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Report On

Emergency Beacons Testing of the
ACR Electronics, Inc. RLB-41
In accordance with IEC 60945

Document 75927040 Report 02 Issue 2 **November 2015**

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REPORT ON

Emergency Beacons Testing of the
ACR Electronics, Inc.
RLB-41

Document 75927040 Report 02 Issue 2

November 2015

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DATED

6 November 2015	6 November 2015	6 November 2015

UKAS TESTING 0141

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CONTENTS

SECTION 1

REPORT SUMMARY

Emergency Beacons Testing of the
ACR Electronics, Inc.
RLB-41

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Emergency Beacon Testing of the ACR Electronics, Inc. RLB-41 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	ACR Electronics, Inc.
Model Number(s)	RLB-41
Serial Number(s)	S/N: #15 (TUV Ref TSR0058) S/N: #9 (TUV Ref TSR0064) S/N: #26 (TUV Ref TSR0051) S/N: #20 (TUV Ref TSR0036) S/N: #6 (TUV Ref TSR0066)
Number of Samples Tested	5
Test Specification/Issue/Date	IEC 60945: 2002
Date of Receipt of Test Samples	9 March 2015
Order Number Date	31575 6 June 2014
Start of Test	17 November 2014
Finish of Test	25 September 2015
Name of Engineer(s)	R Hampton M Hardy J Tuckwell A Guy M Cox F Van Niekerk

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with IEC 60945 is shown below.

Section	Spec. Clause	Test Description	Result	Comments
2.1	6, 14, 15	Operational Checks, Equipment Manuals and Marking and Identification	-	Refer to section 2.1
Configuration: RLB-41 (Conducted) S/N: 015 (TUV Ref TSR058)				
2.2	8.1	Pretest Checks	Satisfactory	
2.3	8.2	Dry Heat Tests	Satisfactory	
2.4	8.3	Damp Heat Test	Satisfactory	
2.5	8.4	Low Temperature Tests	Satisfactory	
Configuration: RLB-41 (Radiated) S/N: 009 (TUV Ref TSR064)				
2.2	8.1	Pretest Checks	Satisfactory	
2.3	8.2	Dry Heat Tests	Satisfactory	
2.4	8.3	Damp Heat Test	Satisfactory	
2.5	8.4	Low Temperature Tests	Satisfactory	
2.6	8.5	Thermal Shock	Satisfactory	
2.7	8.6	Drop Test (onto Hard Surface)	-	Damage to antenna (see test results section)
2.8	8.6.2	Drop Test (into Water)	Satisfactory	
2.9	8.7	Vibration Tests	Satisfactory	
2.10	8.9.2	Immersion Test	Satisfactory	
2.11	8.10	Solar Radiation	Waiver Request	
2.12	8.11	Oil Resistance	Waiver Request	
2.14	9.3	Radiated Emissions	N/A	
2.15	10.4	Immunity to Radiated RF	Satisfactory	
2.16	10.9	Immunity to ESD	Satisfactory	
2.18	12.1	Safety Precautions	N/A	
Configuration: RLB-41 (Radiated) S/N: 026 (TUV Ref TSR051)				
2.17	11.2	Compass Safe Distance Test	Satisfactory	
Configuration: RLB-41 (Radiated) S/N: 020 (TUV Ref TSR036)				
2.13	8.12	Corrosion	Satisfactory	

1.3 APPLICATION FORM

Beacon Manufacturer and Beacon Model

Beacon Manufacturer	ACR Electronics, Inc.
Beacon Model Name	RLB-41
Additional Beacon Model Names	GlobalFix ™ V4

Beacon Type and Operational Configurations

Beacon Type	**Beacon used while:**	**Tick where appropriate**
EPIRB Float Free	Floating in water or on deck or in a safety raft	X
EPIRB Non-Float Free (automatic and manual activation)	Floating in water or on deck or in a safety raft	
EPIRB Non-Float Free (manual activation only)	Floating in water or on deck or in a safety raft	
EPIRB Float Free with VDR	Floating in water or on deck or in a safety raft	
PLB	On ground and above ground	
	On ground and above ground and floating in water	
ELT Survival	On ground and above ground	
	On ground and above ground and floating in water	
ELT Auto Fixed	Fixed ELT with aircraft external antenna	
ELT Auto Portable	In aircraft with an external antenna	
	On ground, above ground, or in a safety raft with an integrated antenna	
ELT Auto Deployable	Deployable ELT with attached antenna	
Other (specify)		

Beacon Characteristics

Characteristic	Specification
Operating frequency	406.040 MHz 121.5 MHz
Operating temperature range	Tmin = -20 °C Tmax= 55°C
Temperature, at which minimum duration of continuous operation is expected	-20 °C
Operating lifetime	48 hours for 121.5 MHZ and 406 MHz
Beacon power supply type (internal non-rechargeable, internal re-chargeable, external, combined, other)	Internal
External power supply parameters (AC/DC and nominal voltage)	N/A
Is external power supply needed to energise the beacon or its ancillary devices in any of operational modes (N/A or Yes or No)	No
Battery cell chemistry	LiMnO2
Battery cell model name, cell size, number of cells in a battery pack, and details of the battery pack electrical configuration	CR-123A, 2/3A size, 3 battery packs, 3 cells each
Battery cell manufacturer	Panasonic
Battery pack manufacturer and part number	ACR pack P/N: A3-06-2865 ACR cell P/N: A1-13-0118 Panasonic cell P/N: CR-123A
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	0.25 years
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	10 years
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	RAKON Ltd, (Made in New Zealand)
Oscillator model name/ part number	RAKON P/N 5344LF, ACR P/N A1-11-0940
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integral
Antenna manufacturer	ACR Electronics, Inc.
Antenna part name and part number	Antenna Assy RLB's, P/N A3-06-2554
Antenna cable assembly min/max RF- losses at 406 MHz, if applicable	N/A
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime	Yes

