MODULATION TYPES: (i.e. GMSK, QPSK)	Phase (16K0G1D), Swept tone AM (3K20A3X), Phase (16K0GXW),		
HIGHEST INTERNALLY GENERATED FREQUENCY	406 MHz		
OUTPUT POWER (W or dBm)	5W, 70mW, 1W		
FCC ID	KLS		
INDUSTRY CANADA ID	6913A		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Search and Rescue, transmits 406 MHz to alert resuce services, transmits AIS to alert local 3rd parties of distress and 121.5 MHz for homing		
BATTERY/POWER SUPPLY			
MANUFACTURING DESCRIPTION	Internal Battery		
MANUFACTURER	Energizer		
TYPE	L91, AA		
PART NUMBER	Orolia Ltd P/N 23-105B		
VOLTAGE	9V		
COUNTRY OF ORIGIN	UK		
MODULES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
POWER			
FCC ID			
COUNTRY OF ORIGIN			
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

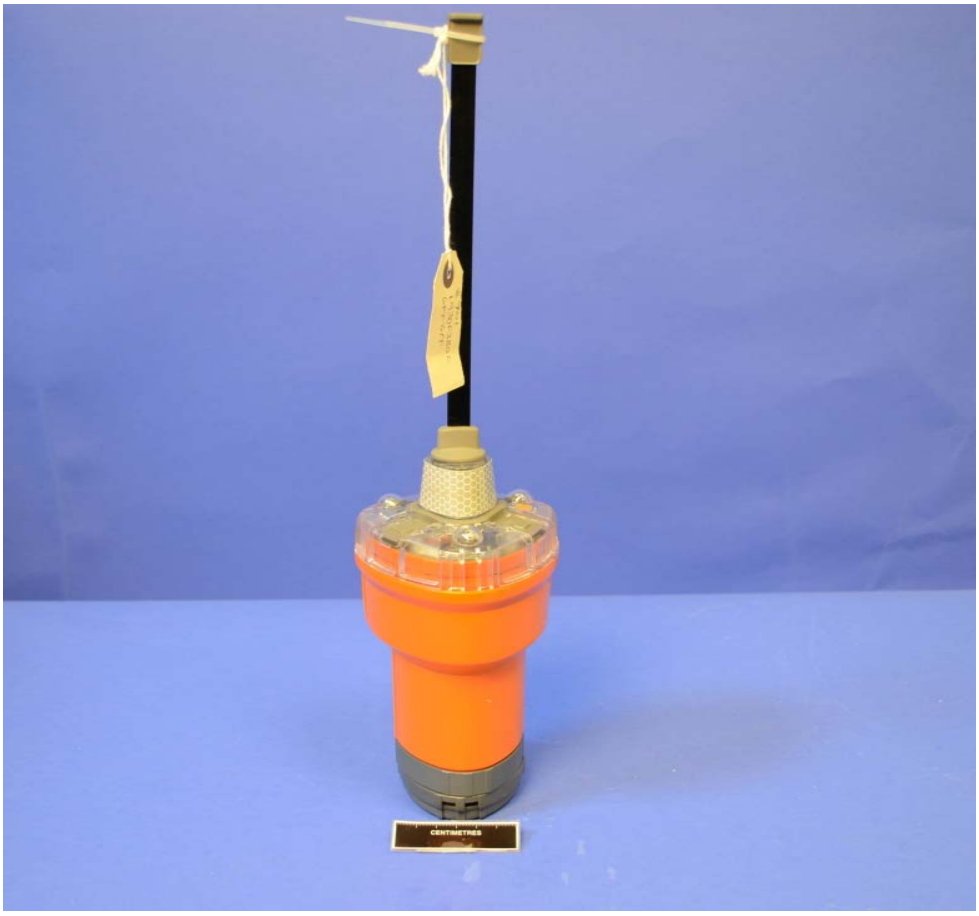
Name: Ruth Sims
Signature:

Position held: R&D Manager
Date: 20/10/17

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Z701 EPIRB operatig on 406 MHz, with a 121.5 MHz homing transmitter and AIS, as shown in the photograph below. A float free housing and manual bracket were also supplied. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test

1.4.2 Physical Test Configuration

The Equipment Under Test (EUT) was operated using its own power source (internal battery). One EUT was configured so that the antenna port was connected to the 50Ω test system using a coaxial cable. This EUT, S/N: RF~01 (TUV Ref TSR0089) was used for tests where the specification required a Functional Check and a Functional Test.

The second EUT, S/N: ENV#2002 (TUV Ref TSR0087) was a fully packaged beacon, similar to the proposed production beacons equipped with its proper antenna. This EUT was used for all tests required within the specification but was only subjected to a Functional Check, where necessary.

When immersion into water was required the radiated sample was the only EUT which was subjected to the test. The 50Ω connector (conducted) sample was not watertight and was therefore not subject to any test where water immersion may have occurred (drop into water, leakage and immersion, high temperature thermal shock, low temperature thermal shock and salt fog). The conducted sample was also omitted from tests which could cause damage to the 50Ω connections (drop on to hard surface).

The EUT(s) were fitted in a Manufacturer supplied Float Free Housing where applicable. See test result section setup photographs for details.

Note: Both the conducted and radiated test samples were subjected to the relevant tests in parallel where possible.

Additional samples (radiated and conducted) were also used tests as detailed in section 1.1.

1.4.3 Monitoring of Performance for EMC tests

EUT Monitoring in Standby Mode

The EUT was monitored throughout the test with a Beacon tester. The Beacon tester was set to record any unintentional transmissions from the EUT.

A spectrum analyser was also used to monitor any unintentional 121MHz signal transmissions.

Throughout the test the EUT's LEDs rate was also observed using CCTV (radiated immunity) and directly (ESD) for any unintentional activation

EUT Monitoring in Active Mode

The EUT was provided with positional data from a GPS simulator and the 406.040 MHz messages were monitored by a Beacon tester. The AIS messages were monitored by a Class A transceiver. The 121 MHz homing signal was monitored with a spectrum analyser.

The LED flash rate was also observed using CCTV (radiated immunity) and directly (ESD).

1.4.4 Performance Criteria for EMC tests (Acceptable Performance Limits)

In Active mode the EUT should continue to work as intended after the test. No degredation of performance or loss of function is allowed as defined in the relevant equipment standard and in the technical specification published by the manufactuer. During the test, degredation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

In Standby mode there should be no transmissions.

1.4.5 Test Conditions for EMC tests

For all EMC tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratory or an open test area as appropriate.

The EUT was powered from the internal battery.

Test Results

IEC 60945, Clause 5.3 states:

The measured test results shall be compared with the corresponding acceptable performance limits and the EUT shall pass the test only if the measured performance margin is favourable and greater than the measurement uncertainty. The test report shall show, for each test measurement, the test result, its associated measurement uncertainty, the acceptable performance limits, and the acceptable performance margin, as applicable.

The tests detailed in this report met the above test requirements.

1.4.6 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Off/Standby Mode
- No apparent activity
- (OFF moulded button pressed)

Self-test
- Moulded TEST pressed for 2 seconds (approx)
- List of items checked as per Customer Supplied Information

Operating
- Moulded ON button pressed
- 406 MHz transmitter active
- 121 MHz Homer transmitter active
- GPS operating in normal duty cycle
- AIS operating in normal duty cycle

Additional methods of activation include:

- Water contacts

1.5 DEVIATIONS

None.

1.6 WAIVER REQUESTS

Not applicable.

1.7 MODIFICATIONS

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted*
0	As supplied by manufacturer.	N/A	N/A
1	AIS Hex ID fix.	Manufacturer	14/07/2016
2	GNSS Count fix and Self Test light issue fix. Alteration made to procedure to allow beacon to enter 'programming mode'. Previously 'hold the Self-Test button in presence of IR programmer'. Now 'hold the Self-Test and Off buttons in presence of IR programmer'. (Corresponding to Modification Nr. 3 detailed in Attachment 1 of Worksheet-02).	Manufacturer	09/09/2016
3	Plastic non-conductive sleeve added around the PCB to reduce sensitivity to infrared radiation.	Manufacturer	07/11/2016
4	Fixed AIS UTC lock sync state and AIS slot offset	Manufacturer	10 July 2017

*Not all EUT samples were updated on this date. Refer to specific tests for EUT modification state.

1.8 REPORT MODIFICATION RECORD

Issue 1 – First Issue.

SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
Orolia Limied
Z701 EPIRB
In accordance with IEC 60945

2.1 OPERATIONAL CHECKS

2.1.1 Specification Reference

IEC 60945, clause 6 (covering clauses 6, 13, 14 and 15 – see table below)

2.1.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#1001 (TUV Ref TSR0081) - Modification State 3
Z701 EPIRB S/N: ENV#2001 (TUV Ref TSR0088) - Modification State 3
Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3

All other items examined and version numbers details below. Where updates were provided the amended version of the document is detailed in the table belong alongside the relevant inspection item:

23-024 EN Smartfind G8_E8 User Manual 1V1.docx
23-260-001N – Rev 1a – Smartfind G8 AIS Main Body Label.pdf
90-7017D ISSUE 7 – SHIPS WHEEL LABEL.pdf
Exhibit 5h Rev01 Label Drawings Z701_Z702_Z703)Z704_Z705.pdf
MED-Z701 Exhibit 15C -103143189LHD-001 battery pack.pdf
23-263-001N – McMurdo Autohousing Brand Label.pdf
23-262N – Autohousing Operation Label.pdf
23-133-XXXB – Rev A00 – Programming Label Set.pdf

2.1.3 Date of Test

07 June 2017 – 20 October 2017

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Results

Clause	Requirement - Title	Requirement - Main extract	Comments
6.1.1	Ergonomics and HMI - General	All modes of operation required by the equipment standard available Modes may be controlled over the required range Use made of every position of every control provided	The EUT has the following controls: ON OFF SELF TEST Instructions on the EUT describe how the EUT should be operated in an emergency, and basic self test information.
6.1.2	Ergonomics and HMI - Arrangement	a) Operational controls, provide for simple, quick and effective operation of the EUT. Controls are logically grouped according to their function.	
6.1.2	Ergonomics and HMI - Arrangement	b) – h)	Not applicable
6.1.3	Ergonomics and HMI - Operation	a) Operational controls permit normal adjustments to be easily performed Arranged to avoid inadvertent operation Controls not required for normal operation (which may affect performance) not readily accessible b) Operational controls and indications easy to use, correct and generally suitable c) Operation of controls does not cause obscuration of its related indicator d) Clearly marked or consistent simple action to recover from a mistaken choice or to leave an unwanted state Always possible for a user to start, interrupt, resume and end an operation.	The EUT is fitted with a red cover. The red cover must be lifted to reveal the ON button. The red cover and over moulded ON button provide two stages for activation: the red cover must be lifted in order to depress the over moulded ON button so that EPIRB activation can occur. De activation requires the same process with the grey cover and over moulded OFF button. For Inadvertent activation (hose stream) test refer to section 2.31

6.1.4	Ergonomics and HMI - Identification	a) Operational controls and indicators easy to identify and read from normal operating position	
6.1.4	Ergonomics and HMI - Identification	b) Character type is simple and clear Character height (mm) shall be not less than 3,5 times the reading distance in metres Nominal character width shall be 0,7 times the character height Instruments meant to be operated are readable from a distance of at least 1 m Other instruments are readable from a distance of at least 2 m	Not applicable.
6.1.4	Ergonomics and HMI - Identification	c) Controls and indicators are identified in English Equipment standard identifications are used.	See 6.1.1 in table above. All other instructions on the EUT are provided in English.
6.1.4	Ergonomics and HMI - Identification	d) Indicators satisfactorily positioned relative to line of sight Indicators not obscured when operating associated controls	Not applicable.
6.1.5	Ergonomics and HMI - Screen display and indicators	a) – t)	Not applicable.
6.1.6	Ergonomics and HMI - Voice announcement	a) - d)	Not applicable.
6.1.7	Ergonomics and HMI - Safety of operation	a) - e)	See 6.1.1 in table above. It is possible to switch from ON to OFF and vice versa. When the EUT is active, LED indications and a strobe light are provided. Feedback is also provided for the self test feature. When the EUT is OFF there is no apparent activity.
6.1.8	Ergonomics and HMI - Distress alert	a) Distress alert is only activated by means of a dedicated distress button Button is physically separated from functional buttons/keys	See 6.1.1 in table above.

6.1.8	Ergonomics and HMI - Distress alert	b) Identified clearly, red and marked “DISTRESS” Lid or cover also marked “DISTRESS”	Not applicable (see also 6.1.1 in table above)
6.1.8	Ergonomics and HMI - Distress alert	c) Protected against inadvertent operation No additional seals or breaking required d) Initiation requires ≥ 2 independent actions	See 6.1.3 in table above.
6.1.8	Ergonomics and HMI - Distress alert	e) Button generates visible and audible indication Flashing light and intermittent acoustic signal start immediately After 3 s of button activation, transmission of distress alert is initiated and indication is steady	See 6.1.7 in table above.
6.1.8	Ergonomics and HMI - Distress alert	f) Not possible to interrupt the transmission of a distress alert or message in progress Is possible to interrupt repetitive transmissions	See 6.1.7 in table above.
6.2.1	Hardware - General	a) Redundant controls removed or blocked off	Not applicable.
6.2.1	Hardware - General	b) Protection against unintentional operation c) Designed to avoid misuse of the controls causing damage or injury	See 6.1.1 and 6.1.3 in table above.
6.2.1	Hardware - General	d) Digital input panels (“0” to “9”) arranged to conform with ITU-T Recommendation E.161 (4x3 array) Alpha-numeric keyboard layout (including “0” to “9”) conform with ISO 3791	Not applicable.
6.2.2	Hardware - Alarms and indicators	a) EUT has facilities permitting the testing of all operational indicators, displays and audible devices.	The EUT has a SELF TEST facility which provides feedback to the user – refer to Manufacture documentation.
6.2.2	Hardware - Alarms and indicators	a) -i) Audible alarms conform to 11.1	Not applicable.

6.2.2	Hardware - Alarms and indicators	b) Alarm indications are red If on displays, red or otherwise highlighted c) No self-illumination in the “safe” condition Indirect illumination low enough to avoid false indications	Not applicable.
6.2.3	Hardware - Illumination	a) – i)	Not applicable.
6.3.1 – 6.3.4	Software - General	As per 4.2.3.1: Software - General Software design and test quality control system audited by a competent authority Supports maintenance and updates of software Manufacturer shall supply documentation demonstrating development in accordance with code of practice	Not applicable.
6.4	Inter-unit connection	a) Software interfaces are tested	Not applicable.
13	Maintenance	Requirements of 4.7 met with due consideration to installation spatial environment likely to be imposed 4.7.1 Maintenance of hardware: EUT designed to be replaced readily without elaborate recalibration or readjustment	Whilst the contents of the User Guide were checked for inclusion the accuracy of details were not confirmed. Maintenance (physical and self test) details are provided in section 7 of the User Guide and indicate a schedule dependant on the vessel type and fit (commercial / voluntary. Section 7.3 details the need for a monthly inspection of the EPIRB and its mountings. Installation siting information is also provided. Section 7.4 provides details of HRU replacement.
13	Maintenance	4.7.1 Maintenance of hardware: EUT constructed and installed to be readily accessible for inspection and maintenance	
13	Maintenance	4.7.2 Maintenance of software:	Not applicable.

14	Equipment manuals	Equipment manuals compliant with 4.8 4.8 Adequate information provided to enable proper operation and maintenance by suitably qualified persons 4.8 a) Operating and servicing manuals written in English 4.8 b) Operating and servicing manuals identify category of EUT as per 4.4 4.8 c) Where EUT so designed, operating and servicing manuals facilitate fault diagnosis and repair to component level, are practicable and provide full circuit diagrams, component layouts and a component parts list 4.8 d) Where EUT so designed, operating and servicing manuals facilitate location, identification and replacement of defective complex modules 4.8 Adequate information provided to allow operation per requirements of relevant equipment standard Examples of typical operational and equipment set up procedures easy-to-use and effective Examples of typical fault-finding routines easy-to-use and effective under simulated fault conditions Installation procedures	The Operating manual was reviewed to confirm the following clauses were addressed. Whilst the contents of the manual were checked for inclusion the accuracy of details were not confirmed: -Operating instructions -Installation instructions -Operating and self test instructions, along with recommended number of checks and criteria for Short and long self-tests. -How to prevent false alarms and how to report a false alarm. -Maintenance including self test functional testing and suggested testing intervals (not specific to battery replacement). -Checking of HRU expiry date, HRU Inspection and cleaning. HRU replacement interval and replacement procedure. -Warning to use only in situations of grave and imminent danger -The Manufacturer advises that there is no need for a warning against installation near strong magnetic fields as magnetic fields cannot activate the beacon. -Mount on the outside of the vessel's structure as high as possible and other siting recommendations. The EUT is not designed for fault diagnosis or repair by the end user. The user guide was written in English. The User Manual states that the EUT is Portable (Smartfind G8_E8 User manual 13 draft_EN received 26 Oct 2016).
15	Marking and identification	EUT compliant with 4.9 4.9 Each unit marked externally, clearly and visible in normal installed position (where practicable) with: 1) manufacturer 2) equipment type number or model identification 3) serial number Alternatively, marking presented on a display at equipment start-up	The EUT labelling includes: 1. The Manufacturer details 2. Model number 3. Serial number

15	Marking and identification	4.9 EUT marked before delivery or on installation	The labelling is affixed to the EUT prior to shipping.
15	Marking and identification	4.9 Title and version of each software element marked or displayed on command	Not applicable.
15	Marking and identification	4.9 When marking, title and version only displayed on display, such information also included in equipment manual	Not applicable.
15	Marking and identification	4.9 Compass safe distance marking compliant with 4.5.3 4.5.3 Each unit clearly marked with minimum safe distance Alternatively, minimum safe distance for fixed (non-portable) equipment given in equipment manual	The compass safe distance value can be found on the EUT labelling.

2.2 DRY HEAT

2.2.1 Specification Reference

IEC 60945, clause 8.2

2.2.2 Equipment Under Test and Modifcation State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3
Z701 EPIRB S/N: RF#02 (TUV Ref TSR0085) - Modification State 4*
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089) - Modification State 4

*(with modified float free housing (storage only))

2.2.3 Date of Test

05 – 07 June 2017 (TSR0087) – Dry heat functional and Storage
25 – 26 August 2017 (TSR0085) – Dry heat storage only
25 – 27 August 2017 (TSR0089) – Dry heat storage and functional

2.2.1 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.2 Environmental Conditions

Ambient Temperature: 19.5 – 22.0°C
Relative Humidity: 44.4 – 45.2%

2.2.4 Test Setup

Storage Test (June 2017 / TSR0087)

Storage Test (August 2017 / TSR0085 and TSR0089)

Functional Test (June 2017 / TSR0087)

Functional Test (August 2017 / TSR0089)

2.2.5 Test Method

Storage Test

The EUT's were placed in a climatic chamber where the temperature was increased from laboratory ambient temperature to +70°C. After 12 - 16 hours (see individual plot for each test), the temperature was returned to ambient conditions. The EUTs were subjected to a performance check at the end of the test.

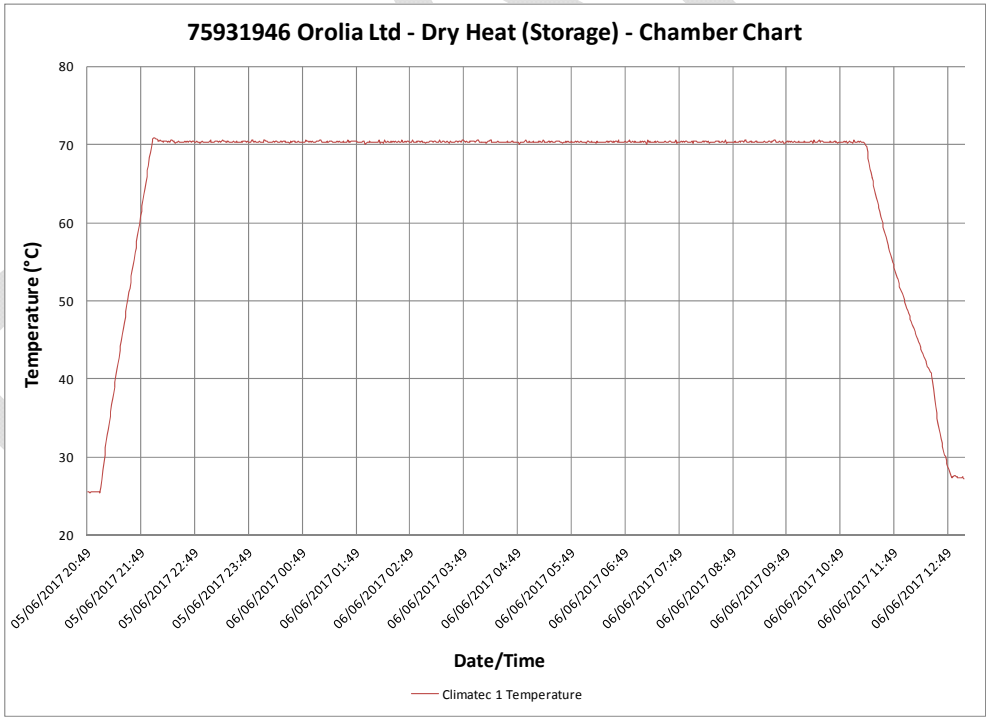
Functional Test

The EUTs were switched on and placed in a climatic chamber where the temperature was increased from laboratory ambient temperature to +55°C. After 11 hours (13 hours for the test in August 2017 (no plot available), the EUTs were subjected to a performance check and performance test. At the end of the test, the temperature was returned to laboratory ambient conditions.