Characteristic	Specification
resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	Yes
Features in beacon that ensure erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes
Encoded position update capability (Yes, No, N/A) and	Yes
Encoded position update interval value (range)	20 min to 4 hours
For Internal Navigation Devices	
– Geodetic reference system (WGS 84 or GTRF)	WGS 84
– GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes
– Navigation device manufacturer	GlobalTop Tech Inc.
– Navigation device model name and part Number	ACR P/N: A1-11-0877-1 GlobalTop P/N: gms-hpr
– Internal navigation device antenna type(integrated, internal, external, passive/active) , manufacturer and model	Integrated in A1-11-0877-1
– GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS
For External Navigation Devices	
– Data protocol for GNSS receiver to beacon interface	N/A
– Physical interface for beacon to navigation device	N/A
– Electrical interface for beacon to navigation device	N/A
– Part number of the external navigation interface device (if applicable)	N/A
– Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A

Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-test Mode
– Activated by a separate switch/ separate switch position (Yes or No)	Yes	Yes
– Self-test/GNSS self-test mode switch automatically returns to normal position when released (Yes or No)	Yes	Yes
– Self-test/ GNSS self-test activation can cause an operational mode transmission (Yes or No)	No	No
– Results in transmission of a single self-test burst only, regardless of how long the self-test activation mechanism is applied (Yes or No)	Yes	Yes
– Results of self-test/ GNSS self-test are indicated by (provide details, e.g. Pass / Fail indicator light, strobe light, etc.)	Refer to Operating Manual	Refer to Operating Manual
– The content of the encoded position data fields of the self-test message has default values	Yes	Yes if NO GNSS found. No if GNSS found
– Performs an internal check and indicates that RF-power is being emitted at 406 MHz and 121.5 MHz, if beacon includes a 121.5 Hz homer (Yes or No)	Yes	No
– Self-test results in transmission of a signal other than at 406 MHz (Yes & details or No)	Yes 121.5 MHz	No
– Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
– List of Items checked by self-test	See Note 1	See Note 1
– Self-test/ GNSS self-test 406 MHz burst duration (440 or 520 ms)	440 ms	520 ms
– Self-test message length format flag in bit 25, ("0" or "1")	1	1
– Maximum duration of a self-test mode, sec	11 Seconds	132 Seconds
– Maximum recommended number of self-tests during battery pack replacement period	120	84
– Distinct indication of self-test start (Yes or No)	Yes	Yes
– Indication of self-test results(Yes or No)	Yes	Yes
– Distinct indication of insufficient battery capacity (Yes or No)	Yes	No
– Automatic termination of self-test mode immediately after completion of the self-test cycle (Yes or No)	Yes	Yes
– Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	84

Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-test Mode
– GNSS Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	N/A	Yes
– Maximum number of self-tests during battery pack replacement period	120	84
– Self-test/ GNSS self-test can be activated from beacon remote activation points (Yes & details or No)	N/A	N/A
– List all methods of Self-test mode and GNSS Self-test modes activation. Provide details on a separate sheet to describe	Switch at EPIRB Activated less than 2 s	Switch at EPIRB Activated more than 5 s

NOTE 1:

First pass/fail indication:
- Beacon will check Battery Capacity monitor.
- Beacon will check for previous emergency activations.

Second pass/fail indication:
- Beacon will test that the PLL locks.
- Beacon will test that 406 MHz RF power is present during a 406 MHz transmission.
- Beacon will test battery voltage during a 406 MHz transmission.
- Beacon will test that 121.5 MHz RF power is present during a 121.5 MHz transmission.

Third pass/fail indication:
- Beacon will check the code checksum.
- Beacon will check the serialization of the current (ACR or POS) 406 message checksum.
- Beacon will check for GPS module communication.

Message Coding Protocols:	(x)	Tick the boxes below against the intended protocol options
User Protocol (tick where appropriate)		Maritime with MMSI
		Maritime with Radio Call Sign
		EPIRB Float Free with Serial Number
		EPIRB Non Float Free with Serial Number
		Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number
		National (Short Message Format)
		National (Long Message Format)
Standard Location Protocol (tick where appropriate)	X	EPIRB with MMSI
	X	EPIRB with Serial Number
		ELT with 24-bit Address
		ELT with Aircraft Operator Designator
		ELT with Serial Number
		PLB with Serial Number
National Location Protocol (tick where appropriate)	X	National Location: EPIRB
		National Location: ELT
		National Location: PLB

RLS Location Protocol (tick where appropriate) [1]		EPIRB
		ELT
		PLB
User Location Protocol (tick where appropriate)	X	Maritime with MMSI
	X	Maritime with Radio Call Sign
	X	EPIRB Float Free with Serial Number
	X	EPIRB Non Float Free with Serial Number
	X	Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number
Beacon includes a homer transmitter(s) (Yes or No) - homer transmitter(s) frequency - homer transmitter(s) power		Yes 121.5 MHz 17 - 22 dBm EIRP
□ homer transmitter(s) duty cycle □ duty cycle of homer swept tone		96 % 33 %
Beacon includes a high intensity flashing light (e.g. Strobe)		Yes
- light intensity		>0.75 cd
- flash rate		20 flashes per minute
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)		Yes
Other ancillary devices (e.g. voice transceiver, remote control, external audio and light indicators, external activation device). List details on a separate sheet if insufficient space to describe.		N/A
Beacon includes automatic activation mechanism (Yes or No). Specify type of automatic beacon activation mechanism		Yes. Automatic activation occurs when water makes contact across water sensors when not in bracket
Beacon includes features and functions not listed above, related or non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space		No

1 RLS protocols will be effective as of 1 November 2015. The use of RLS-enabled beacons will be regulated by national administrations.

Beacon model hardware part number (P/N) and version	A3-06-2862, Rev B
Beacon model software/firmware P/N, version, date of issue/releases	K3-01-0122, Version B, Release 10/15/2014
Beacon model printed circuit board P/N and version	A3-07-0413 Rev G
Known non-compliances with C/S T.001 requirements(Yes or No) If Yes, provide details (or use a separate sheet if insufficient space)	No
Beacon Manufacturer Point of Contact (POC) for this Type Approval application:	Name and Job Title: Mr. Dan Stankovic, Director of Certification and Test. Phone: 954-981-3333 X 2175 E-mail: dan.stankovic@acrartex.com

Dated:.07/10/2015..... Signed: Dan Stankovic, Director of Certification and Test

(Continued on Next Page)

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a ACR Electronics, Inc. RLB-41 as shown in the photograph below. 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 were configured so that the antenna port was connected to the 50Ω test system using a coaxial cable. This EUT, S/N: 015 (TUV Ref TSR058) was used for tests where the specification required a Functional Check and a Functional Test.

A second EUT, S/N: 009 (TUV Ref TSR064) 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 required.

A third EUT, S/N: 026 (TUV Ref TSR051) was a fully packaged beacon, similar to the proposed production beacons equipped with its proper antenna. This EUT was used for the Compass Safe Distance test.

A fourth EUT, S/N: 020 (TUV Ref TSR036) was a fully packaged beacon, similar to the proposed production beacons equipped with its proper antenna. This EUT was used for the Corrosion test.

Where immersion into water was required the radiated sample (S/N: 009 (TUV Ref TSR064)) 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). It was also omitted from the drop onto hard surface test to avoid damage to the conducted ports.

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

1.4.3 Modes of Operation

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

Off/Standby Mode
- Main activation button to “OFF” position

Self-test
- Depress Self-test activation button for 2 seconds
- List of items checked as per Customer Supplied Information (Application Form)

Long/GPS/GNSS Self-test
- Depress Self-test activation button for 6 seconds
- List of items checked as per Customer Supplied Information (Application Form)
- Navigation data applied as applicable (e.g. none applied for timeout, data applied for ‘fast acquisition’)

Operating
- Depress Main activation button
- 121 Homer active and offset
- GPS operating in normal duty cycle for the following navigation input conditions Note1
- No navigation data applied

Note 1: The manufacturer has declared that the GPS receiver operates as follows:

GPS On/Off Cycle:
The following schedule is followed until an initial valid GPS location is encoded into the beacon message:
- For the first 60 minutes, the GPS is turned on for 10 minutes once every 20 minutes.
- For the next 60 minutes, the GPS is turned on for 5 minutes once every 15 minutes.

If a valid location fix is obtained during either of the above GPS on times, the GPS is turned off immediately. The GPS is then turned on no less than 25 minutes and no more than 30 minutes from the time the GPS was previously turned on, then the GPS is then turned on and off according to the schedule below. If no valid fix was obtained during the above schedule, the schedule below is followed.

- For the next 6 hours the GPS is turned on once every 30 minutes and is on for a period of 5 minutes or until a valid location fix is obtained.
- For the next 18 hours the GPS is turned on once every 2 hours and is on for a period of 5 minutes or until a valid location fix is obtained.
- Until the battery end-of-life, the GPS is turned on once every 4 hours and is on for a period of 5 minutes or until a valid location fix is obtained.

1.4.4 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 121.325 MHz 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 MHz messages were monitored by Beacon tester. The 121.325 MHz homing signal was monitored with a spectrum analyser.

Throughout the test the LED flash rate was also observed using CCTV (radiated immunity) and directly (ESD). The magnitude of the 406.040 MHz signal was recorded on a signal analyser prior to the start of the test and then compared to the view trace for each burst.

At the end of the test the Beacon tester files were analysed for positional data accuracy and message consistency.

1.4.5 Performance Criteria for EMC tests (Acceptable Performance Limits)

In Active mode the EUT should continue to work correctly; the beacon should continue to transmit the 406.040 MHz and 121.5 MHz signals with no degradation of amplitude.

In Standby mode there should be no transmissions.

1.4.6 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 or test laboratory 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.

1.5 DEVIATIONS

A deviation from the standard was made during the vibration test. The Performance Check was only carried out at the end of the test, as required in the product specific standard.

1.6 WAIVER REQUESTS

Waiver requests have been provided for Solar Radiation (2.10) and Oil Resistance (2.11). See Annex A: Customer Supplied Information.

1.7 MODIFICATIONS

No modifications were made to the samples under test during the test campaign.

1.8 REPORT MODIFICATION RECORD

Issue 1 – First Issue
Issue 1 – Additional information added to section 2.7.

SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
ACR Electronics, Inc.
RLB-41

2.1 OPERATIONAL CHECKS, EQUIPMENT MANUALS, MARKING AND IDENTIFICATION (NUA)

2.1.1 Specification Reference

IEC 60945, Clause 6, 14 and 15

2.1.2 Equipment Under Test and Modification State

RLB-41 S/N: #6 (TUV Ref TSR0066) - Modification State 0
User Manual: Y1-03-0280 (Rev T4 unless indicated otherwise below)
Labels: A1-20-1007JDASH
A1-20-1759D
A1-20-1760C
A1-20-1804A
A3-06-2862B
A3-06-2932ADASH

2.1.3 Date of Test

25 September 2015

2.1.4 Test Results

The RLB-41 Operating manual Issue and labels were 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.