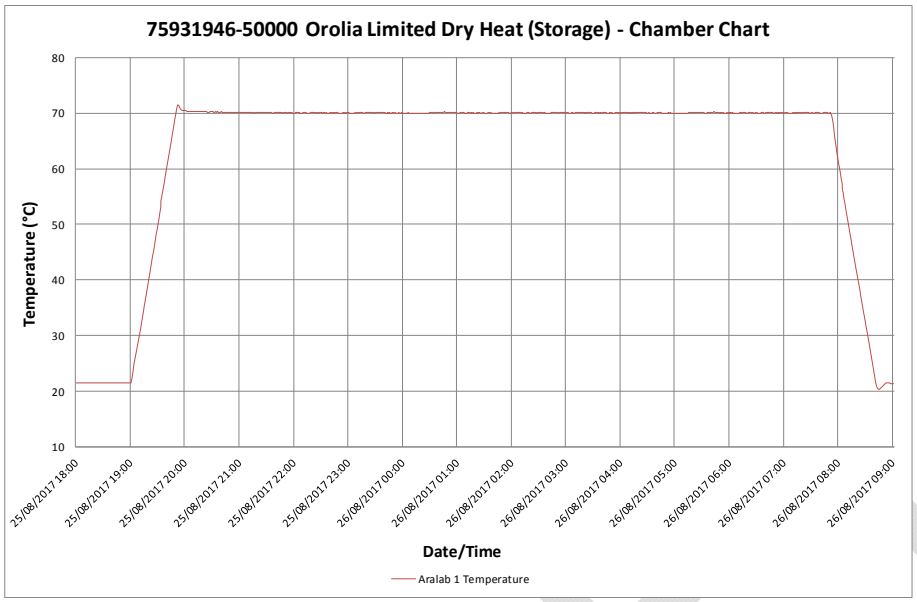
2.2.6 Test Results

Storage Test

Temperature Plot (TSR0087)



Temperature Plot (TSR0085 and TSR0089)



Post-Storage Period Performance Check

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039955
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: RF#02 (TUV Ref TSR0085)

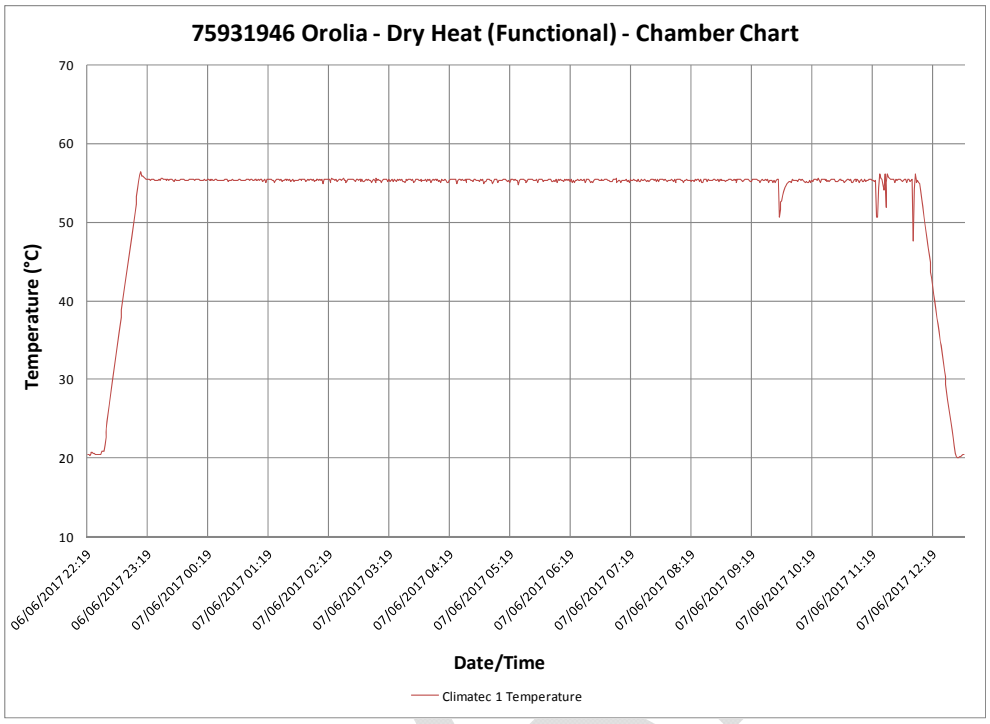
Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039951
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089)

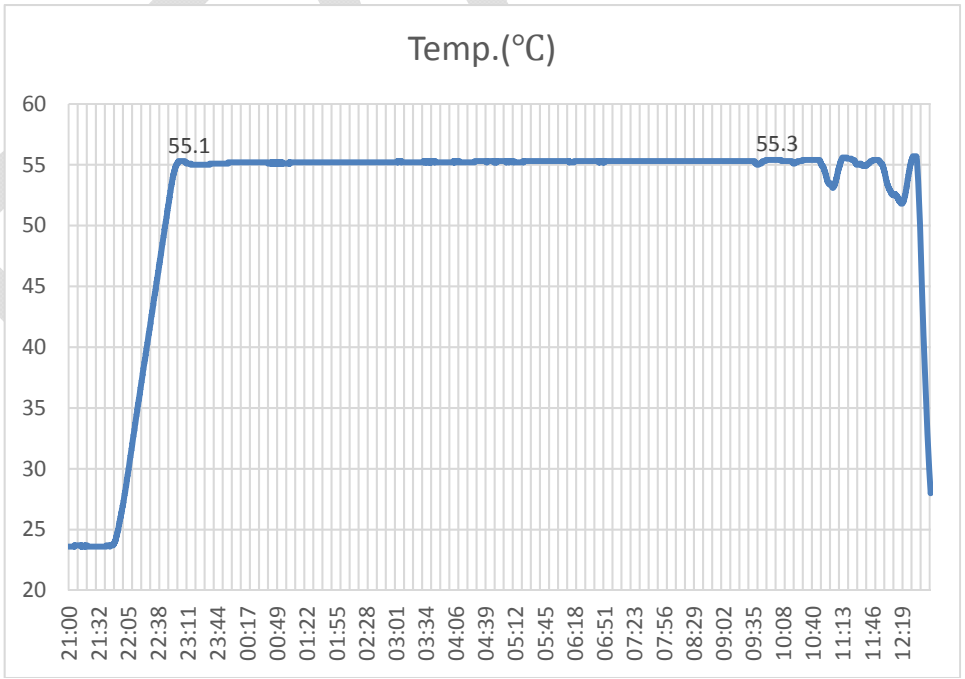
Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039912
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Functional Test

Temperature Plot (TSR0087)



Temperature Plot (TSR0089)



Note: The variations in temperature towards the end of the plot above are due to the chamber door being opened briefly to activate/deactivate the EUT. The temperature inside the chamber was allowed to stabilise before measurements were made.

Performance Check

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.040011
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089)

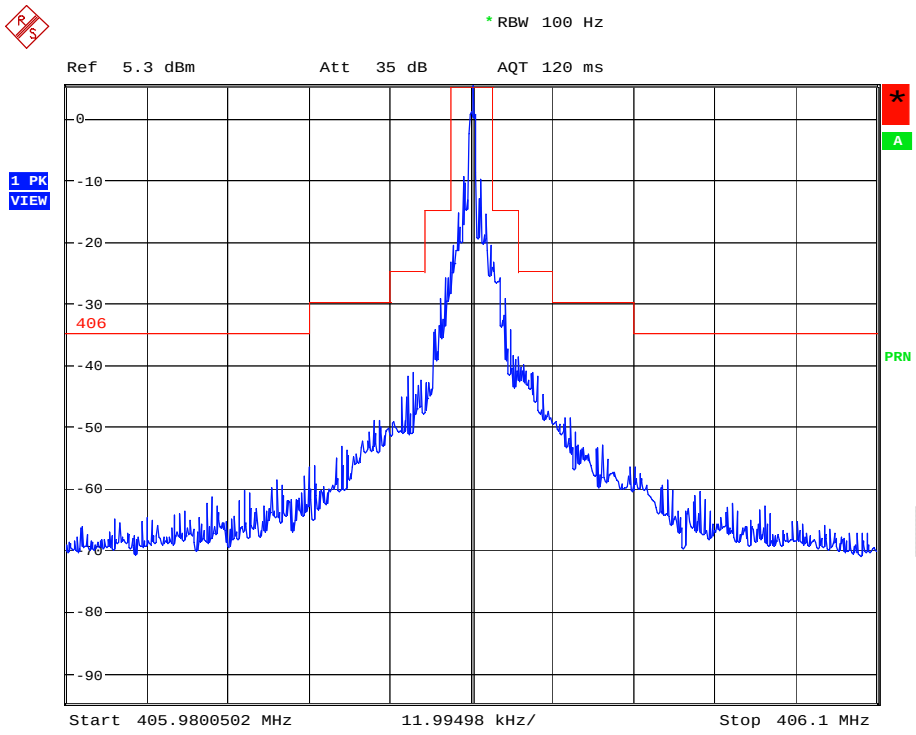
Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039921
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Performance Test

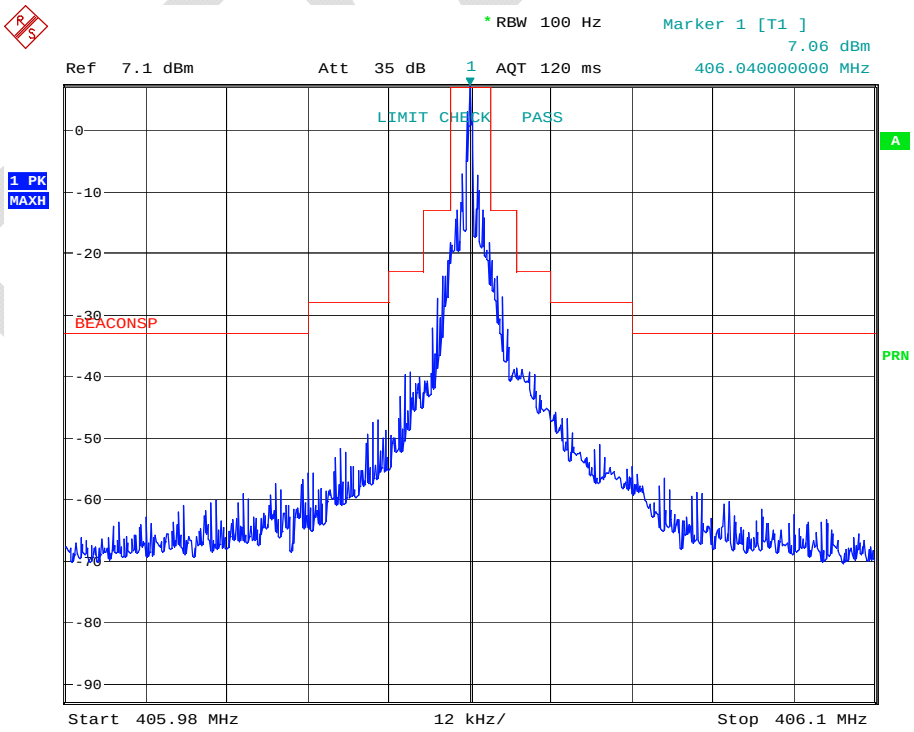
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089)

Parameter	Result (Max/Min)
Output Power (dBm)	35.85 / 35.80
Digital Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
Bit Rate (bit/sec)	400.02 / 400.02
Modulation: Rise Time (uS)	194.4 / 192.3
Modulation: Fall Time (uS)	194.7 / 191.7
`Positive Deviation (rad)	1.1565 / 1.0659
Negative Deviation (rad)	-1.1586 / -1.0802
Nominal Frequency (MHz)	406.0399317 / 406.0399307
Short-term Stability (/100ms)	82.256E-12 / 67.411E-12
Medium-term Stability – Slope (/minute)	23.934E-11 / 60.512E-12
Medium-term Stability – Residual	72.160E-11 / 11.515E-11
Spurious Emissions	(see Plot)
121 MHz Presence	P
AIS (Message 1 and 14 integrity check)	P

Spurious Emissions (June 2017 / TSR0087)



Spurious Emissions (August 2017 / TSR0089)



2.3 DAMP HEAT

2.3.1 Specification Reference

IEC 60945, clause 8.3

2.3.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089) - Modification State 4

2.3.3 Date of Test

05 – 07 June 2017 (TSR0087)
01 – 02 Sept (TSR0089)

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Environmental Conditions

Ambient Temperature: 21.2 – 23.4 °C
Relative Humidity: 54.7 – 58.6 %

2.3.6 Test Setup

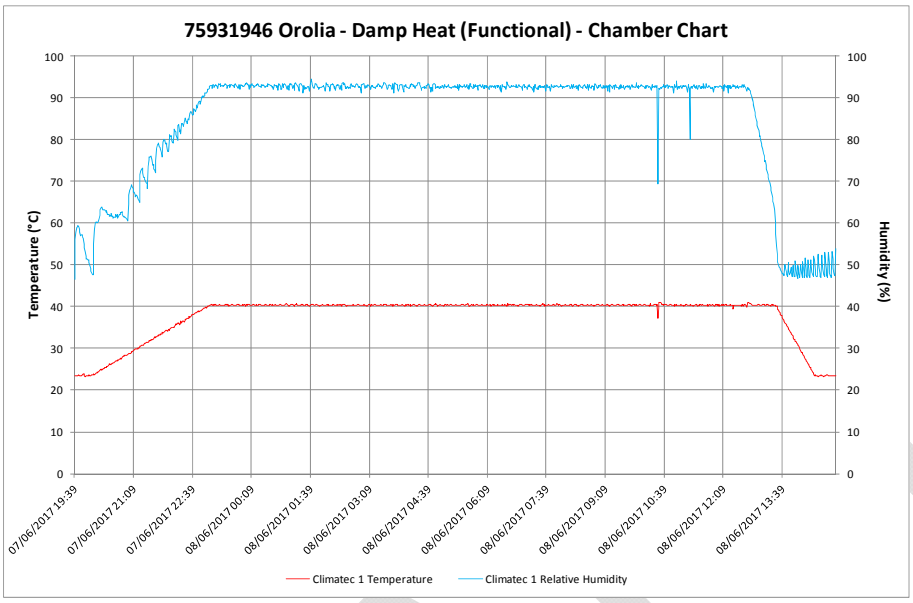
Damp Heat (June 2017 / TSR0087)

2.3.7 Test Method

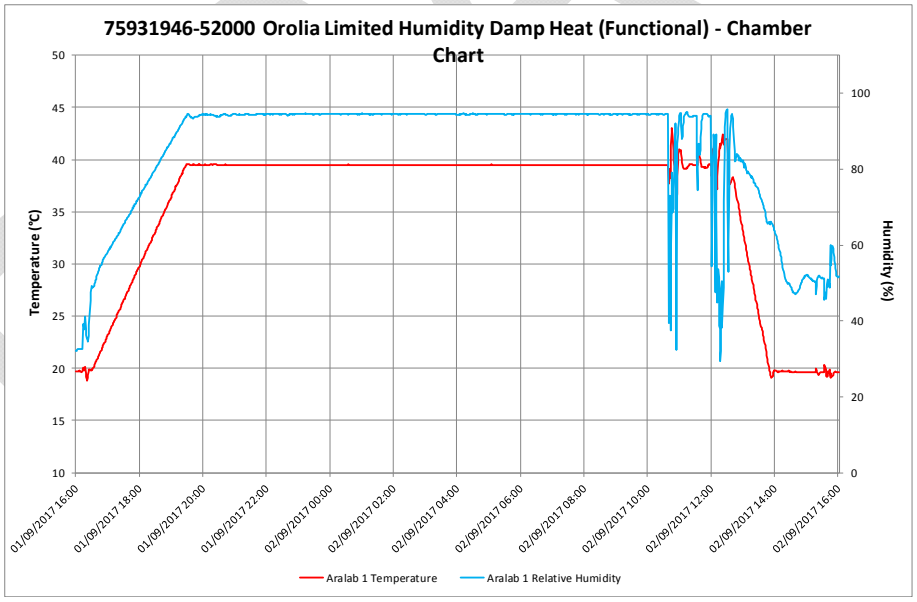
The EUT's were placed in a climatic chamber where the temperature was increased from laboratory ambient to +40°C and the relative humidity increased to 93%. After 10 hours, the EUT's were activated for at least 2 hours (both tests). During this period the EUT's were subjected to a performance check.

2.3.8 Test Results

Temperature Plot (TSR0087)



Temperature Plot (25 – 26 August 2017 (TSR0089)



Note: The variations in temperature and humidity towards the end of the plot above are due to the chamber door being opened briefly to activate/deactivate the EUT. The temperature and humidity inside the chamber was allowed to stabilise before measurements were made.

Summary of Performance Check Results

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039999
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0089)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06333603CEBD1379E64DCBA*
406 MHz Frequency	406.039930
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

During the test, the EUT picked up GPS navigation data. The encoded position is within the requirements of Cospas Sarsat T.007.

2.4 LOW TEMPERATURE

2.4.1 Specification Reference

IEC 60945, clause 8.4

2.4.2 Equipment Under Test and Modifcation State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089) - Modification State 4

2.4.3 Date of Test

08 – 14 June 2017 (TSR0087) – Low Temperature Storage and Functional
02 – 04 September 2017 (TSR0089) – Low Temperature Storage and Functional

2.4.4 Test Equipment Used

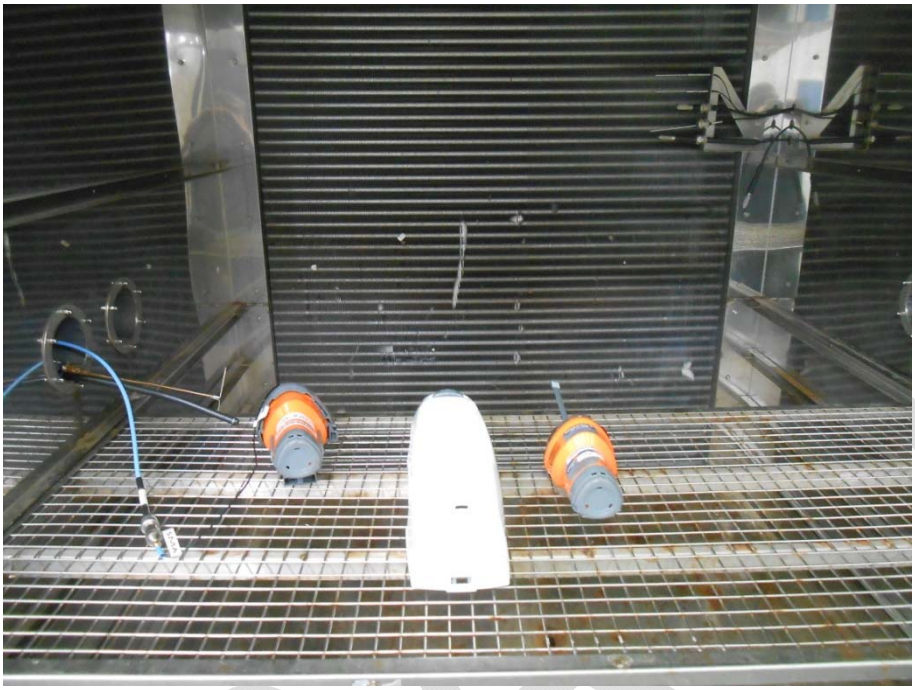
The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Environmental Conditions

Ambient Temperature: 23.4 – 25.4°C
Relative Humidity: 39.6 – 64.2%

2.4.6 Test Setup

Storage Test



Functional Test

2.4.7 Test Method

Storage Test

The EUT's were placed in a climatic chamber where the temperature was decreased from laboratory ambient temperature to -30°C. After 16 hours, the temperature was returned to ambient temperature. The EUT's were subjected to a performance check at the end of the test.

Functional Test

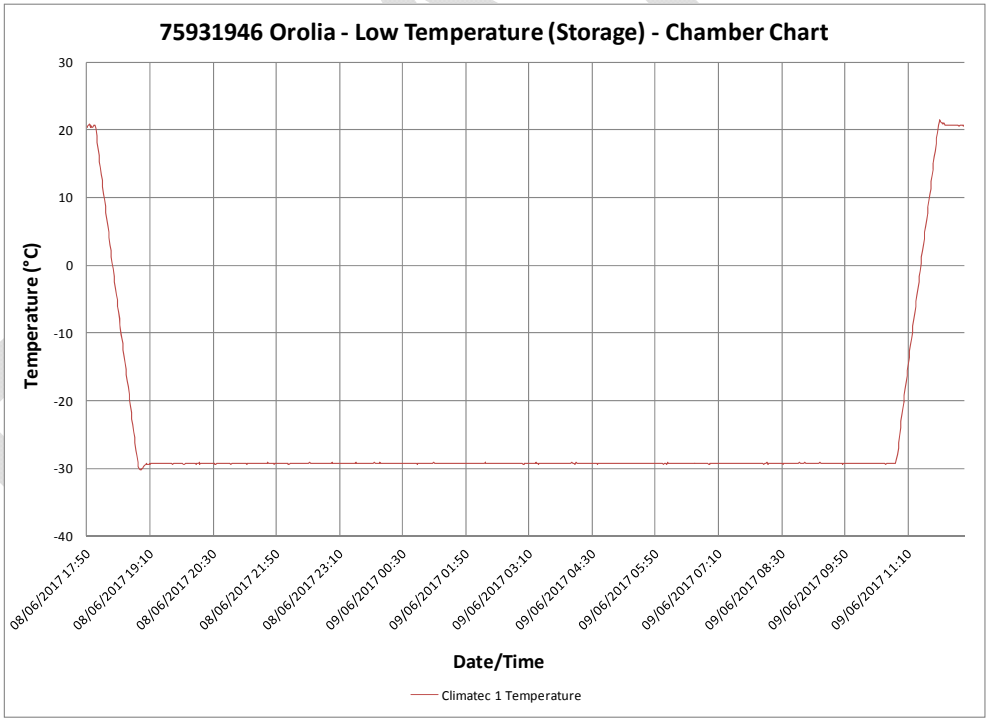
The EUT's were placed in a climatic chamber where the temperature was decreased from laboratory ambient to -20°C. After 10.5 hours, the EUT's were activated for at least 2 hours. During this period the EUT's were subjected to a performance test and check.