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Sub clause	Statement	Comment
Clause 4.8 (14) Equipment Manuals		
(A.694/8.3)	Adequate information shall be provided to enable the equipment to be properly operated and maintained by suitably qualified members of a ship's crew.	Details of installation, operation and maintenance are included within the operating manual. These details include, but not limited to: Mounting location (for manual and float free housings) Manual activation and deployment Manual activation without deployment (can be operated in housing) Maintenance
a)	Be written in English	The operating manual provided was in English.
b)	Identify the category of the equipment or units to which they refer (4.4);	The IEC 60945 equipment category (Portable) is identified in the operating manual (Rev T4 as supplied 16 October 2015).
c)	In the case of equipment so designed that fault diagnosis and repair down to component level are practicable, provide full circuit diagrams, component layouts and a component parts list;	The EUT is not designed to be fault diagnosed or repaired down to component level. The following warning is presented in the operating manual: **NOTE:** The beacon contains no user replaceable items other than the battery. Any other service issues must be handled by ACR or an authorized Battery Replacement Center.
d)	In the case of equipment containing complex modules in which fault diagnosis and repair down to component level are not practicable, contain sufficient information to enable a defective complex module to be located, identified and replaced. Other modules and those discrete components which do not form part of modules shall also meet the requirements of 4.8 c) above.	The EUT is a single unit (other than the battery pack which is user replaceable) and as such does not have complex modules which can be located, identified or replaced.
	Moreover adequate information shall be provided to allow equipment to be installed so that it operates in accordance with the requirements of the relevant equipment standard, taking into account limitations imposed by the operation of other equipment also required to be installed on the bridge.	The operating manual does not include any installation information relating to other equipment. Compass safe distance value is included in the operating manual (Rev T4 as supplied 16 October 2015).

Clause 4.9 (15) Marking and identification		
(A.694/9)	*Each unit of the equipment* shall *be marked externally with the following information which,* where practicable, shall *be clearly visible in the normal installed position:* *1) identification of the manufacturer;* *2) equipment type number or model identification under which it was type tested; and* *3) serial number of the unit.*	The label details were reviewed and the following observations made: The identification of the manufacturer is presented on the label. The equipment model (RLB-41) is presented on the EUT / a field is reserved (depending on the specific label required). A specific field is reserved for the UIN on the label.
	Alternatively, the marking may be presented on a display at equipment start-up.	Not applicable to this device.
	The equipment shall be marked either before delivery to the ship, or on the ship at the time of installation.	The manufacturer advises that all labelling is affixed prior to shipment from the factory.
	The title and version of each software element included in the installed software system shall be either marked or displayed on command on the equipment.	Not applicable to this device.
	When the marking and the title and version of the software are displayed only on the display, such information shall also be included in the equipment manual. Marking requirements for compass safe distance are given in 4.5.3.	Not applicable to this device. The compass safe distance value is presented on the product label.
6.1.1	A check shall be made that all modes of operation required by the equipment standard are available, and that they may be controlled over the required range. Use shall be made of every position of every control provided to ensure that it performs the function for which it is identified and that it operates in the expected manner.	The RLB-41 has an Activation and one test button; these buttons are membrane push buttons and are easily operated in accordance with the instructions in the user manual.

Clause 6.1.2 (4.2.1.2) Arrangement		
a)	The number of operational controls, their design and manner of function, location, arrangement and size shall provide for simple, quick and effective operation. Controls shall be arranged in functional groups. The layout of function keys shall be compatible with their importance, for example keys for emergency functions should have a prominent position, distinctive appearance and be dedicated to their function.	The EUT has an Activation and one test button; these buttons are membrane push buttons and are easily operated in accordance with the instructions in the user manual. The Activation button also de activates the EUT. The Test button initiates the self test routine. Labels on the EUT advise how to activate and run the self test. The size and shape of the activation switch is adequate and appropriate
b)	Check that the shape and size of each control is appropriate to its mode of operation…	The Activation button is red in colour and uses a familiar power symbol. The Test button is yellow and uses a capital T to denote it.
c)	In the case of touch screens check that the dimension of the response area for a push to activate operation is a minimum of 15 mm height and width and the force required for operation is a maximum of 1,5 N where applicable.	Not applicable to this device.
d)	Check that information presentation is suited to the maximum expected rate of change of information, for example analogue presentation is sometimes more suited to rapid change than digital.	Not applicable to this device.
e)	Check that rotating controls and indicators turn clockwise for increased value or effect.	Not applicable to this device.
f)	Check that linear controls and indicators move upwards or to the right for increased value or effect.	Not applicable to this device.
g)	Check that where users must rapidly discern directional change, digital displays are provided with indications of directions of change	Not applicable to this device.
h)	Check that equipment elements relating to control, and indicators associated with control, are readily distinguishable from elements provided for other functions, such as equipment set-up.	Not applicable to this device.