At the conclusion of all testing, a satisfactory Performance Check was carried on both EUTs.

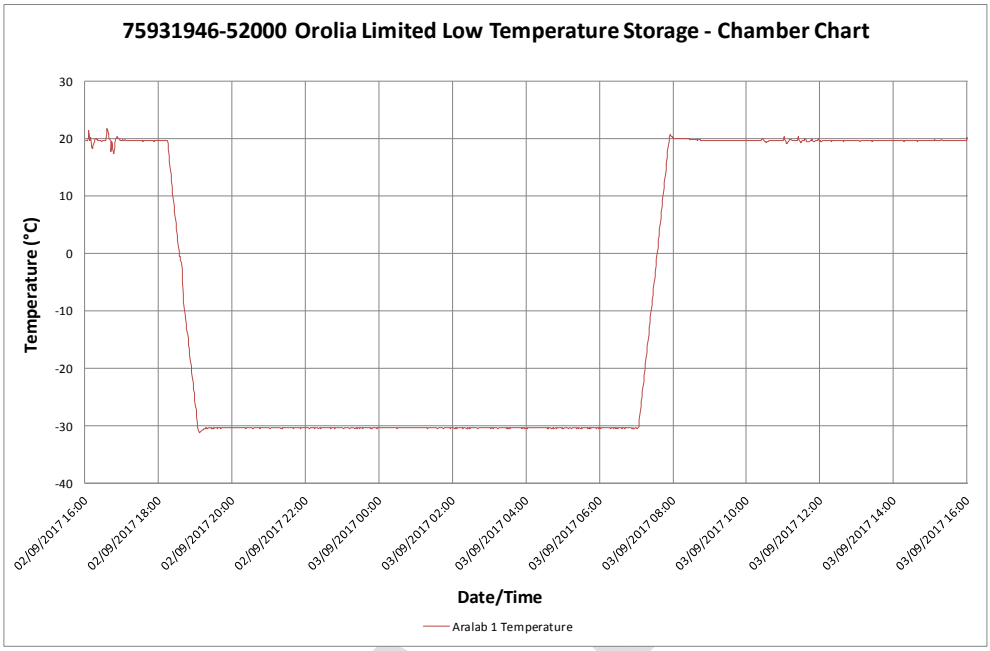
2.4.8 Test Results

Storage Test

Temperature Plot (TSR0087)



Temperature Plot (TSR0089)



Post storage period Performance Check

Smartfind G8 AIS (Type: Z701) S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039988
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

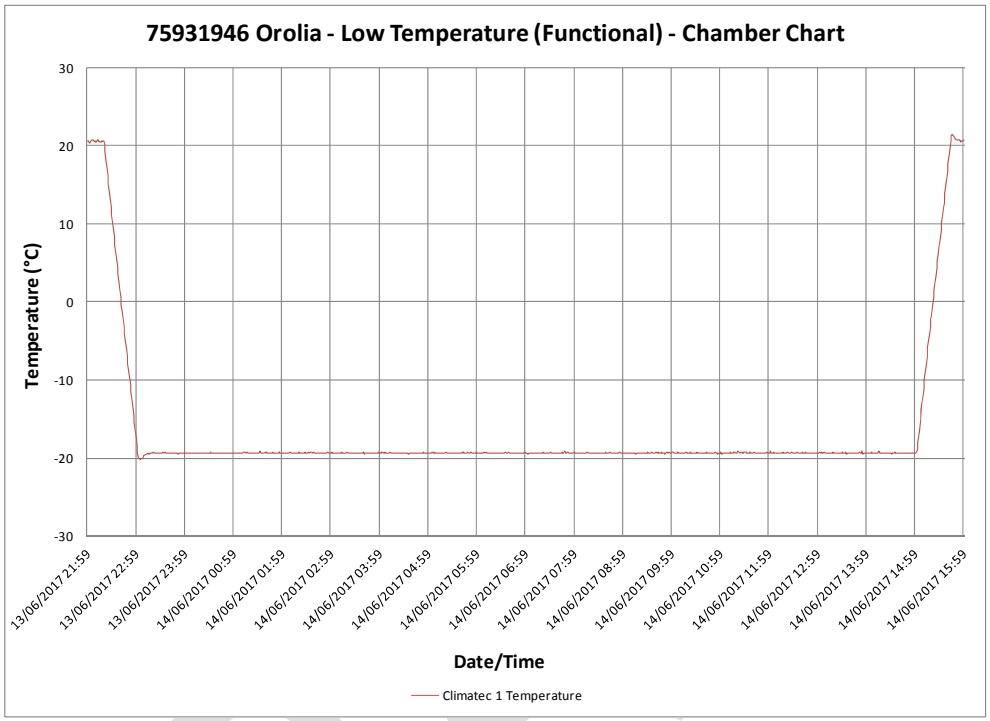
Smartfind G8 AIS (Type: Z701) S/N: ENV#2001 (TUV Ref TSR0089)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06333603CEBD1379E64DCBA*
406 MHz Frequency	406.039953
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

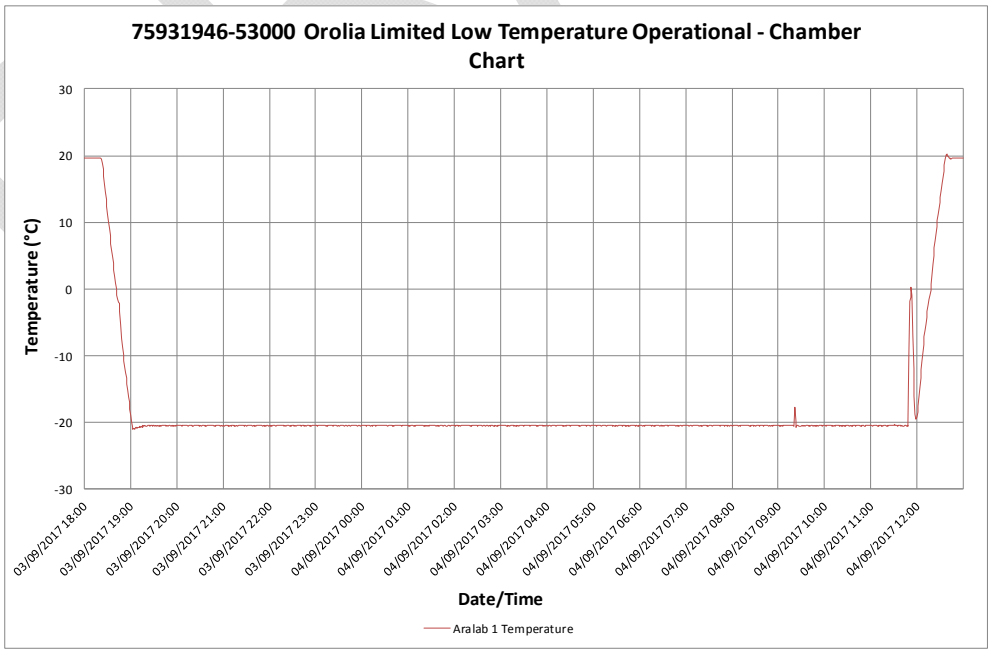
*The EUT picked up GPS whilst operating within the climatic chamber. The encoded position was within the limits of C/S T.007.

Functional Test

Temperature Plot (TSR0087)



Temperature Plot (TSR0089)



Performance Check

Smartfind G8 AIS (Type: Z701) S/N: ENV#2001 (TUV Ref TSR0088)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06332E02BC44E379CC03741*
406 MHz Frequency	406.0400668
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

*The EUT picked up GPS whilst operating within the climatic chamber. The encoded position was within the limits of C/S T.007.

Smartfind G8 AIS (Type: Z701) S/N: ENV#2001 (TUV Ref TSR0089)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06333603CEBD1379E64DCBA*
406 MHz Frequency	406.039953
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

*The EUT picked up GPS whilst operating within the climatic chamber. The encoded position was within the limits of C/S T.007.

Performance Test

Smartfind G8 AIS (Type: Z701) S/N: ENV#2001 (TUV Ref TSR0088)

Parameter	Result (Max/Min)
Output Power	37.28 / 37.10
Digital Message	FFFE2F8C9EF9C06332E02BC44E379CC03741*
Bit Rate: (bps)	400.02 / 400.02
Modulation: Rise Time (uS)	194.4 / 192.3
Modulation: Fall Time (uS)	194.7 / 192.6
Positive Deviation (rad)	1.1492 / 1.0829
Negative Deviation (rad)	-1.1431 / -1.0819
Nominal Frequency (MHz)	406.0400668 / 406.0400648
Short-term Stability (/100ms)	11.689E-11 / 10.068E-11
Medium-term Stability – Slope (/minute)	-79.772E-12 / -43.561E-11
Medium-term Stability – Residual Frequency Stability (no units)	75.155E-11 / 16.591E-11
121 MHz Presence	P
Spurious Emissions	(see Plot)
AIS (Message 1 and 14 integrity check)	P

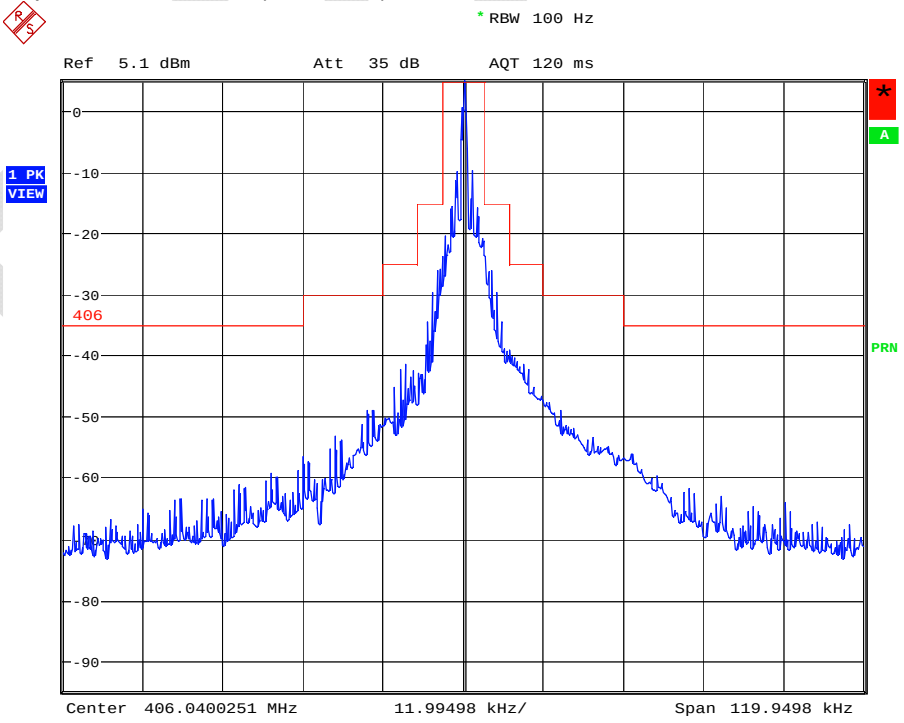
The EUT picked up GPS whilst operating within the climatic chamber. The encoded position was within the limits of C/S T.007.

Smartfind G8 AIS (Type: Z701) S/N: ENV#2001 (TUV Ref TSR0089)

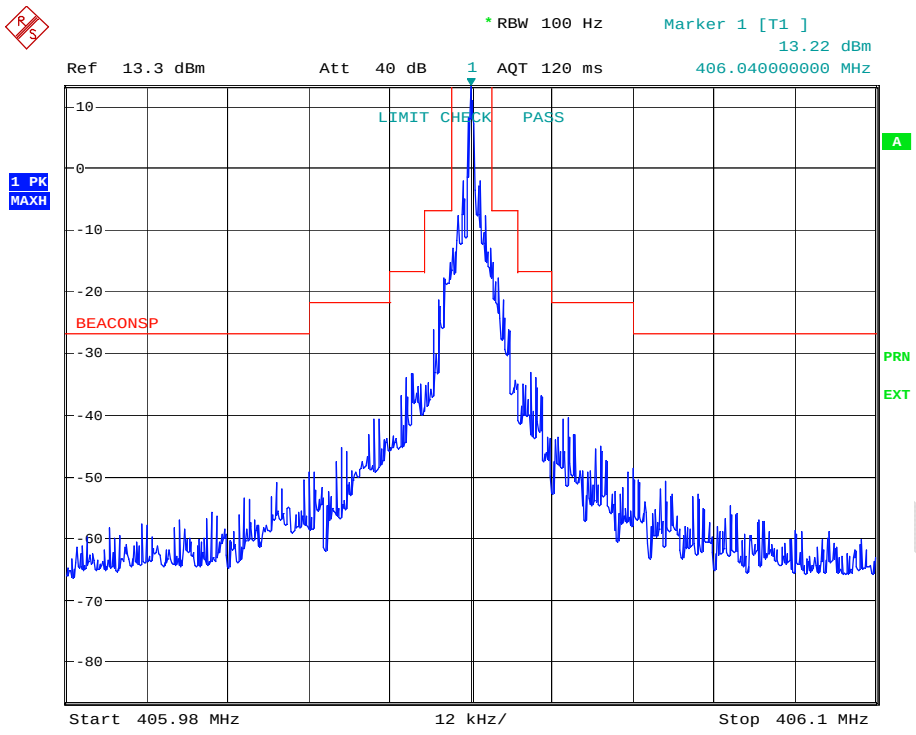
Parameter	Result (Max/Min)
Output Power	36.65 / 36.57
Digital Message	FFFE2F8C9EF9C06332E02BC44E379CC049D7* FFFE2F8C9EF9C06332E02BC44E379C4046BA*
Bit Rate: (bps)	400.02 / 400.02
Modulation: Rise Time (uS)	197.4 / 195.3
Modulation: Fall Time (uS)	197.7 / 195.6
Positive Deviation (rad)	1.1253 / 1.0802
Negative Deviation (rad)	-1.1266 / -1.0831
Nominal Frequency (MHz)	406.0399883 / 406.0399881
Short-term Stability (/100ms)	11.539E-11 / 88.169E-12
Medium-term Stability – Slope (/minute)	10.951E-11 / -63.855E-12
Medium-term Stability – Residual Frequency Stability (no units)	63.843E-11 / 22.389E-11
121 MHz Presence	P
Spurious Emissions	(see Plot)
AIS (Message 1 and 14 integrity check)	P

*The EUT picked up GPS whilst operating within the climatic chamber. The EUT encoded two positions during the test - both positions were within the limits of C/S T.007.

Spurious Emissions (TSR0087)



Spurious Emissions (TSR0089)



2.5 THERMAL SHOCK

2.5.1 Specification Reference

IEC 60945, clause 8.5

2.5.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) – Modification State 3

2.5.3 Date of Test

14 - 16 August 2017

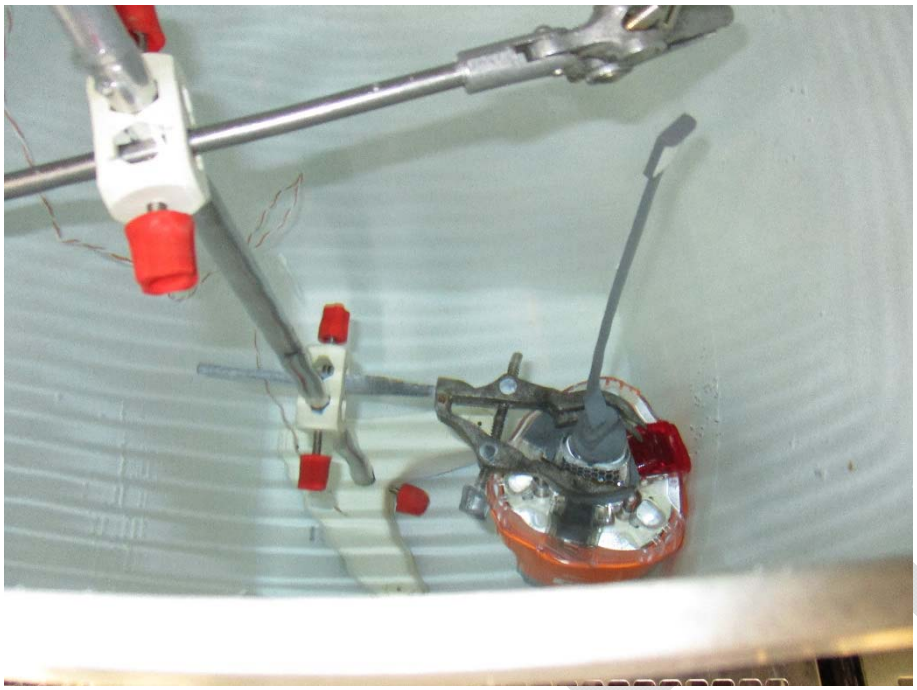
2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Environmental Conditions

Ambient Temperature 25.4°C
Relative Humidity 44.0%

2.5.6 Test Setup



2.5.7 Test Method

The EUT was placed in the pre-conditioning climatic chamber at a temperature of 70°C for greater than 1 hour.

The EUT was then immersed in a water vessel (preconditioned for greater than 1 hour) at 25°C, at a level of 100mm below the surface of the water (measured to the highest point of the EUT). The EUT activated immediately after immersion into water. A performance check and inspection were carried out at the end of the test.

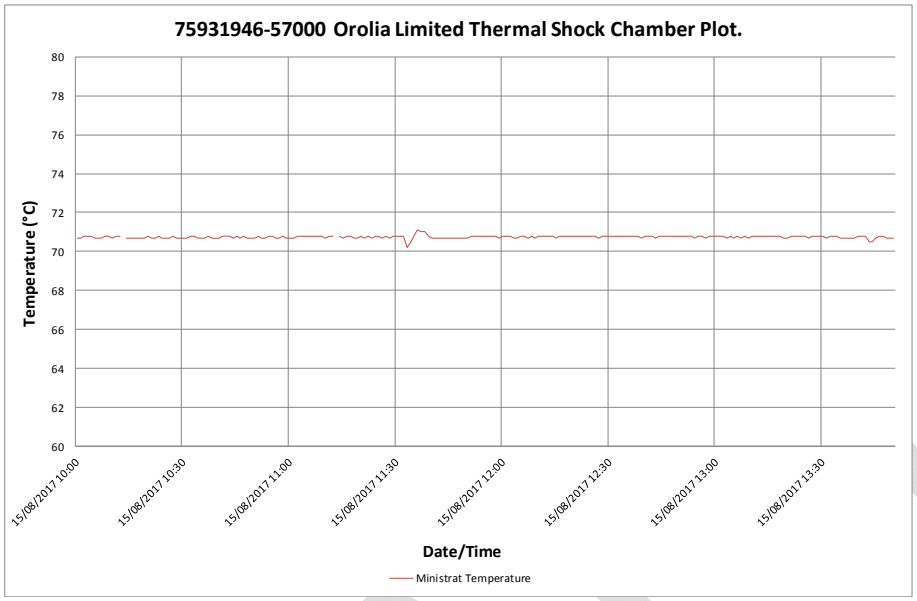
The EUT was weighed before and after the water test:

Pre immersion weight: 692 g

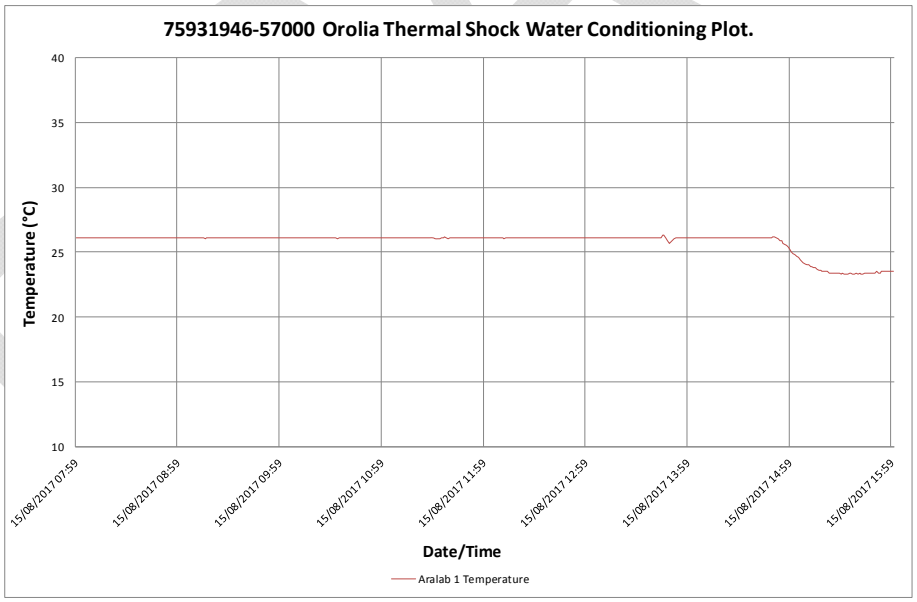
Post immersion weight: 692 g

2.5.8 Test Results

Preconditioning Temperature Plot



Water Temperature Plot



Summary of Performance Check Results

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039932
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

2.6 DROP ON HARD SURFACE

2.6.1 Specification Reference

IEC 60945, clause 8.6

2.6.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) – Modification State 3

2.6.3 Date of Test

27 July 2017

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Environmental Conditions

Ambient Temperature 22.8°C
Relative Humidity 43.6%

2.6.6 Test Setup

2.6.7 Test Method

The EUT was dropped 6 times, one on each face, from a height of 1000 mm onto the test surface (solid piece of hardwood).