Clause 6.1.3 (4.2.1.3) Operation		
a)	Check that all operational controls permit normal adjustments to be easily performed, and are arranged in a manner which minimizes the chance of inadvertent operation. Check that controls not required for normal operation and which may affect performance are not readily accessible.	The EUT has two buttons, one for Activation and one for Test. The Activation switch is designed to protect against inadvertent operation as there is a protective cover and two independent steps are required to activate the beacon. A protective witness seal is also provided.
b)	Check all operational controls and indications for ease of use and correctness, and for general suitability related to their function and environment, for example expected ambient illumination and sound.	The EUT has an Activation and one Test button; these buttons are membrane push buttons and are easily operated in accordance with the instructions in the user manual. The Activation button also de activates the EUT. The Test button initiates the self test routine. The EUT also includes red and green LED's and a strobe light which illuminate during test and activation. The operating manual gives clear explanations relating the LED flash sequences.
c)	Check that the operation of a control does not cause obscuration of its related indicator where observation of the indicator is necessary for making the adjustment.	The Activation button is adjacent to the LED indicators. Once activated the user is not required to hold the Activation button and is therefore free to view the LEDs.
d)	Check that in all operations there is a clearly marked or consistent simple action to recover from a mistaken choice or to leave an unwanted state. Check that it is always possible for a user to start, interrupt, resume and end an operation.	The Activation button is also the deactivation button. Should the EUT be switched on inadvertently, the user is able to switch it off again.
Clause 6.1.4 (4.2.1.4) Identification		
a)	Check that all operational controls and indicators are easy to identify and read from the position where the equipment is normally operated.	The Activation switch is easy to identify; it is red and utilises a familiar power symbol. The Test button utilises a large capital letter T.
b)	Check that instrument and indicator character type is simple and clear. The character height (mm) shall be not less than 3,5 times the reading distance in metres, and the nominal character width shall be 0,7 times the character height. Check that instruments meant to be operated, or fitted in connection with controls are readable from a distance of at least 1 m, and that other instruments are readable from a distance of at least 2 m.	Not applicable to this device.
c)	Check that the controls and indicators are identified in English, and that the identifications provided in the equipment standard are used.	Not applicable to this device.
d)	Check that indicators are satisfactorily positioned relative to the operator's line of sight, and are not obscured when operating associated controls under normal operating conditions.	Not applicable to this device.

Clause 6.1.5 (4.2.1.5) Screen Display and Indicators		
a)-t)	The clauses in this section relate to display equipment and are therefore not applicable to this device.	Not applicable to this device.
Clause 6.1.6 (4.2.1.6) Voice announcement		
a)-d)	The clauses in this section relate to display equipment and are therefore not applicable to this device.	Not applicable to this device.
Clause 6.1.7 Safety of Operation		
a)	Check that the system attempts to prevent ascertainable user-action error from occurring.	Not applicable to this device.
b)	Check that all actions that may be irreversible require a confirmation before proceeding.	Not applicable to this device.
c)	Check that when an action causes a detectable error the system gives clear feedback such as by including UNDO and/or REDO options where possible.	Not applicable to this device.
d)	Check that the EUT makes use of any quality indication contained in the input from other systems or sources.	Not applicable to this device.
e)	Check that the user has available means to return to a known safe state with a single action.	The user can easily deactivate the RLB-41, in the event of mistaken activation.
Clause 6.1.8 (4.2.1.8) Distress Alert		
a)	Check that a distress alert is only activated by means of a dedicated distress button, and that it is not a key of an ITU-T digital input panel, or of an ISO keyboard on the equipment. Check that the button is physically separated from functional buttons/keys used for normal operation. Check that the button is a single button used for no other purpose than to initiate a distress alert.	The EUT has one Activation button and one Test button, there are no other controls on the EUT.
b)	Check that the dedicated distress button is clearly identified by being red in colour and marked “DISTRESS”. Where a non-transparent protective lid or cover is used check that this is also marked “DISTRESS”.	The activation button is red in colour, but not marked ‘DISTRESS’,
c)	Check that the dedicated distress button is protected against inadvertent operation by means of a spring loaded lid. Check that it is not necessary for a user to remove additional seals or to break the lid or cover in order to operate the distress button.	The Activation switch is designed to protect against inadvertent operation as there is a protective cover which needs to be pushed to the side. A protective witness seal is also provided as required by the equipment standard.
d)	Check that the distress alert initiation requires at least two independent actions. Lifting the protective lid or cover is considered as the first action. Pressing the distress button is considered as the second independent action.	The user must slide the protection cover before depressing the Activation button. A ‘witness tab’ is broken on first sliding of the protection cover.
e)	Check that the equipment indicates the status of a distress alert transmission. Check that when the distress button is pressed a flashing light and intermittent acoustic signal start immediately & after being pressed for at least 3 s, the distress alert transmission is initiated and the indication steady.	The EUT emits a single audible tone when activated. Indicator LED’s and a strobe light flash at regular interval after activation, and a short audible tone sounds when a transmission occurs.

Clause 6.1.8 (4.2.1.8) Distress Alert Cont.		
f)	Check that it is not possible to interrupt the transmission of a distress alert or distress message which is in progress, but that it is possible to interrupt repetitive transmissions of a distress message.	The EUT can be deactivated at any point after activation.
Clause 6.2.1 (4.2.2.1) Hardware General		
a)	Check that provision has been made for the removal of, or for blocking off, the position of controls of any optional facilities which are not fitted.	The EUT has no controls other than the Activation and Test buttons.
b)	Check that operational controls, the inadvertent exercise of which could switch off the equipment, lead to performance degradation, or to false indications not obvious to the operator, are specially protected against unintentional operation.	Deactivation of the EUT is only possible when the Activation button is depressed and held for a period of time. The protective cover can be switched back across the Activation button to prevent inadvertent Activation or deactivation. The buttons are also recessed.
c)	Check that the design of the EUT is such that misuse of the controls required for normal operation, and which are accessible to the operator, shall not cause damage to the equipment or injury to personnel.	It would not be very easy to use any control to cause damage.
d)	Check that where a digital input panel with the digits “0” to “9” is provided, the digits are arranged to conform with ITU-T Recommendation E.161 (4x3 array) or, alternatively, where an alpha-numeric keyboard layout, as used on office machinery and data processing equipment, is provided, the digits “0” to “9” are arranged to conform with ISO 3791.	No digital input panel. Not applicable to this device.
Clause 6.2.2 (4.2.2.2) Alarms and Indicators		
a)	Check that the EUT is provided with facilities which permit the testing of all operational indicators (alarm, warning and routine), displays and audible devices. Check audible alarms as described in 11.1.	The RLB-41 has a self-test mode, where all aspects of the device can be tested, and checked against the requirements of the user manual. A LED sequence is provided to confirm the result
b)	Check that alarm indications are red, or if on displays, red or otherwise highlighted.	Not applicable to this device.
c)	Check that warning and alarm indications show no self-illumination, except to outline the alarm area on CRT or LCD displays, in the “safe” condition, and that any indirect illumination is low enough to avoid false indications.	Not applicable to this device.
Clause 6.2.3 (4.2.2.3) Illumination		
a)	Check that any illumination provided in the EUT is adequate for operation of the equipment under all expected conditions of ambient illumination. Check that it can be adjusted for night use so that the night vision of the officer of the watch is not harmed by it.	Not applicable to this device.
b)	Check that means are provided for dimming the output of any light source of the equipment which is capable of interfering with navigation.	Not applicable to this device.
c)	Check that any external illumination required is clearly identified in the equipment manual.	Not applicable to this device.
d)	Check that warning and alarm indicator lamps cannot be dimmed below reading intensity.	Not applicable to this device.

Clause 6.2.3 (4.2.2.3) Illumination Cont.		
e)	Check that the illumination is dazzle-free and adjustable to extinction, except for those warning and alarm indicators which are illuminated in the warning/alarm condition, and indicators required for equipment reactivation or distress alerting, which are to be clearly visible in all appropriate conditions of ambient illumination.	Not applicable to this device.
f)	Check that controls which are not illuminated, such as tracker balls, are locatable easily and unambiguously by tactile means.	Not applicable to this device.
g)	Check that all information is presented with high contrast on a low-reflectance background which emits negligible light at night.	Not applicable to this device.
h)	Check that transparent covers to instruments cannot cause reflections which reduce readability to an unacceptable level.	Not applicable to this device.
i)	Check that adjustable dimming from full brightness is provided for all lamps which are to be used in conditions of varying ambient illumination.	Not applicable to this device.
Clause 6.3 (4.2.3.1) Software, General		
6.3.1	The code of practice employed in the design and testing of the software integral to the operation of the equipment under test shall be specified and conform to a quality control system audited by a competent authority…. The manufacturer shall supply documentation demonstrating that the software of the EUT is developed and tested according to the code of practice and the requirements of 4.2.3 e.g. by block, data flow or status diagram.	ACR advise that document Y1-10-0112-41B addresses this requirement.
Clause 6.3.2 (4.2.3.2) Safety of Operation		
a)	Check documentation for compliance with 4.2.3.2.	Not applicable to this device.
b)	Check that software defaults, where applicable, are inserted in all modes of operation and that the default value: – facilitates the preferred or expected operation of the equipment in accordance with the applicable equipment standards – does not lead to an unexpected or invalid operation, and – has the effect of minimising the number of inputs or transmissions into the system under which it operates.	Not applicable to this device.
c)	Check that the software prevents an operation or warns an operator when attempting an input that leads to an invalid operation of the equipment.	Not applicable to this device.
d)	Check that the operator has the possibility to choose a value other than the default value.	Not applicable to this device.
e)	Check that operations not required for normal operation, or which may adversely affect system performance, are not readily accessible.	Not applicable to this device.

Clause 6.3.3 (4.2.3.3) Monitoring		
6.3.3	Check documentation for compliance with 4.2.3.3. The manufacturer shall provide information on how to produce a non-recoverable error. Carry out the non-automatically recoverable error according to the above information. Check that the alarm can be recognized as noted in the manufacturers documentation. NOTE This test can be waived if the manufacturer gives a written explanation of how the equipment watchdog operates and a written declaration is given to the test-house of how this function works and that the behaviour of the watchdog complies with the noted requirements.	ACR advise that document Y1-10-0112-41B addresses this requirement.
Clause 6.3.4 Operation		
6.3.4	Check documentation for compliance with 4.2.3.4. (The system may allow function keys to speed up selection of common sequences.)	Not applicable to this device.
Clause 6.4 (4.2.4) Inter-unit Connection		
a)	Check with the manufacturer of the EUT, using equipment documentation if necessary, that when it is connected to, and operating with, other units of equipment, arrangements have been provided to maintain the performance of the EUT and of the other units.	Not applicable to this device.
b)	Check that the software interfaces between the EUT and other equipment are tested, and that special test software is provided for this purpose if necessary;	Not applicable to this device.
c)	Ensure that arrangements have been made to achieve electrical separation and isolation between the EUT and the equipment to which it may be connected, if appropriate, such as by checking that: 1) an exchange of any signals between units is carried out with minimum effect on the signal source; 2) there is no loading of circuits or mismatch of transmission lines, particularly on high frequency or fast-rise time signals; 3) a capability exists of sustaining a 1 kV isolation between units of equipment.	Not applicable to this device.