2.6.8 Test Results

Test Observations

The EUT was monitored and did not activate automatically during the test. The EUT was subjected to a visual inspection post-test. The antenna was distorted as shown in the photograph below. It was considered that the distortion could affect the functionality of the beacon.

A Satellite Qualitative test was carried out during the limited Cospas-Sarsat testing, after this test and the results were found to be compliant – see section Annex A for test data.

EUT post drop test

Summary of Performance Check Results

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039952
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

2.7 DROP INTO WATER (NUA)

2.7.1 Specification Reference

IEC 60945, clause 8.6.2

2.7.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) – Modification State 3

2.7.3 Date of Test

31 July 2017

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Environmental Conditions

Ambient Temperature 26.1°C
Relative Humidity 31.0%

2.7.6 Test Setup

2.7.7 Test Method

The EUT was dropped three times from a height of 20m into water. The EUT was dropped once with the antenna vertical up, antenna vertical down, and antenna horizontal. A performance check was carried out after the test.

2.7.8 Test Results

Test Observations

The EUT activated immediately on contact with the water after each drop. Once the EUT was removed from the water a performance check was performed. In each case the EUT transmitted the following message: FFFE2F8C9EF9C06332E0227236F796A6B046. The encoded position within this message was Latitude: N 50°50.67'
Longitude: W 1°6.73' and within the accuracy limits stated in Cospas Sarsat T.007.

The EUT was subjected to a visual inspection by the manufacturer post-test and no signs of external damage or water ingress were observed.

Summary of Performance Check Results

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039966
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

2.8 VIBRATION

2.8.1 Specification Reference

IEC 60945, clause 8.7

2.8.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3
Z701 EPIRB S/N: RF#02 (TUV Ref TSR0085) - Modification State 4*
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089) - Modification State 4

*(with modified float free housing (storage only))

2.8.3 Date of Test

20, 21 & 29, 30 June 2017
06 – 07 September 2017

2.8.4 Test Equipment Used

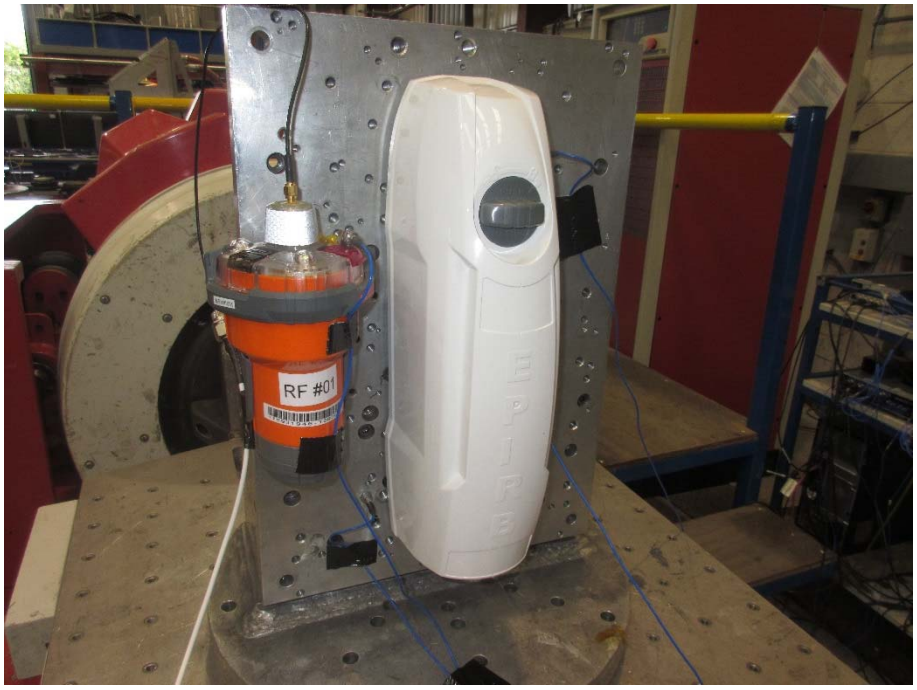
The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Environmental Conditions

Ambient Temperature 20.4 – 23.2°C
Relative Humidity 40.7 - 47.9%

2.8.6 Test Setup

Vibration Setup Forward and Aft Axis (September 2017 / TSR0085 and TSR0089)



Vibration Setup Side to Side Axis (September 2017 / TSR0085 and TSR0089)

Vibration Setup Up and Down Axis (September 2017 / TSR0085 and TSR0089)

2.8.7 Test Method

The EUT was fixed to the vibration table and was subject to the following vibration profiles:

Resonance Sweep

– 5 Hz and up to 13.2 Hz with an excursion of ±1 mm (7 m/s² maximum acceleration at 13.2 Hz);
– above 13.2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s².

One sweep was performed at a rate of 0.5 octaves / minute.

The EUT was subjected to a 2 hour dwell at each of the following resonant frequencies:

Axis	Resonant Frequency (Hz) TSR0087	Resonant Frequency (Hz) TSR0085	Resonant Frequency (Hz) TSR0089
Side to Side	99.6	17.76	17.8 and 76.5
Forward and Aft	75.6	51.02	30
Up and Down	40.1 and 70.2	30 and 35.21	30 and 35.2

During the test a spectrum analyser and handheld beacon tester were set to monitor the EUT output (AIS, 121 MHz and 406 MHz message) to ensure that there were no unintentional transmissions. At the conclusion of the test, the EUT was subjected to a performance check.

2.8.8 Test Results

Post Test Performance Check

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039967
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039944
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

Z701 EPIRB S/N: RF#02 (TUV Ref TSR0085)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039944
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

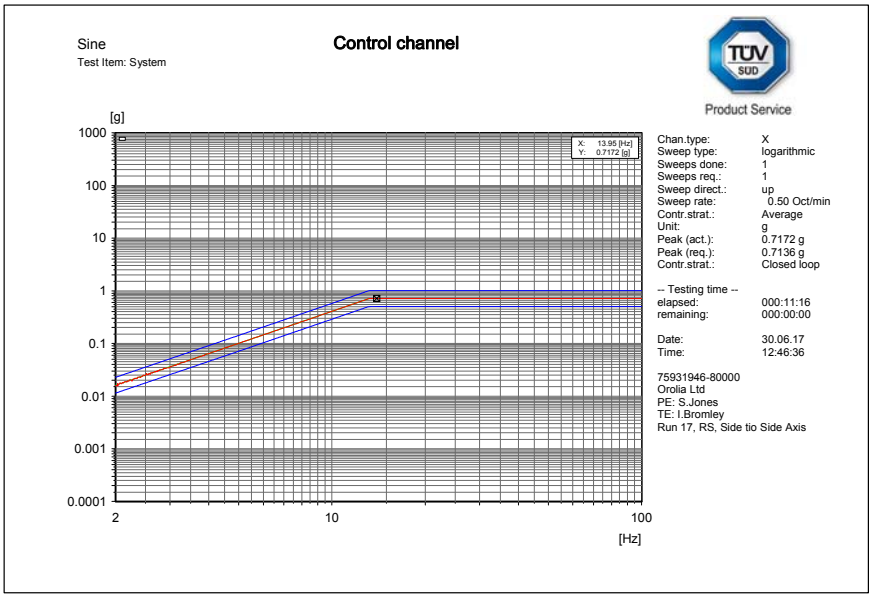
Mechanical Inspection

Post test no signs of mechanical degradation were witnessed.

Activation Monitoring

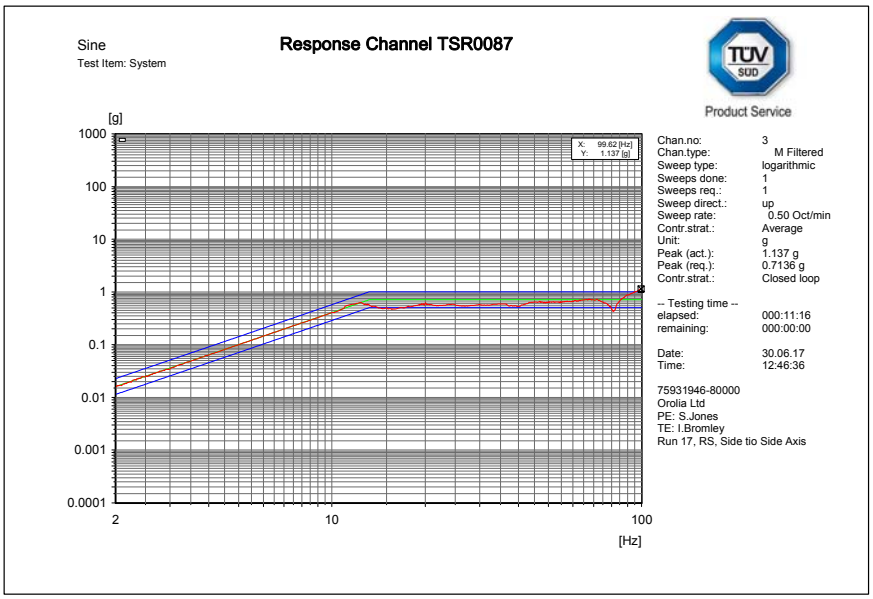
During the test the EUT was monitored for signs of activation, none were found.

Side to Side Axis – Resonance Search – Control (TSR0087)



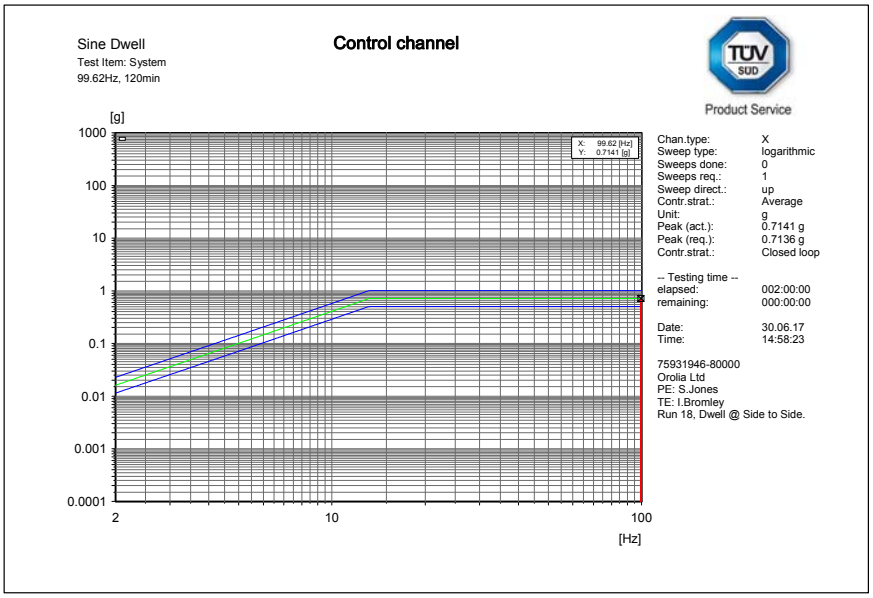
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_008.rsn

Side to Side Axis – Resonance Search – TSR0087



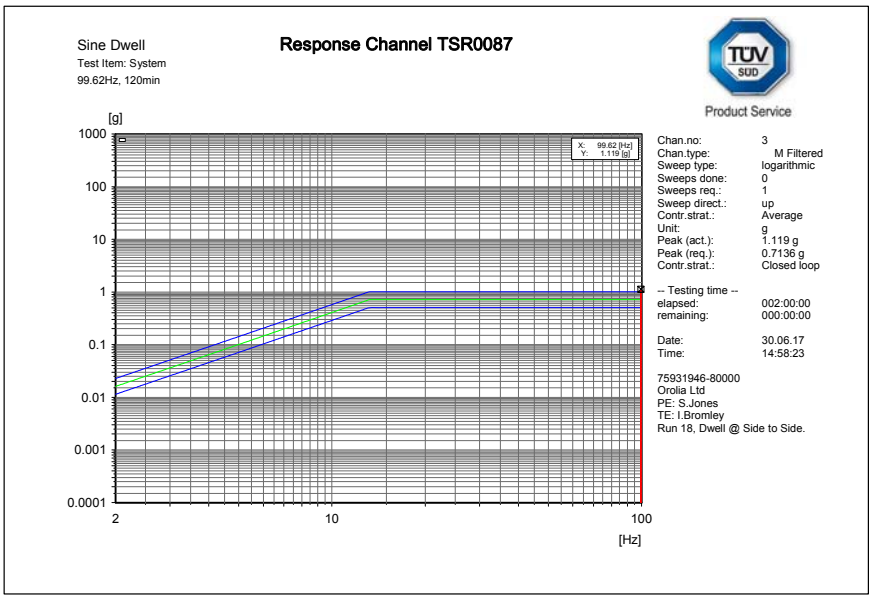
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_008.rsn

Side to Side Axis – Endurance Run – Control (TSR0087)



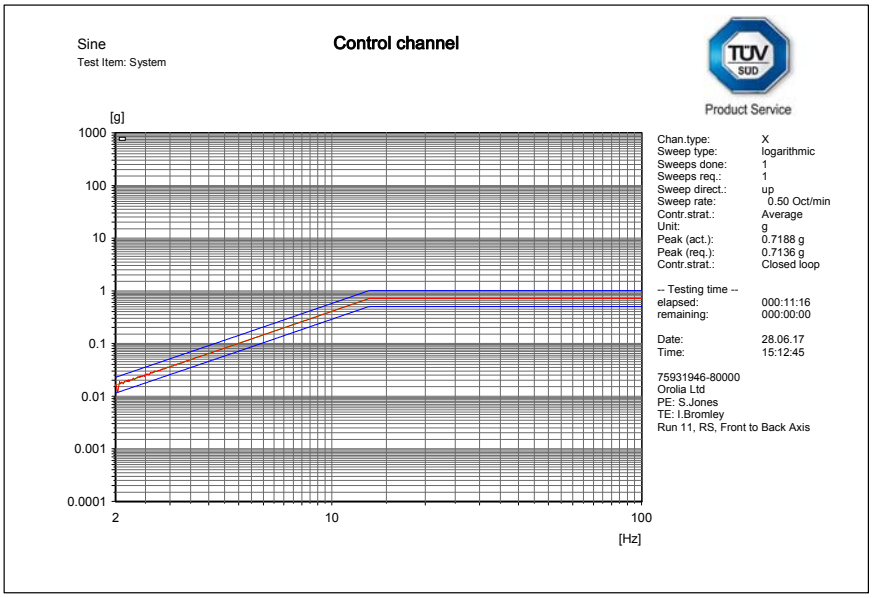
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_005.rsd

Side to Side Axis – Endurance Run – TSR0087 – 99.6 Hz



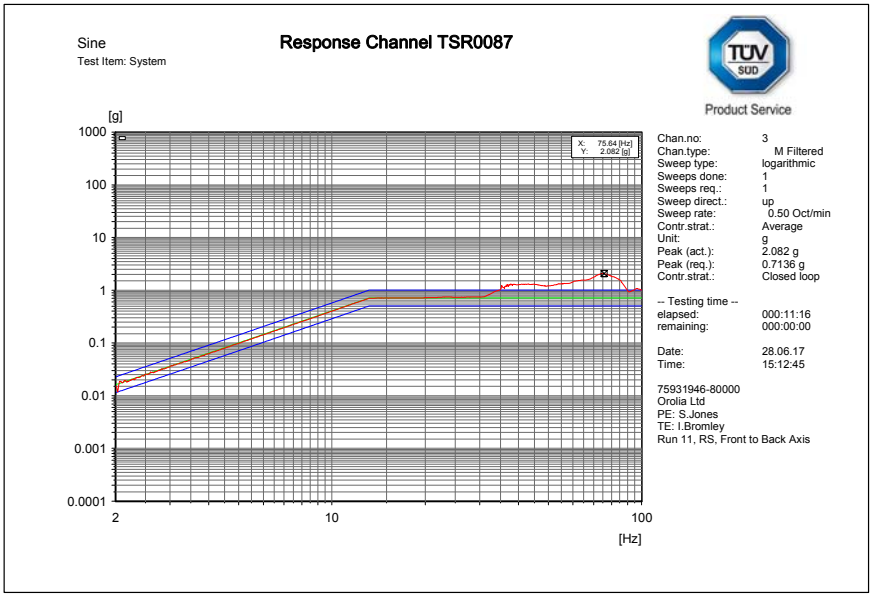
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_005.rsd

Forward and Aft Axis – Resonance Search – Control (TSR0087)



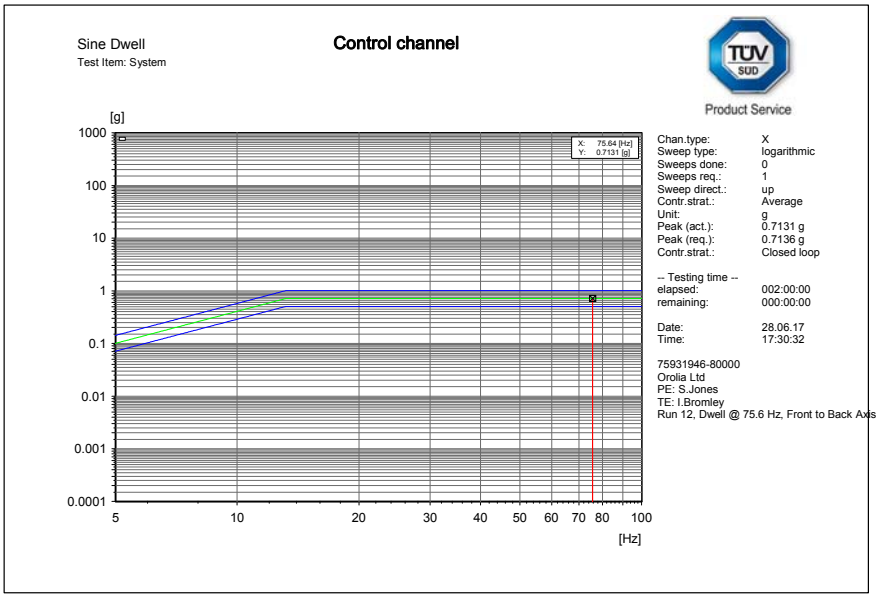
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_003.rsn

Forward and Aft Axis – Resonance Search – TSR0087



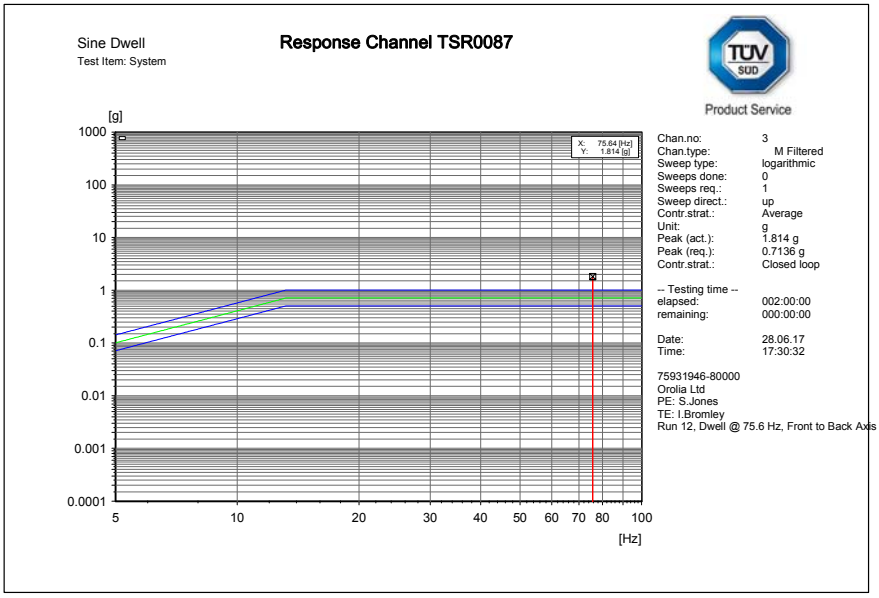
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_003.rsn

Forward and Aft Axis – Endurance Run – Control (TSR0087)



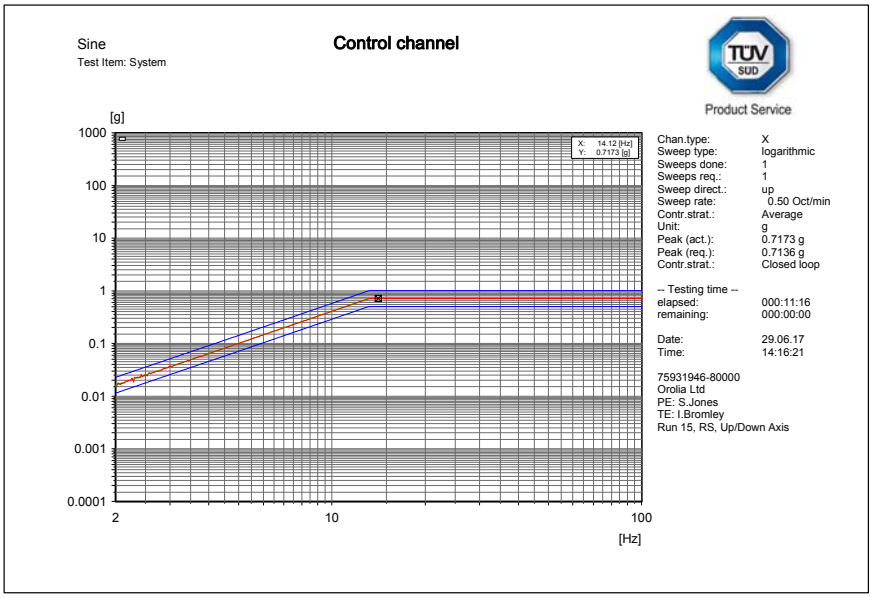
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_002.rsd

Forward and Aft Axis – Endurance Run – TSR0087 – 75.6 Hz



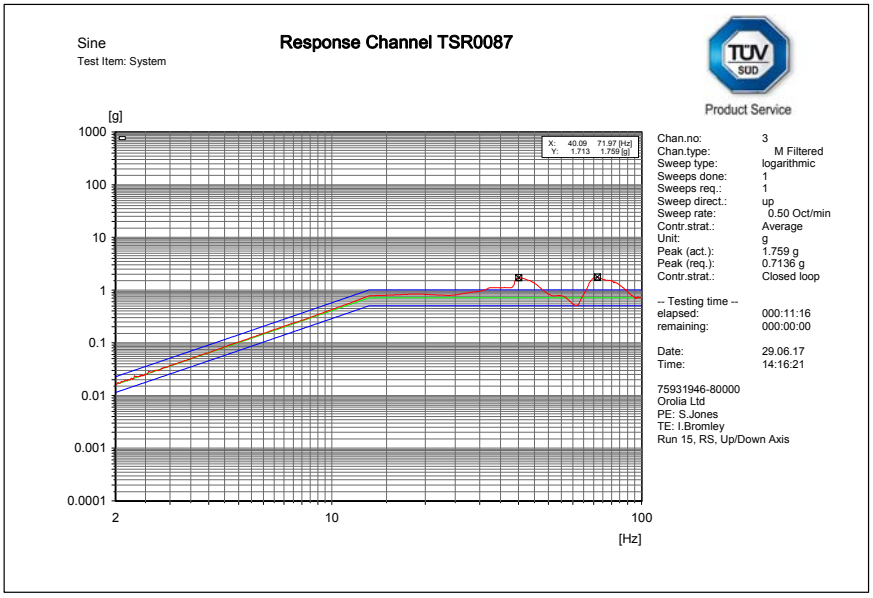
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_002.rsd

Up and Down Axis – Resonance Search – Control (TSR0087)



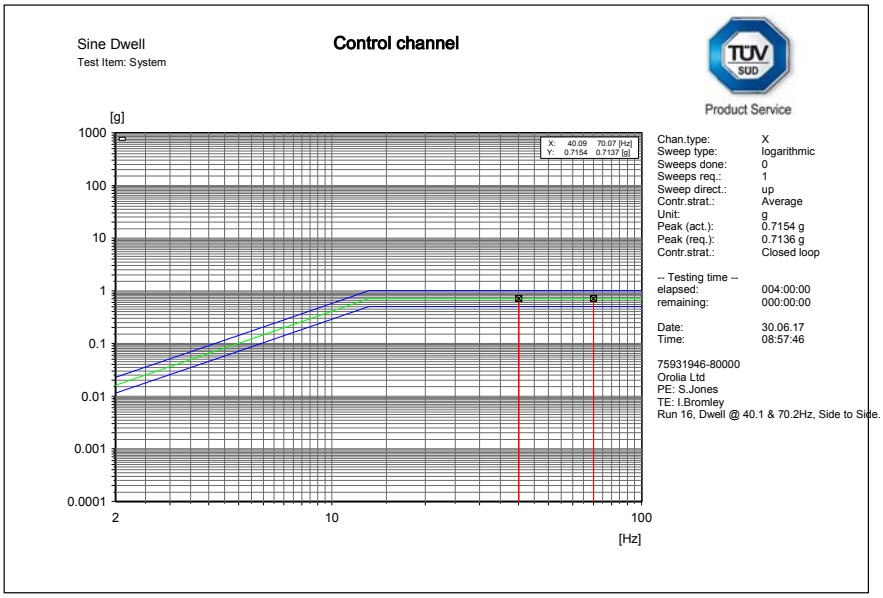
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_005.rsn

Up and Down Axis – Resonance Search – TSR0087



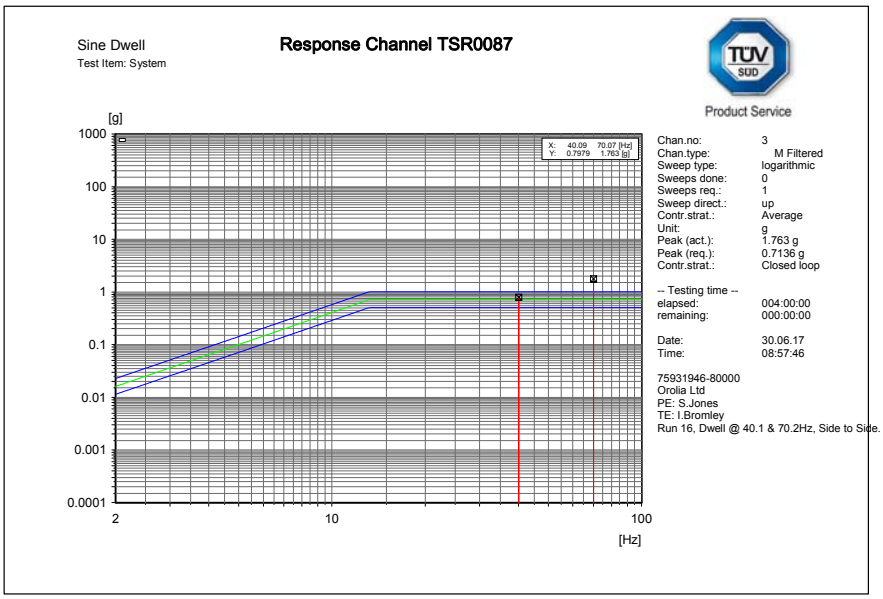
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\RS_005.rsn

Up and Down Axis – Endurance Run – Control (TSR0087) – 40.1 Hz and 70.2 Hz



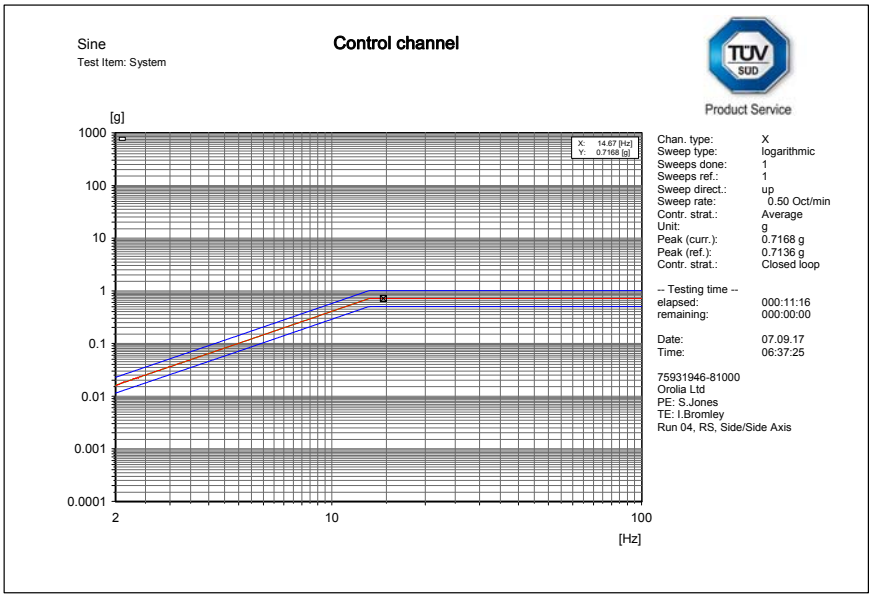
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_004.rsd

Up and Down Axis – Endurance Run – TSR0087 – 40.1 Hz and 70.2 Hz



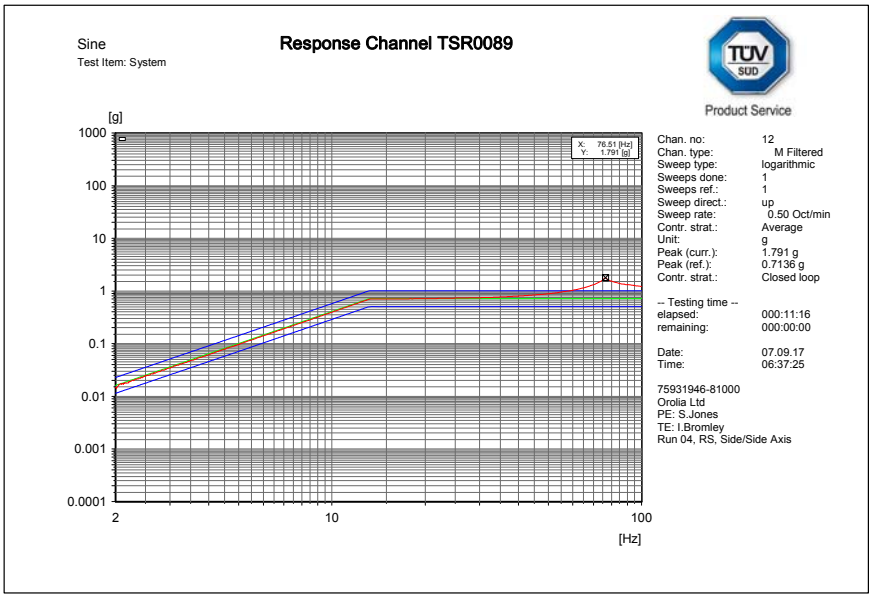
C:\VcpNT\Daten\m+p\Orolia\75931946-80000\75.6Hz Sine Dwell_004.rsd

Side to Side Axis – Resonance Search – Control (TSR0089)



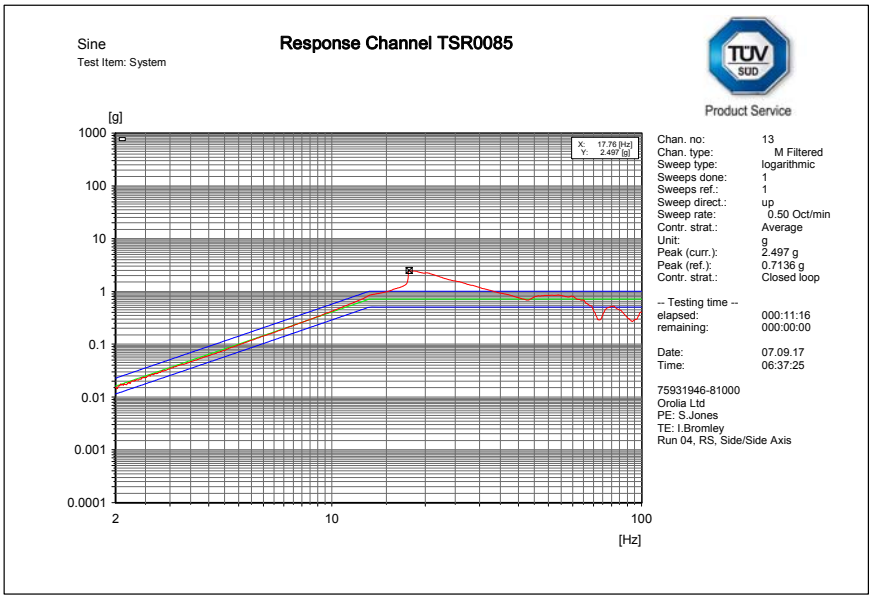
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_002.rsn

Side to Side Axis – Resonance Search – TSR0089



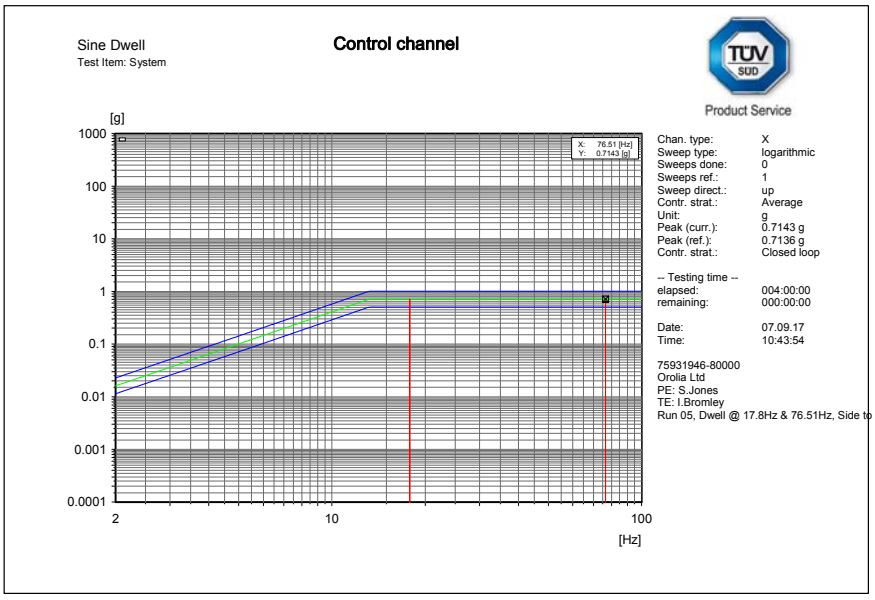
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_002.rsn

Side to Side Axis – Resonance Search – TSR0085



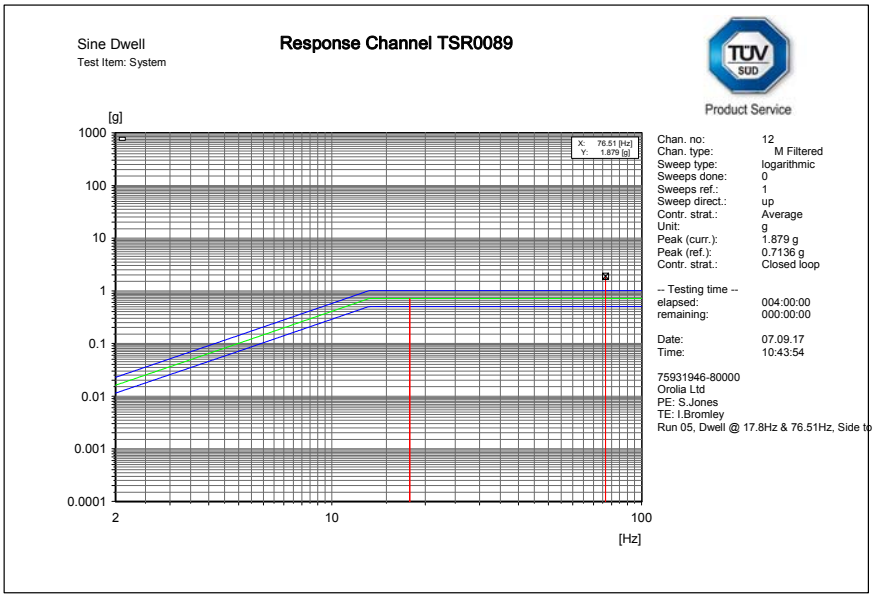
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_002.rsn

Side to Side Axis – Endurance Run – Control (TSR0085 and TSR0089)



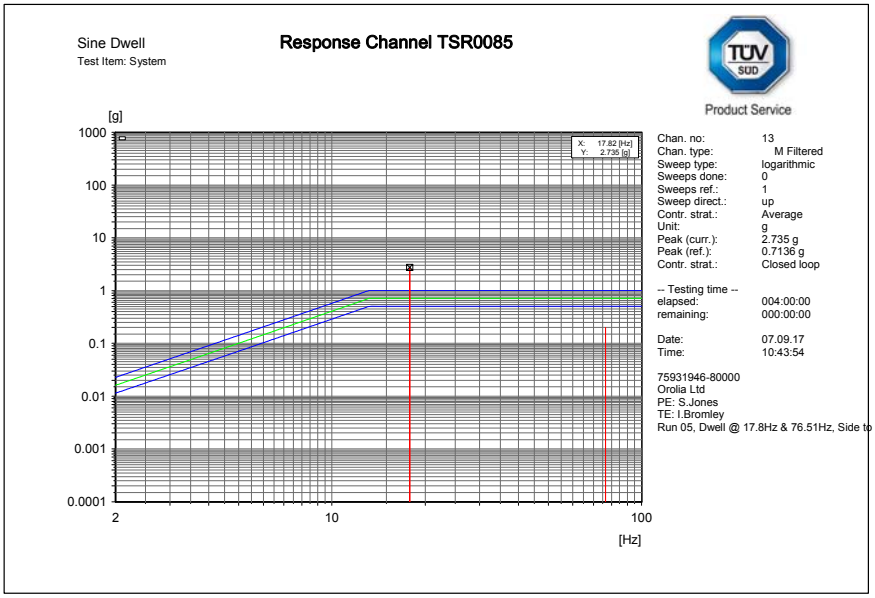
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_001.rsd

Side to Side Axis – Endurance Run – TSR0089



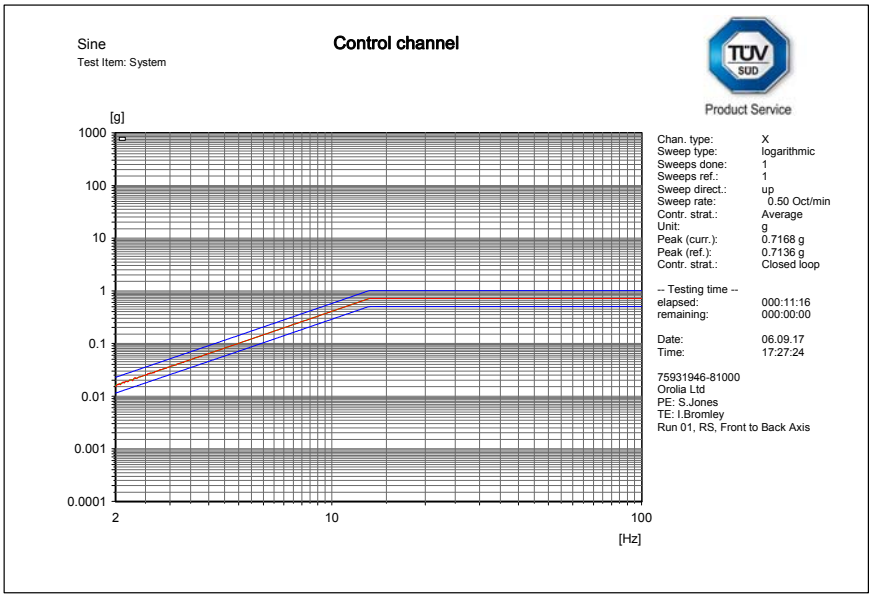
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_001.rsd

Side to Side Axis – Endurance Run – TSR0085



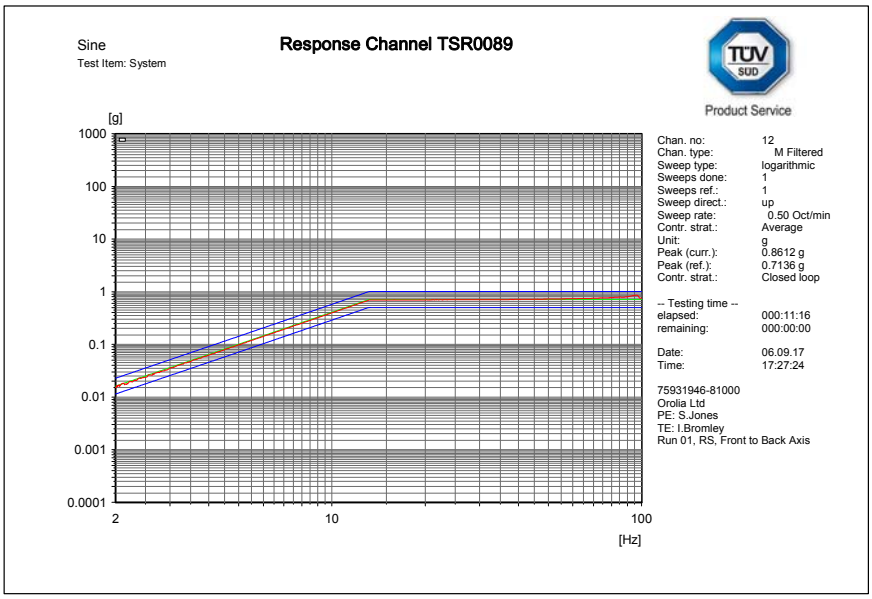
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_001.rsd