2.2 PRETEST CHECKS

2.2.1 Specification Reference

IEC 60945, Clause 8.1

2.2.2 Equipment Under Test and Modification State

RLB-41 S/N: #15 (TUV Ref TSR0058) - Modification State 0
RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.2.3 Date of Test

30 March 2015

2.2.4 Test Equipment Used

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

2.2.5 Environmental Conditions

Ambient Temperature 22.4.0°C
Relative Humidity 48.1.0%

2.2.6 Test Results

Visual Inspection

Prior to the start of the testing schedule the EUT was visually inspected. No signs of damage were found.

Performance Check

A Performance Check was conducted to ensure that the EUT was functional before all upcoming tests.

Summary of Performance Check Results

RLB-41 S/N: #15 (TUV Ref TSR0058)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.0400
121 MHz Presence	Pass

Summary of Performance Check Results

RLB-41 S/N: #9 (TUV Ref TSR0064)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.0400
121 MHz Presence	Pass

2.3 DRY HEAT TESTS

2.3.1 Specification Reference

IEC 60945, Clause 8.2

2.3.2 Equipment Under Test and Modification State

RLB-41 S/N: #15 (TUV Ref TSR0058) - Modification State 0
RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.3.3 Date of Test

30 March 2015, 31 March 2015, 07 April 2015 and 08 April 2015

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: 20.5 - 23.2 °C
Relative Humidity: 23.4 - 31.3 %

2.3.6 Test Setup

2.3.7 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 approximately 12 hours, the temperature was returned to ambient conditions. The EUTs were subjected to a performance check at the end of the test.

Functional Test

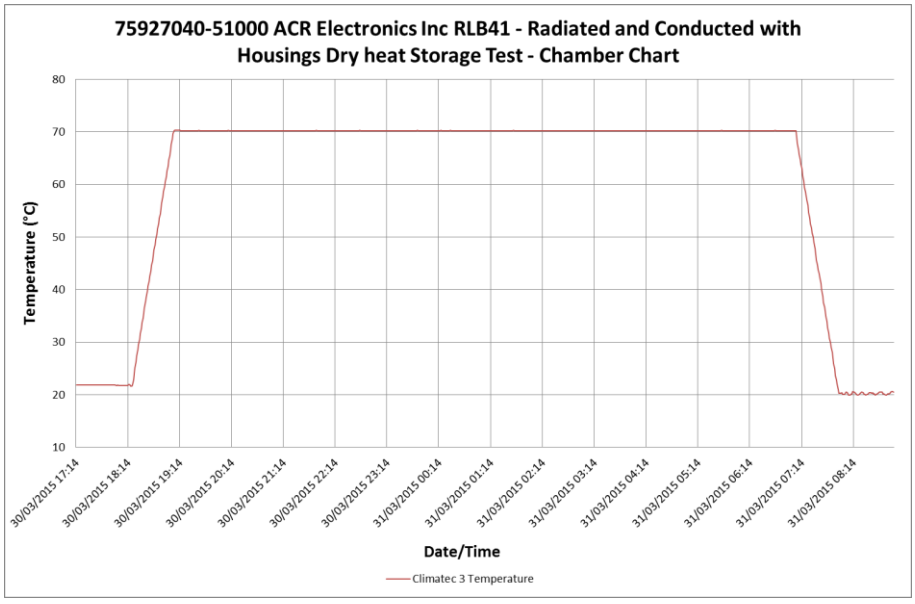
The EUTs were switched on, and placed in a climatic chamber where the temperature was increased from ambient temperature to +55°C. The conditions remained for a period of approximately 17 hours. Towards the end of this period the EUTs were subjected to a performance check and performance test. At the end of the test, the temperature was returned to laboratory ambient conditions.

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

2.3.8 Test Results

Storage Test

Temperature Plot



Post-Storage Period Performance Check

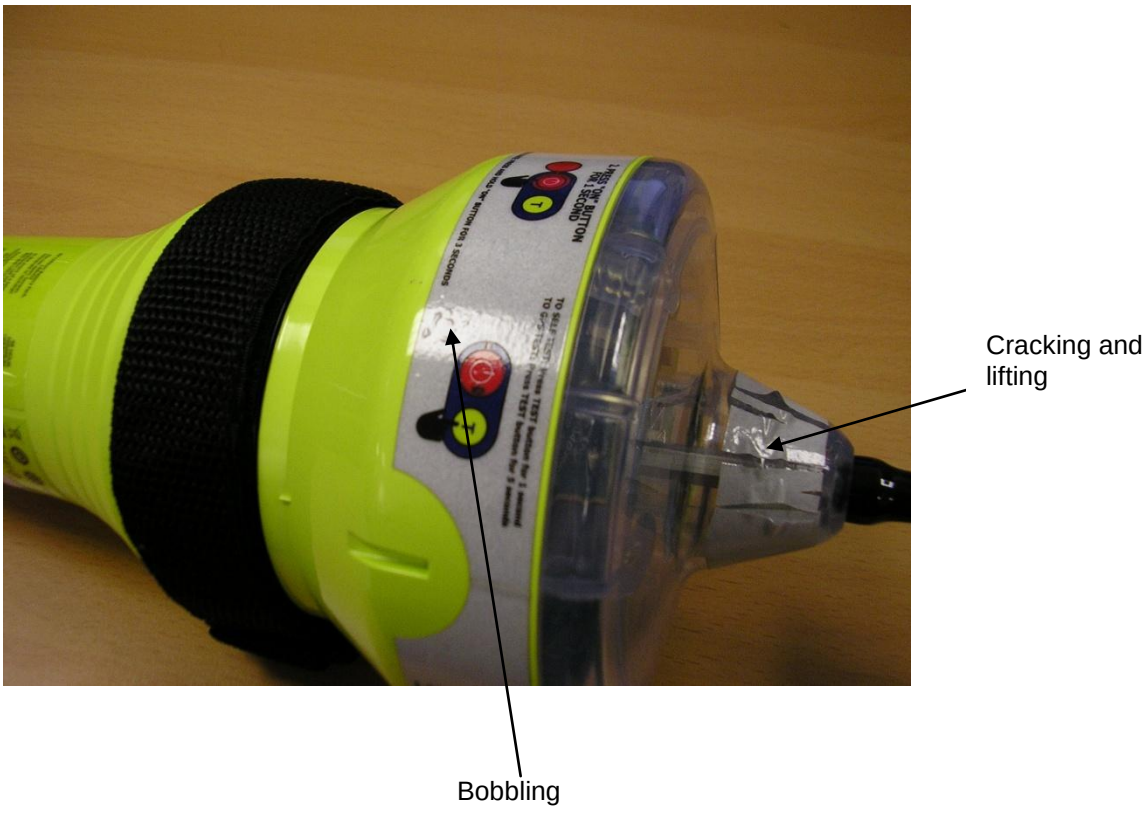
RLB-41 S/N: #15 (TUV Ref TSR0058)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039988
121 MHz Presence	Pass