Forward and Aft Axis – Resonance Search – Control (TSR0085 and TSR0089)



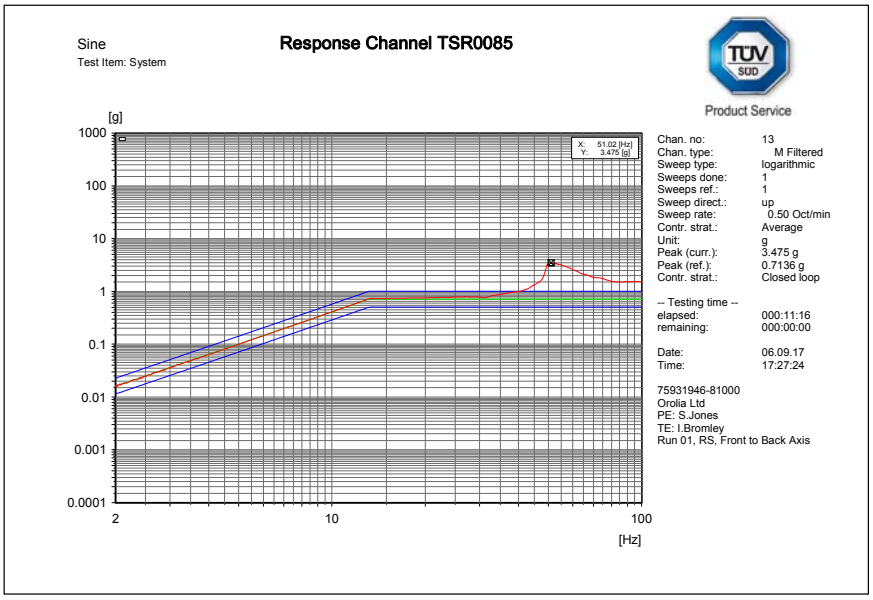
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_001.rsn

Forward and Aft Axis – Resonance Search – TSR0089



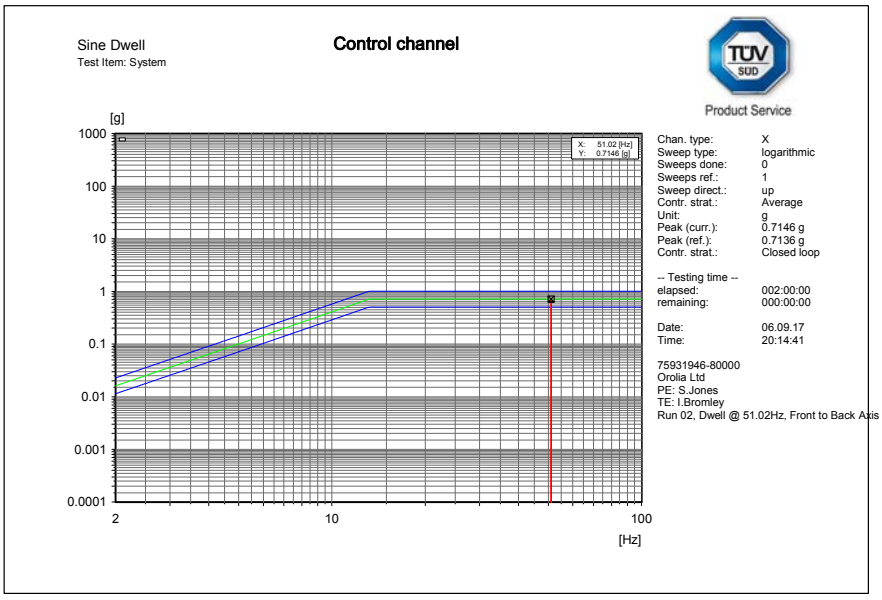
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_001.rsn

Forward and Aft Axis – Resonance Search – TSR0085



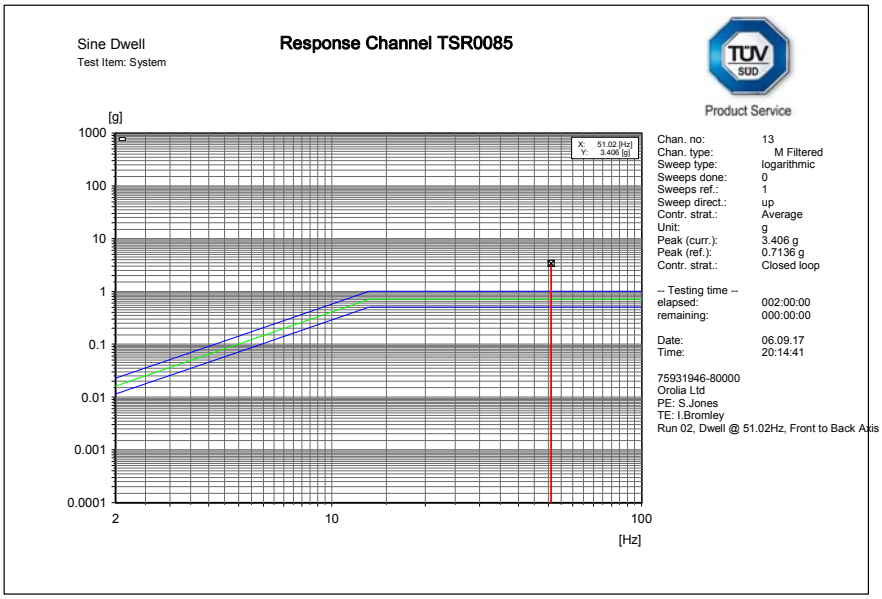
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_001.rsn

Forward and Aft Axis – Endurance Run – Control (TSR0085) – 51.02 Hz



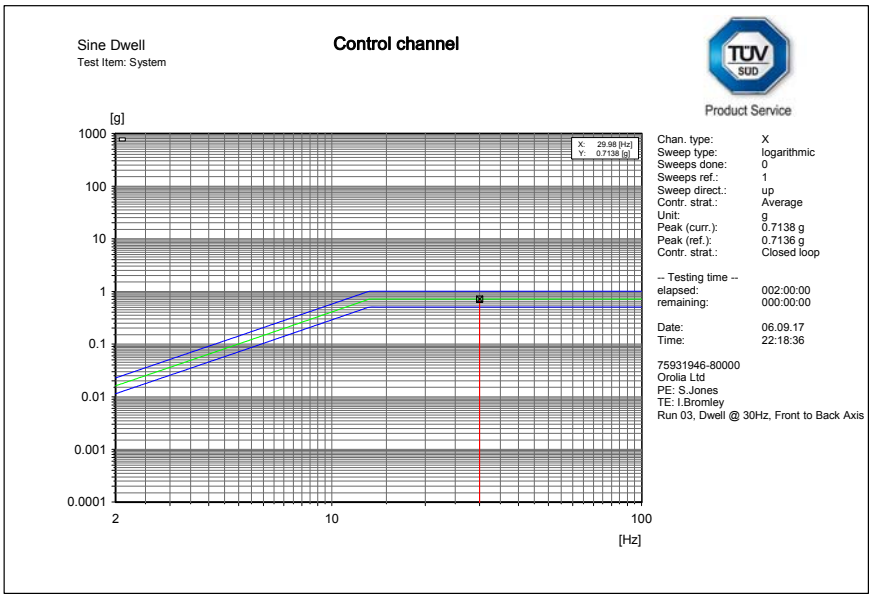
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\51.02 Hz, Sine dwell, 120minHz_001.rsd

Forward and Aft Axis – Endurance Run TSR0085 – 51.02 Hz



C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\51.02 Hz, Sine dwell, 120minHz_001.rsd

Forward and Aft Axis – Endurance Run Control (TSR0089) – 30 Hz



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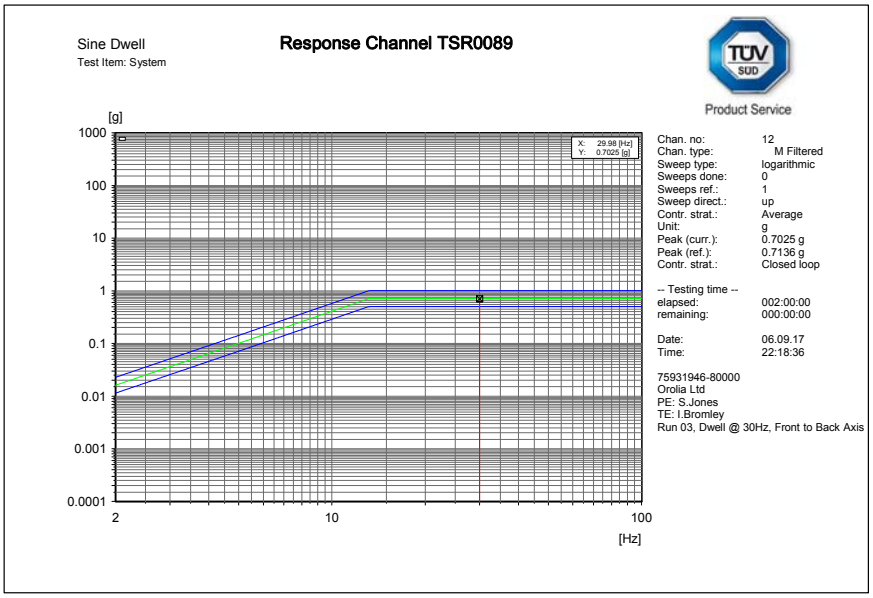
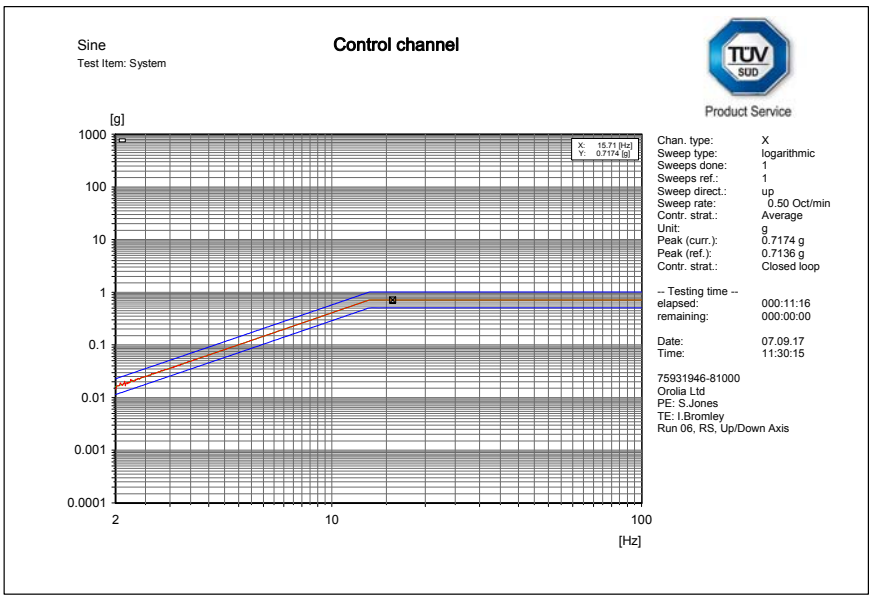
Forward and Aft Axis – Endurance Run TSR0089 – 30 Hz



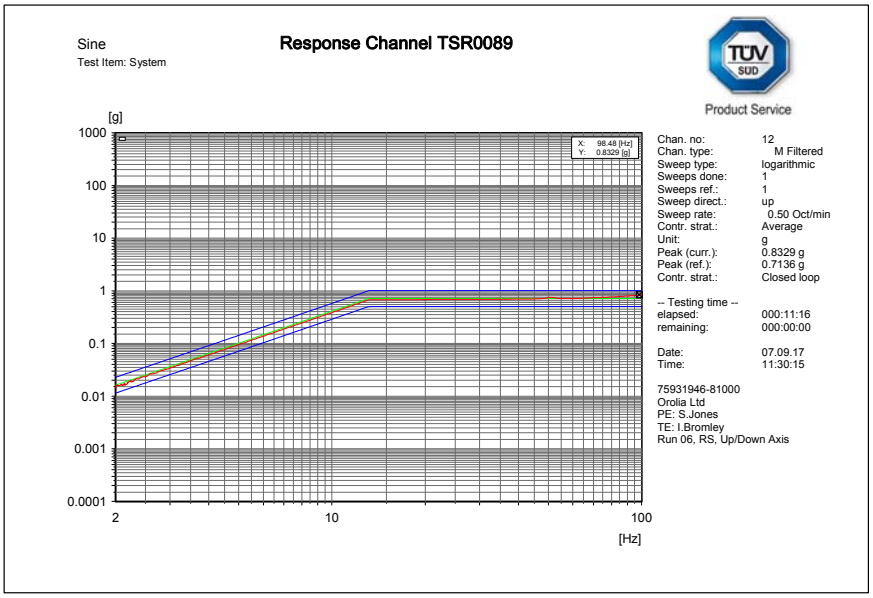
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\30 Hz, Sine dwell, 120minHz_001.rsd

Up and Down Axis – Resonance Search (Control) (TSR0085 and TSR0089)



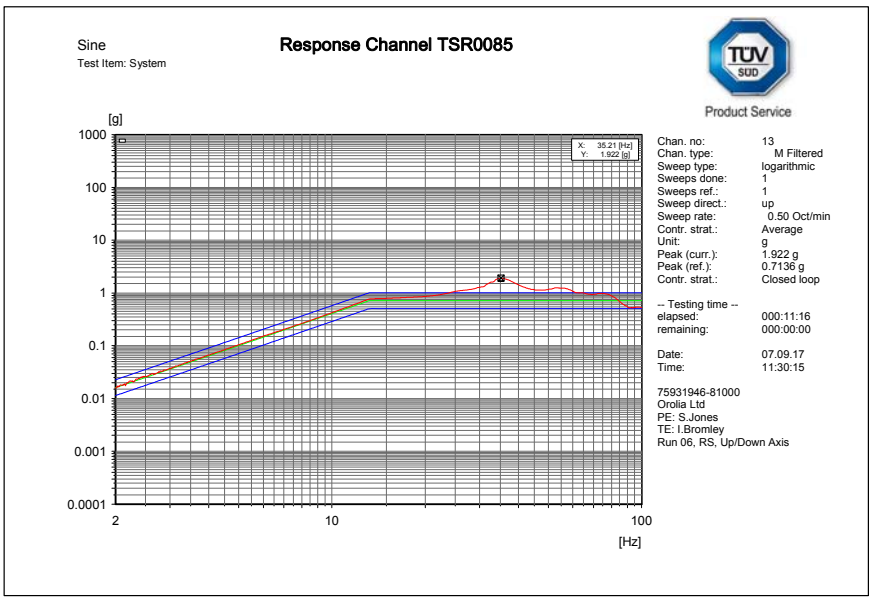
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_003.rsn

Up and Down Axis – Resonance Search (TSR0089)



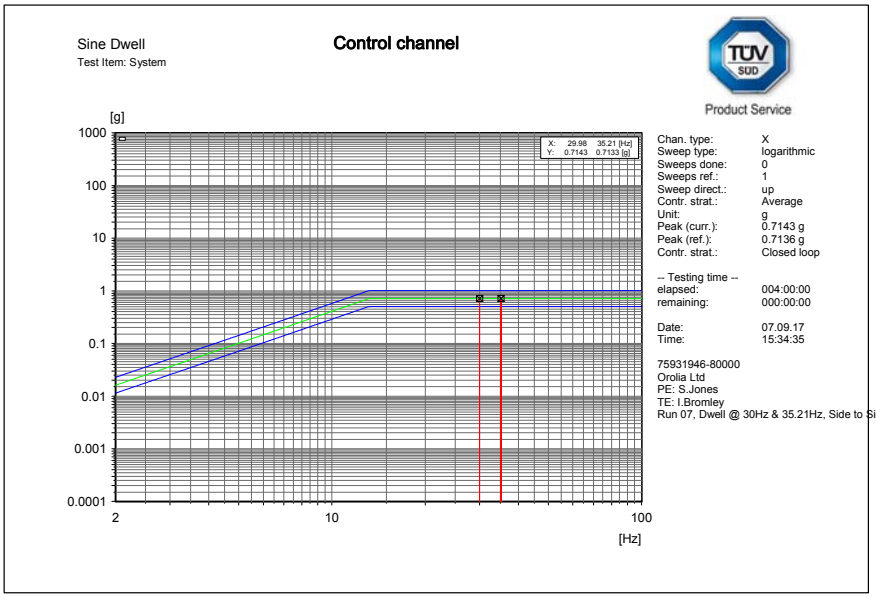
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_003.rsn

Up and Down Axis – Resonance Search (TSR0085)



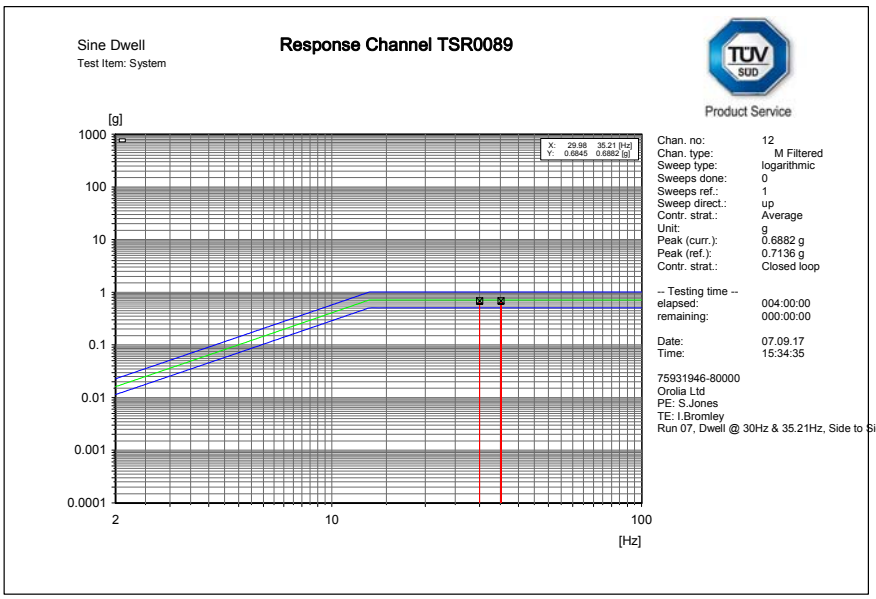
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\RS_003.rsn

Up and Down Axis – Endurance Run (Control) (TSR0085 and TSR0089)



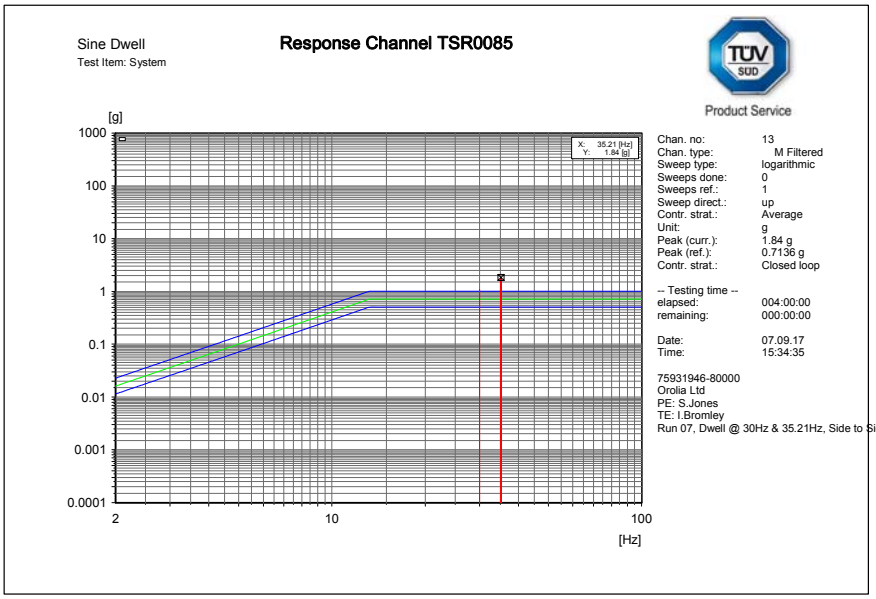
C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_002.rsd

Up and Down Axis – Endurance Run (TSR0089)



C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_002.rsd

Up and Down Axis – Endurance Run (TSR0085)



C:\VcpNT\Daten\m+p\Orolia\75931946-81000\6-9-17\2 dwells, 120minHz_002.rsd

2.9 IMMERSION

2.9.1 Specification Reference

IEC 60945, clause 8.9

2.9.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) – Modification State 3

2.9.3 Date of Test

23 August 2017

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Environmental Conditions

Ambient Temperature 23.8°C
Relative Humidity 45.6%

2.9.6 Test Setup

2.9.7 Test Method

The EUT was immersed in water and placed in a high pressure vessel. The pressure was increased to 1 bar (10 metres) for 5 minutes. At the conclusion of the test, the EUT was inspected for ingress of water, and subjected to a performance check.

2.9.8 Test Results

Inspection

On completion of the test the EUT was subjected to an inspection. No sign of water ingress was found.

Pre immersion weight: 692 g

Post immersion weight: 692 g

Summary of Performance Check Results

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039957
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

2.10 SOLAR RADIATION

2.10.1 Specification Reference

IEC 60945, clause 8.10

Refer to TUV SUD PSB Pte Ltd report 7191166085-CHM17-CCK

2.11 OIL RESISTANCE

2.11.1 Specification Reference

IEC 60945, clause 8.11

2.11.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#1003 (TUV Ref TSR0070) - Modification State 3

2.11.3 Date of Test

11 May 2017 – 12 May 2017

2.11.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.11.5 Environmental Conditions

Ambient Temperature	24.8°C
Relative Humidity	38.3%

2.11.6 Test Method

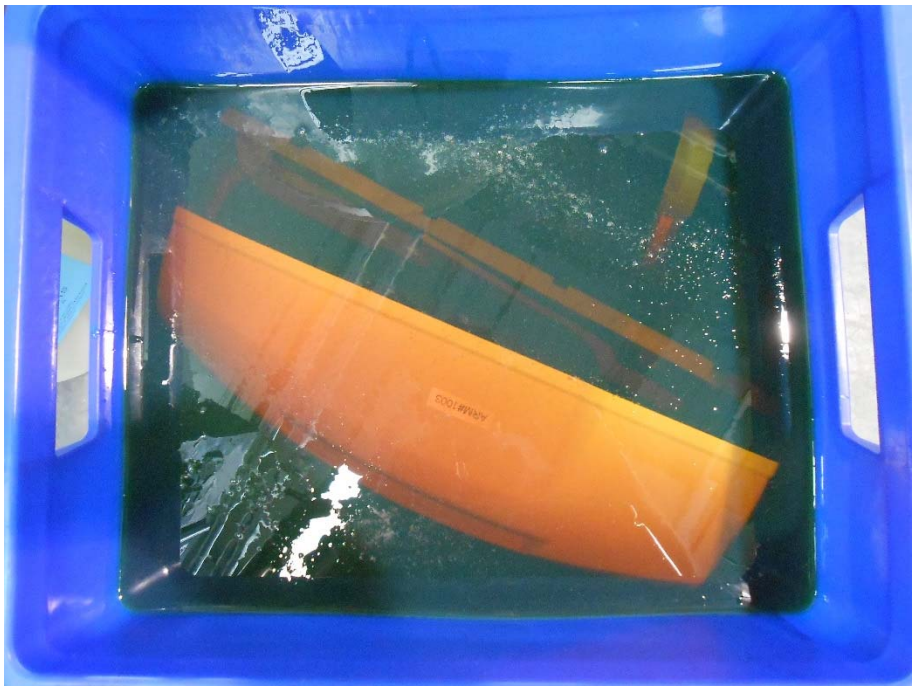
The oil was identified as IRM 901. This is considered a direct replacement for the now obsolete ASTM Oil no.1. See Annex A for oil specification.

The EUT was completely immersed in the oil where it remained for 3 hours.

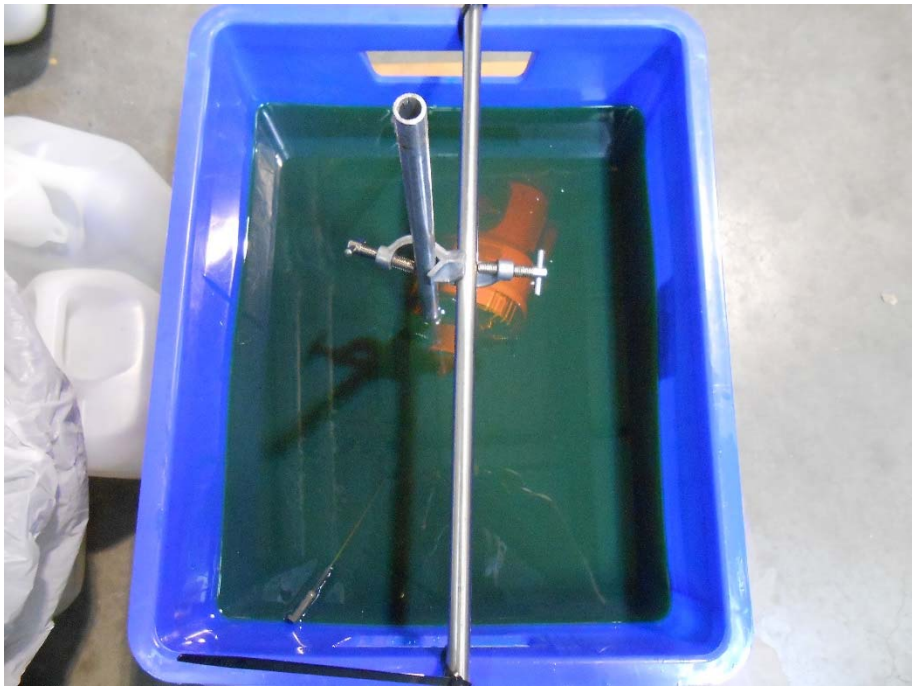
After the 3 hour immersion the EUT was removed and cleaned. A visual inspection was made.

2.11.7 Test Results

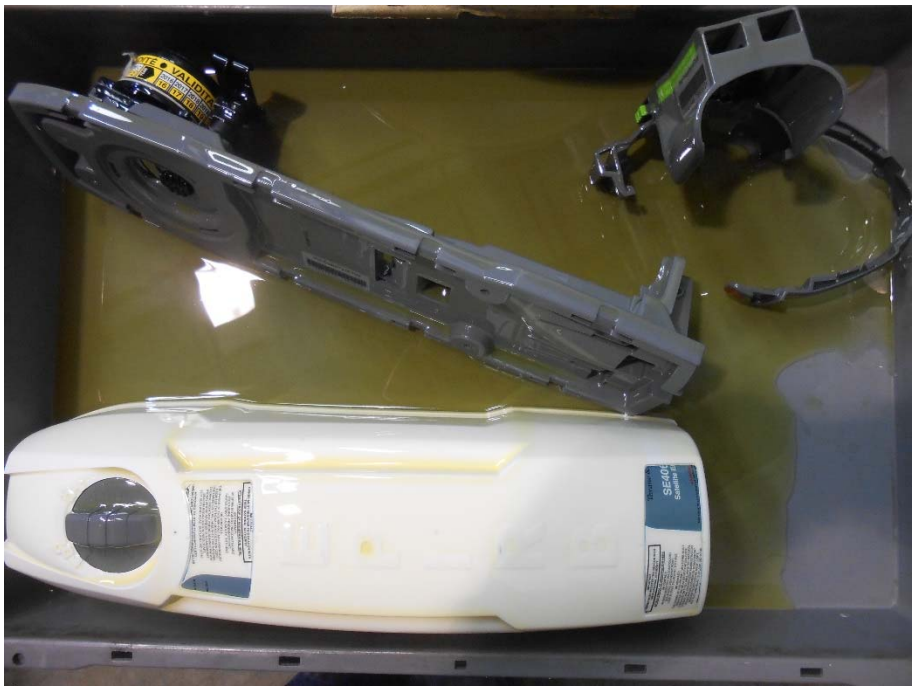
The test was carried out satisfactorily; no evidence of damage or deterioration was observed.



Test Setup Photo (Float free housing and manual bracket – Oil Immersion



Test Setup Photo (EUT)



EUT post oil immersion

Post Test Performance Check Results

Z701 EPIRB S/N: #1003 (TUV Ref TSR0070)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06333603CEBD1379E64DCBA*
406 MHz Frequency	406.040292
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

* During the performance check, the EUT picked up GPS navigation data. The position accuracy was within the requirements of Cospas Sarsat T.007.

2.12 CORROSION

2.12.1 Specification Reference

IEC 60945, clause 8.12

2.12.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: N/A (TUV Ref TSR0038) - Modification State 1

2.12.3 Date of Test

05 July 2016 – 02 August 2016

2.12.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.12.5 Environmental Conditions

Ambient Temperature 19.9 – 30.9°C
Relative Humidity 30.3 – 67.2%

2.12.6 Test Setup

2.12.7 Test Method

The EUT was placed in a chamber and sprayed with a salt solution for 2 h at normal temperature. The salt solution was prepared by dissolving (5 ± 1) parts by weight of sodium chloride (NaCl) in 95 parts by weight of distilled or demineralised water.

At the end of the spraying period, the EUT was placed in a chamber which was maintained at a temperature of 40 °C ± 2 °C, and a relative humidity between 90 % and 95 % for a period of seven days.

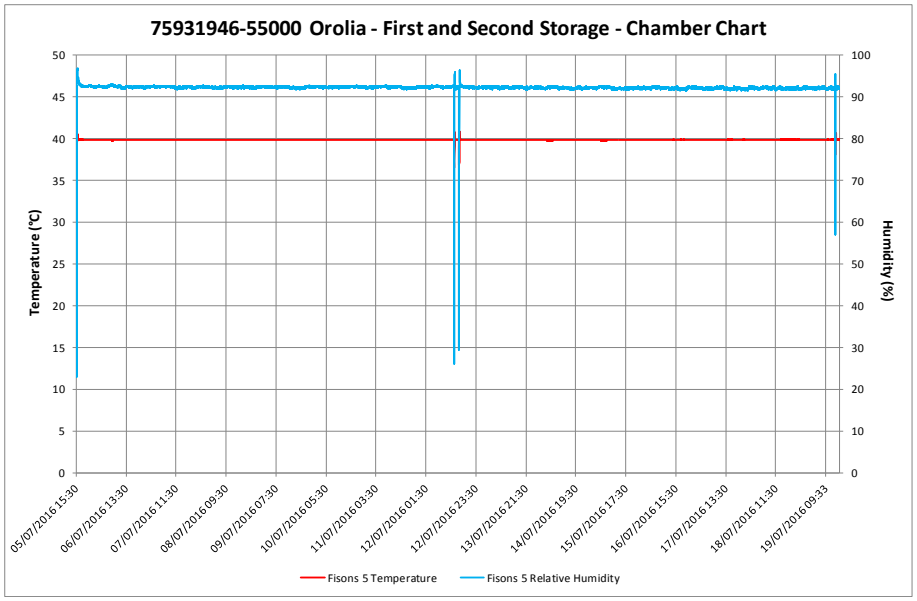
The EUT was subjected to a test comprising four spraying periods, each of duration 2 h, with a storage period of seven days after each.

At the conclusion of the test the EUT was inspected with the naked eye without magnification. The EUT was then subjected to a performance check.

2.12.8 Test Results

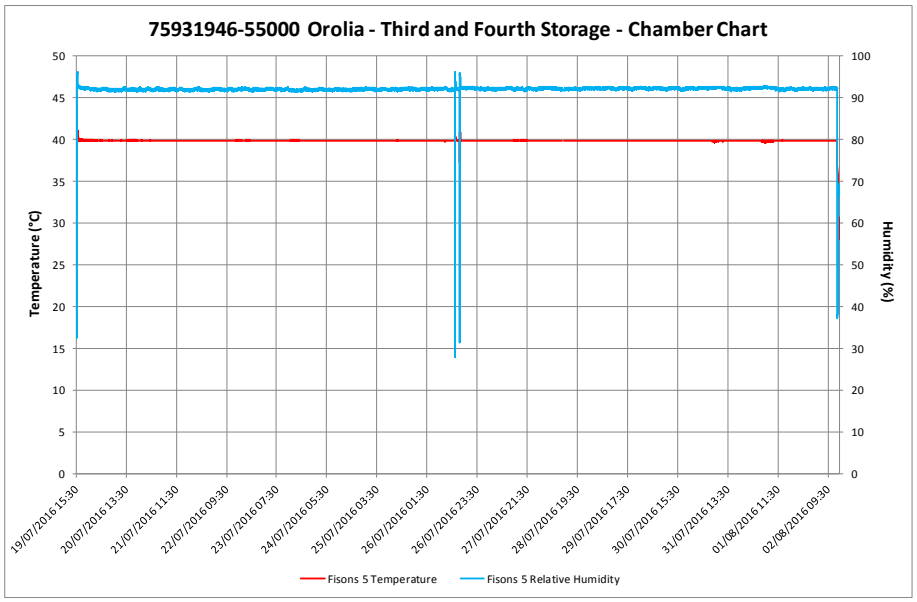
The test method was completed satisfactorily.

Temperature Plot (First and Second Storage)

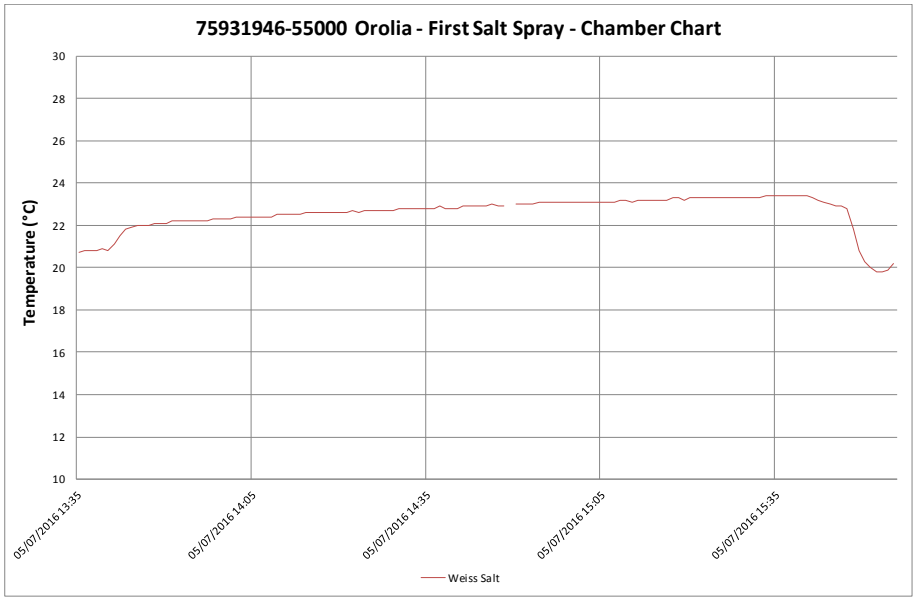


Product Service

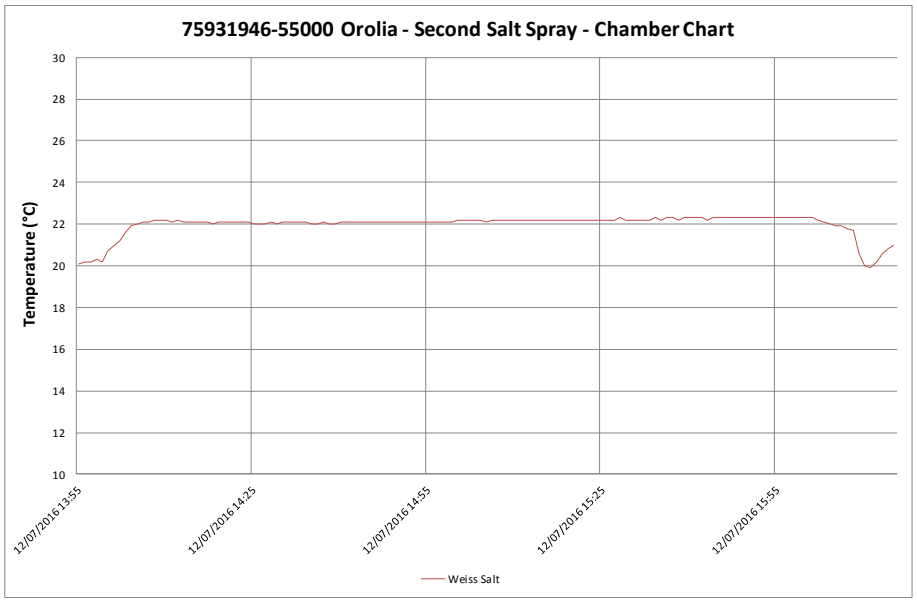
Temperature Plot (Third and Fourth Storage)



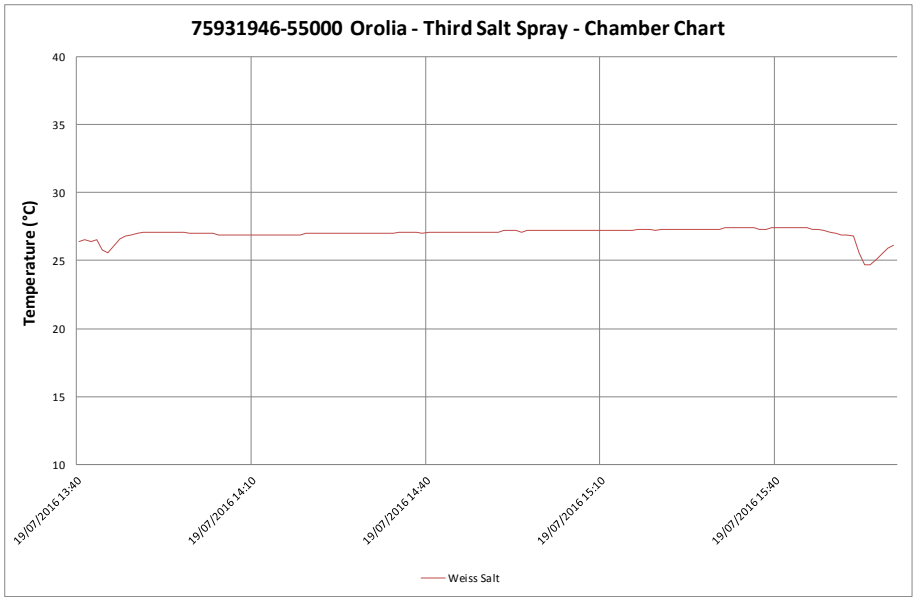
First Salt Spray Chamber Plot



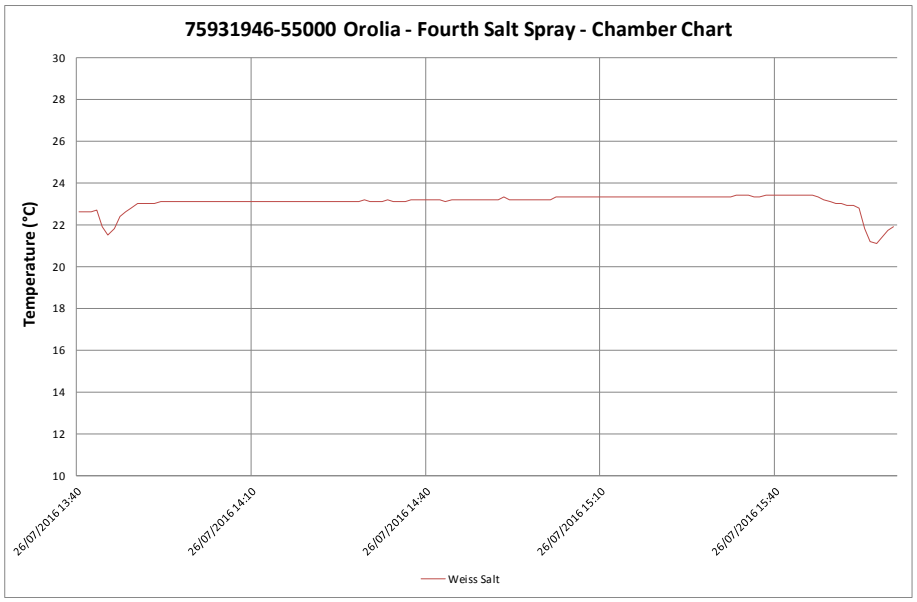
Second Salt Spray Chamber Plot



Third Salt Spray Chamber Plot



Forth Salt Spray Chamber Plot



Inspection

On completion of the test the EUT was subjected to an inspection. No sign of water ingress was found.

Summary of Performance Check Results

Z701 EPIRB S/N: 404 (TUV Ref TSR0038)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B783E0F66C
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.040280
121 MHz Presence	P
AIS (Message 1 and 14 reception)	P

2.13 RADIATED EMISSIONS

2.13.1 Specification Reference

IEC 60945, clause 9.3

Test not applicable – the product specific standard (IEC 61097-2) replaces this test with the Spurious Emissions test (clause 5.19 of IEC 61097-2). The resuls of this can be found in TUV SUD document 75931946 Report 05.

2.14 IMMUNITY TO RADIATED RADIOFREQUENCIES

2.14.1 Specification Reference

IEC 60945, clause 10.4

2.14.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) - Modification State 3
Z701 EPIRB S/N: RF#01 (TUV Ref TSR0089) – Modification State 4

2.14.3 Date of Test

16 October 2017

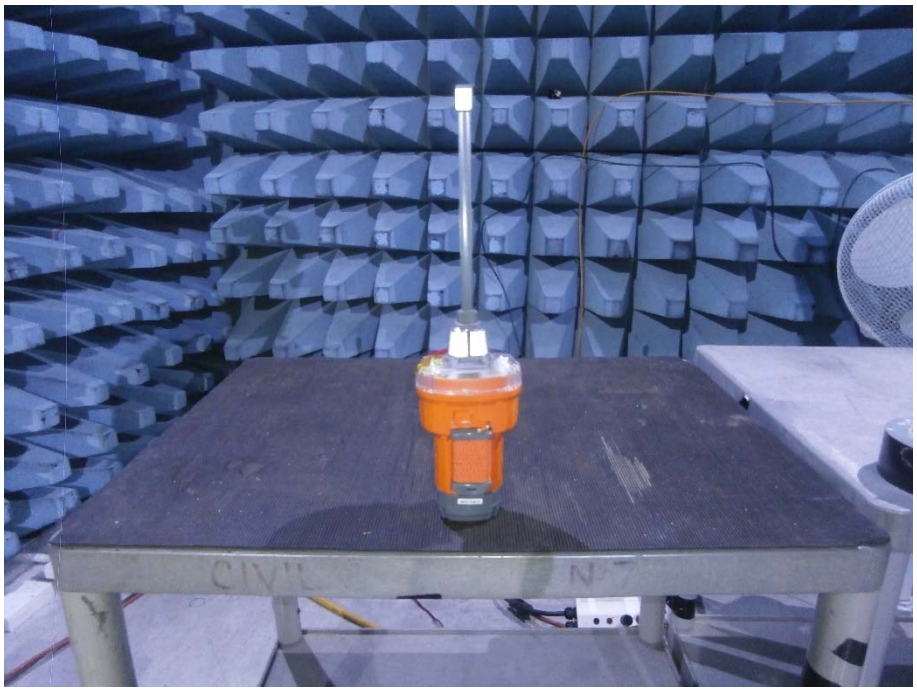
2.14.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.14.5 Environmental Conditions

Ambient Temperature 19.8°C
Relative Humidity 52%

2.14.6 Test Setup



Operating (GPS signal present, 121 active and AIS active).

Inactive (Standalone – worst case configuration without float free housing)

2.14.7 Test Method

The test was applied in accordance with the test method requirements of IEC 61000-4-3.

The test was performed with the EUT in Standby and Operating modes.

2.14.8 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of EN 60945 (performance criterion B as per IEC 61097-2).

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Operating (GPS signal present, 121 active and AIS active).

Tabulated Results for RF Electromagnetic Field				
Step Size	1%			
Dwell Time < 1GHz Dwell Time > 1GHz	3 s 9 s			
Modulation	400Hz Sine 80% AM			
Frequency Range (MHz)	Test Face	Antenna Polarisation	Test Level (V/m)	Result
80 MHz to 2 GHz	Front, Rear and Top	Horizontal and Vertical	12.6 V/m (10 + MU)	Pass

Results for Configuration and Mode: Inactive (Standalone).

Tabulated Results for RF Electromagnetic Field				
Step Size	1%			
Dwell Time < 1GHz Dwell Time > 1GHz	3 s 9 s			
Modulation	400Hz Sine 80% AM			
Frequency Range (MHz)	Test Face	Antenna Polarisation	Test Level (V/m)	Result
80 MHz to 2 GHz	Front, Rear and Top	Horizontal and Vertical	12.6 V/m (10 + MU)	Pass

2.15 IMMUNITY TO ESD

2.15.1 Specification Reference

IEC 60945, clause 10.9

2.15.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: RF#02 (TUV Ref TSR0085) - Modification State 4

2.15.3 Date of Test

26 September 2017

2.15.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.15.5 Environmental Conditions

Ambient Temperature 20.0 – 21.0°C
Relative Humidity 50.2%

2.15.6 Test Method

The test was applied in accordance with the test method requirements of IEC 61000-4-2.

The test was performed with the EUT in Standby and Operating modes.

2.15.7 Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of IEC 60945: C1 for Immunity to Electrostatic Discharge (Enclosure Port) (performance criterion B as per IEC 61097-2).

Results for Configuration and Mode: Operating (GPS signal present, 121 active and AIS active).

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

◯ Contact ☐ Air

ID	Test Point	Discharge	Results									
			2kV		4kV		6kV		8kV		15kV	
			+	-	+	-	+	-	+	-	+	-
	Horizontal Coupling Plane	Contact	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
	Vertical Coupling Plane	Contact	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
	Contact Discharge Points	Contact	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A
	Air Discharge Points	Air	✓*	✓*	✓*	✓*	N/A	N/A	✓*	✓*	N/A	N/A

Key to Results	
✓	The EUT's performance was not impaired at this test point when the ESD pulse was applied.
✓*	No discharge occurred at this point when the ESD pulse was applied.
N/A	Not Applicable.

Results for Configuration and Mode: Inactive (Standalone).

Performance assessment of the EUT made during this test: Pass.

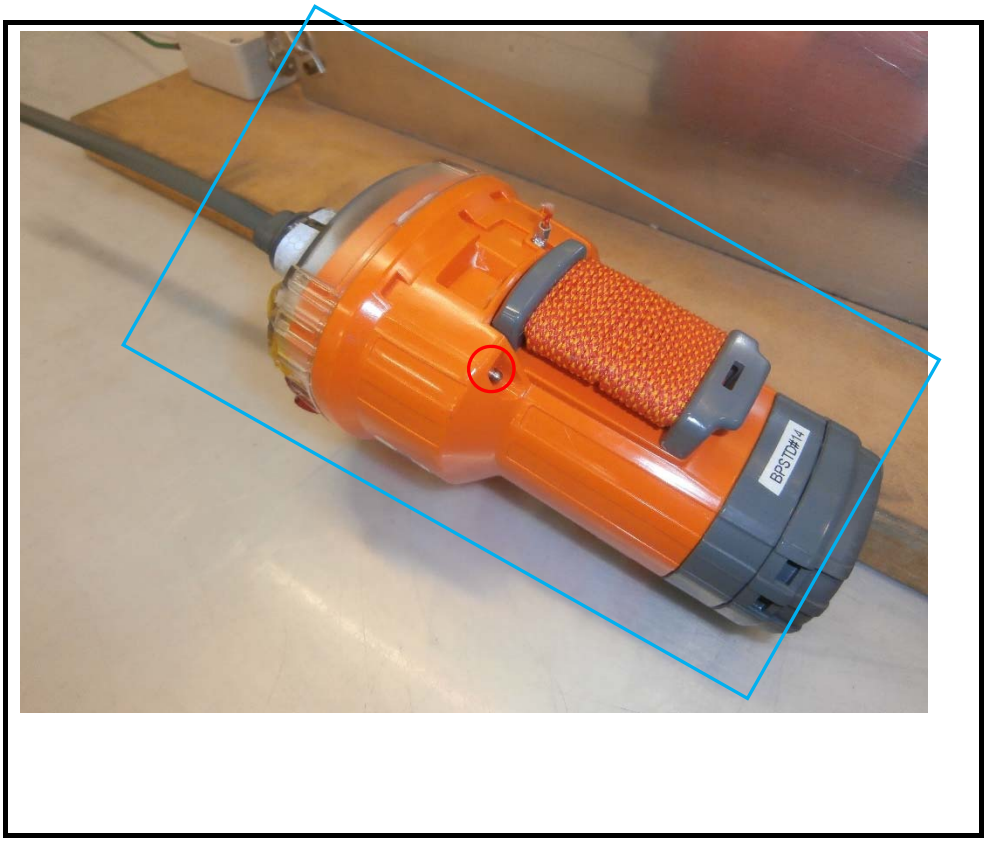
Detailed results are shown below.

◯ Contact ☐ Air

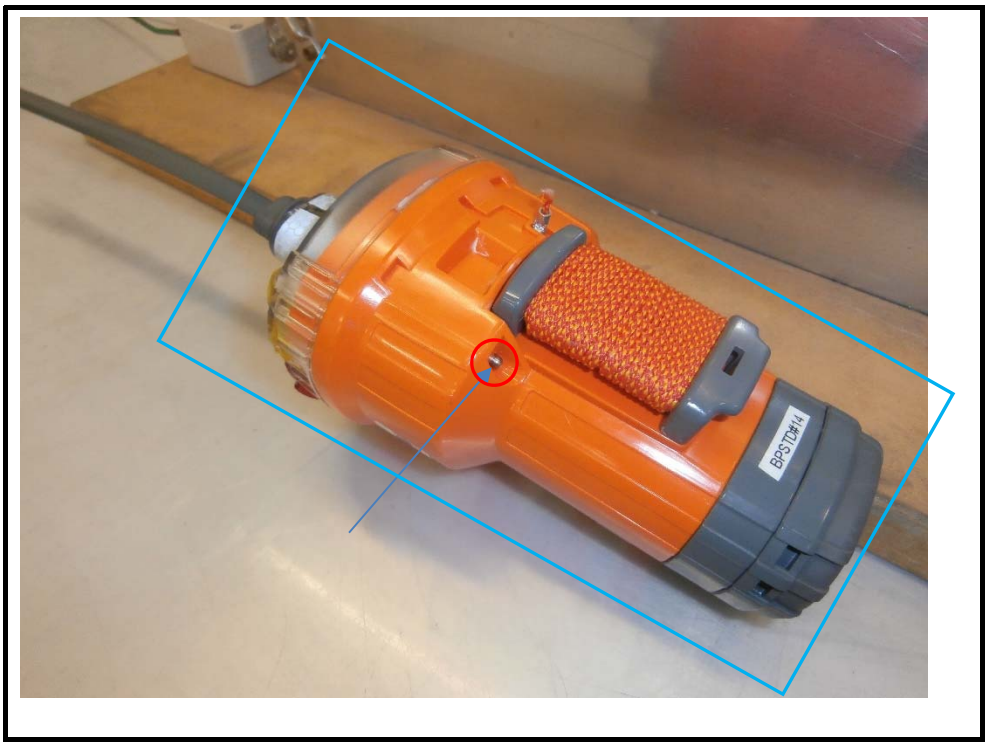
ID	Test Point	Discharge	Results									
			2kV		4kV		6kV		8kV		15kV	
			+	-	+	-	+	-	+	-	+	-
	Horizontal Coupling Plane	Contact	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
	Vertical Coupling Plane	Contact	✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A
	Contact Discharge Points	Contact	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A
	Air Discharge Points	Air	✓*	✓*	✓*	✓*	N/A	N/A	✓*	✓*	N/A	N/A
A	Ob 1 No discharge, Green LED flashed	Contact	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A	N/A	N/A

Key to Results	
✓	The EUT's performance was not impaired at this test point when the ESD pulse was applied.
✓*	No discharge occurred at this point when the ESD pulse was applied.
N/A	Not Applicable.

ESD Test Points: Operating (GPS signal present, 121 active and AIS active).



ESD Test Points: Inactive (Standalone)



2.16 COMPASS SAFE DISTANCE

2.16.1 Specification Reference

IEC 60945, clause 11.1

2.16.2 Equipment Under Test and Modification State

Z701 EPIRB S/N: ENV#2002 (TUV Ref TSR0087) – Modification State 3

2.16.3 Date of Test

08 May 2017

2.16.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.16.5 Environmental Conditions

Ambient Temperature 20.5°C
Relative Humidity 29.1%

2.16.6 Test Method

A wooden table aligned E-W was used with a compass set in the centre, aligned to read zero. The table was marked to give a graduated scale of distance. The EUT was moved towards the compass until a standard deviation of 0.3° was obtained.

Each orientation of the EUT was tested in this manner with the measurement distance between the compass centre and the EUT being noted.

The test was repeated with readings taken when the compass gave a steering deviation of 0.9°.

The local area Magnetic Flux density (H) at the site of testing was 19.91uT.

The above testing was performed three times with the EUT as follows:

a. Unpowered.
b. Normalised.
c. Power applied.

Prior to performing the tests in accordance with part b above, the EUT was normalised by placing it into Helmholtz Coil Assembly and subjecting it to a magnetic field of 79A/m.

The test was applied in accordance with the test method requirements of IEC 60945.

2.16.7 Test Results

Standard Compass safe distance (mm)	650
Emergency Compass safe distance (mm)	350

Horizontal maximum flux density, Magnetic North (H)	H	19.89
Standard compass deviation limit (degrees)	5.4/H = A	A = 0.3
Emergency compass deviation limit (degrees)	18/H = B	B = 0.9

Orientation of the EUT	Un-powered State		Normalised		Powered Up	
	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection
Front	320	170 0.5°deflection	285	170 0.7°deflection	240	170 0.5°deflection
Top	245	170 0.5°deflection	480	170 0.5°deflection	300	170 0.6°deflection
Left Hand Side	410	305	470	290	220	170 0.5°deflection
Right Hand Side	540	330	560	310	190	170 0.8°deflection
Underside	550	170 0.4°deflection	235	170 0.4°deflection	310	170 0.8°deflection
Rear	630	220	360	225	200	170 0.4°deflection

Note: the compass safe distance was measured with the EUT standalone and installed in the float free housing, no difference was found between the two configurations.

2.17 PROTECTION AGAINST ACCIDENTAL ACCESS TO DANGEROUS VOLTAGES

2.17.1 Specification Reference

IEC 60945, clause 12.1

The EUT is a portable EPIRB powered by an internal battery pack for which there is no access to hazardous parts with a finger.

The EUT is a sealed unit. The battery pack is held in place by one fixing. If the EUT has a carry strap, this fixing is not visible as the carry strap casing covers the battery pack fixing. There is no other obvious point at which to gain access to any interior part of the EUT. When the battery pack is removed tools would be required to gain access to the interior part of the EUT.

SECTION 3

TEST EQUIPMENT

3.1 TEST EQUIPMENT

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 Dry Heat					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Climatic Chamber	Climatec	Climatec 1	2124	12	11-Nov-2017
GPS/SBAS Simulator	Spirent	STR4500	3056	0	30-Sep-2017
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	12-Jun-2018
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018
Power Meter	Hewlett Packard	436A	47	12	02-Aug-2018
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	27-Feb-2018
Time Interval Analyser	Yokogawa	TA720	3253	12	15-Nov-2017
Signal Generator	Hewlett Packard	8644A	96	12	27-Apr-2018
Termination (50ohm)	Diamond Antenna	DL-30N	344	12	23-Sep-2017
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Beacon RF Unit	TUV SUD Product Service	N/A	3066	-	TU
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	02-Aug-2018
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3163	12	27-Oct-2017
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	14-Sep-2017
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2018
Section 2.3 Damp Heat					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Climatic Chamber	Climatec	Climatec 1	2124	12	11-Nov-2017
GPS/SBAS Simulator	Spirent	STR4500	3056	0	30-Sep-2017
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	12-Jun-2018
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.4 Low Temperature					
Power Meter	Hewlett Packard	436A	47	12	3-Aug-2018
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Power Meter	Hewlett Packard	436A	94	12	3-Nov-2017
Signal Generator	Hewlett Packard	8644A	96	12	27-Apr
Beacon RF Unit	TUV SUD Product Service	N/A	97	-	TU
Time Interval Analyser	Yokogawa	TA720	181	12	21-Apr-2018
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	14-Dec-2017
3dB/10W Attenuator	Texscan	HFP-50N	475	12	4-Apr-2018
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	17-Apr-2018
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Climatic Chamber	Climatec	Climatec 1	2124	12	11-Nov-2017
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	2-Feb-2018
GPS/SBAS Simulator	Spirent	STR4500	3056	0	30-Sep-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	30-Jun-2017
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3163	12	27-Oct-2017
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	14-Sep-2017
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	19-Sep-2017
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	15-Nov-2017
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2017
Power Sensor	Agilent Technologies	8482A	3289	12	18-Jan-2018
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2018
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	15-Sep-2017
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3353	12	25-May-2018
Rubidium Frequency Standard	Symmetricom	8040C	3490	12	28-Apr-2018
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	2-Mar-2018
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	2-Mar-2018
Oscilloscope	Yokogawa	DL750	4552	12	6-Apr-2018
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4601	12	13-Jul-2018
2 metre N-Type Cable	Florida Labs	NMS-235SP-78.8-NMS	4622	12	12-Oct-2017
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	12-Jun-2018
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018
Attenuator (30dB, 100W)	Weinschel	48-30-43	4863	12	3-May-2018
Attenuator (30dB, 100W)	Weinschel	48-30-43	4871	12	3-May-2018

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 Climatic Thermal Shock					
Climatic Chamber	Unitemp	Ministrat	2129	12	17-Feb-2018
Thermometer	Digitron	T208	2340	12	7-Nov-2017
10 meter Tape Measure	Stanley	Fatmax 10m/33'	4071	-	TU
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	12-Jun-2018
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	20-Jul-2018
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Section 2.6 Drop onto Hard Surface					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Hardwood Block	-	Wood Type: Elm	2650	-	TU
Section 2.7 Drop into Water					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Bomb Release	MOD	1000kg	3667	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Section 2.8 Vibration					
Isotron Accelerometer	Endevco	256-10	3113	6	17-Feb-2018
Vibration System	Ling Dynamic Systems	875	3170	6	28-Jan-2018
Isotron Accelerometer	Endevco	256-10	3383	6	18-Feb-2018
Accelerometer	Endevco	256-10	3433	6	5-Mar-2018
Accelerometer	Endevco	256-10	3571	6	7-Jan-2018
Vibration & Shock Controller	m + p International	VibPilot VP8	3730	12	25-Jul-2018
Vibration Controller	m + p International	Vibpilot 8	3772	12	9-Sep-2017
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Section 2.9 Immersion					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E7405A	1410	12	23-Aug-2018
Over Pressure (T)	ASL (TUV)	0 TO 15 PSI	2125	-	TU
Montford F43	Montford	4FT CUBED	2126	12	25-Nov-2017
Hygromer	Rotronic	A1	2138	12	2-Feb-2018
Balance	Geniweigher	GM-11K	2334	12	14-Mar-2018
Digital Pressure Gauge	Druck	DPI 700	2342	12	24-Jan-2018
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Pressure Indicator	Druck	DPI 700	2458	12	18-Jul-2018
Stop Watch	Acctim	Timer	2466	12	7-Sep-2017
5m Tape Measure	Stanley	Fatmax 5m	4024	-	TU
Stop Watch	Radio Spares	Model 694 (974)	4026	0	19-Sep-2017

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.12 Climatic - Corrosion					
Climatic Chamber	Fisons	Fisons 5	2123	12	24-Dec-2016
Balance	Geniweigher	GM-11K	2334	12	21-Mar-2017
pH Meter	Jenway	3310	2335	-	TU
Temperature Logger	Digitron	2098T	2479	12	22-Oct-2016
Measuring cylinder	Unknown	50mL	3136	-	TU
Receptacle (100mm dia Nominal)	Embee	100mm	3321	-	TU
Stop Watch	Radio Spares	Model 694 (974)	4026	0	19-Sep-2017
Hydrometer	Brannen	1.00-1.05 g/ml	4672	12	30-Oct-2016
Salt Spray Test Chamber	Ascott	S2000IS	4725	12	30-Mar-2017
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	24-Jun-2017
Section 2.14 Radiated Immunity					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	-	TU
Antenna	Schaffner	CBL6143	322	-	TU
Termination (50ohm)	Meca	405-1	370	12	13-Oct-2017
Power Meter	Rohde & Schwarz	NRVD	748	-	TU
RF Power Amplifier	Amp Research	1000W1000M7	1633	-	TU
CW TWT (1-2.5GHz)	Thorn	PTC6341	2069	-	TU
Dual Directional Coupler	Amp Research	DC6280M3	3337	12	3-Nov-2017
Signal Generator, 9kHz to 6GHz	Rohde & Schwarz	SMB 100A	3500	12	9-Jun-2018
Power Sensor; 100kHz - 6GHz/500pW - 20mW	Rohde & Schwarz	NRV-Z4	3815	-	TU
Section 2.15 Electrostatic Discharges					
Antenna (Double Ridge Guide,1GHz-18GHz)	EMCO	3115	35	12	2-Dec-2017
Spectrum Analyser	Hewlett Packard	8562A	1001	12	22-Nov-2017
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESD Generator	Schloder	SESD 30000	4724	12	28-Apr-2018
Section 2.17 Compass Safe Distance					
Sussex Helmholtz Coil	Various	88771	327	-	TU
Magnetometer	Bartington	MAG01	671	36	24-Feb-2018
Marine Binnacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU

List of absolute measuring and other principal items of test equipment.
TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

EUT (Conducted Sample)

EUT – Rear View (Conducted Sample)

EUT installed in manual bracket

EUT installed in float free housing

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

ANNEX A

OIL SPECIFICATION

Pkg. Lot 091712/T
Pkg. Lot 091712/T-2
Lot# IRM9010003 Pkg. Lot 092412/T

HollyFrontier Refining & Marketing LLC

CERTIFICATE OF ANALYSIS

ATTENTION	CHIEF CHEMIST OR QUALITY CONTROL MANAGER
FAX	6096950102
CUSTOMER ORDER NO.	00083579
HRM ORDER NO.	00083579
PRODUCT NAME	IRM 901
HRM PRODUCT CODE	241400
MANUFACTURED BY:	Holly Refining & Marketing - Tulsa Tulsa, OK, USA
SHIPMENT DATE	09/18/12
SHIPPED TO	RE CARROLL INC RE CARROLL INC 1570 N OLDEN AVE TRENTON, NJ 08638
SHIPPED VIA	CARROLL 1825
QUANTITY ORDERED	5500
BATCH NO.	TWMC1702
DOCUMENT NUMBER	00083579_091812_2414.JDH

Test Description	Test Method	Specification Range Minimum	Maximum	Test Value
APPEARANCE	VISUAL			BRIGHT
ANILINE POINT, C	D611	123.	125.	124.5 ✓
VISCOSITY, CST @ 210F	D445	18.70	21.00	18.8 ✓
GRAVITY, API	D1250	27.8	29.8	28.9 ✓
DENSITY @ 15C, KG/DM3	D4052	0.8768	0.8878	0.8817 ✓
VGC	D2501	0.790	0.805	0.799 ✓
FLASH, COC, C	D92	243		296 ✓
PARAFFINIC CARBON ATOMS%	D2140	65		71 ✓

Jennifer Hall
Quality Manager
Tulsa, OK

9/26/12

Comments/Questions? Call your Customer Service Representative:
800-456-4786