RLB-41 S/N: #9 (TUV Ref TSR0064)

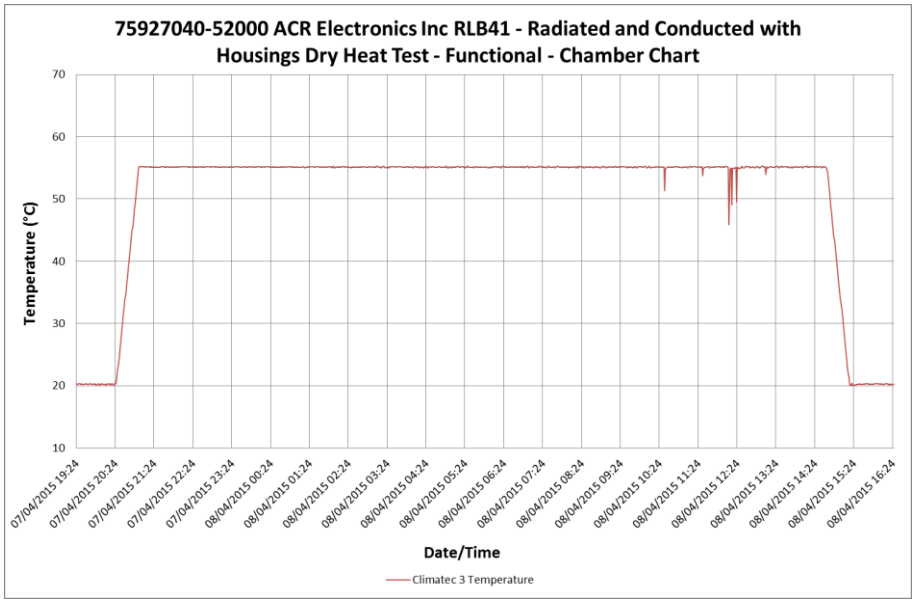
Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039983
121 MHz Presence	Pass

Observation: it was noted after the 12 hour storage period there was some damage to the labels including cracking, lifting and bobbling as indicated below:



Functional Test

Temperature Plot

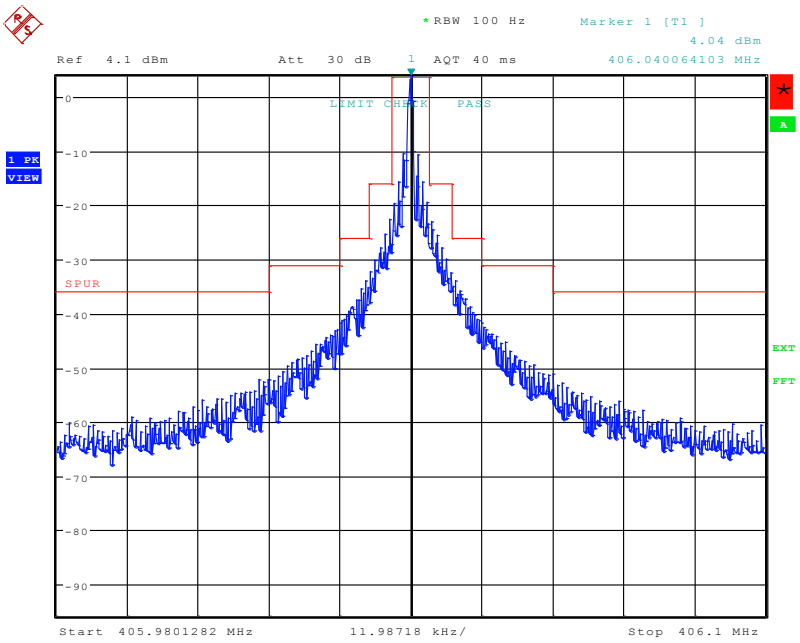


During Functional Period Performance Test

RLB-41 S/N: #15 (TUV Ref TSR0058)

Parameter	Result (Max / Min)
Output Power	37.67 / 37.66
Digital Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
Bit Rate	399.93 / 399.91
Modulation: Rise Time (uS)	190.3 / 166.3
Modulation: Fall Time (uS)	191.7 / 163.6
Positive Deviation (rad)	1.1848 / 1.0136
Negative Deviation (rad)	-1.1860 / -1.0253
Nominal Frequency (MHz)	406.0399700 / 406.0399699
Short-term Stability (/100 ms)	12.465E-11 / 10.024E-11
Medium-term Stability – Slope (/minute)	25.992E-12 / 53.624E-13
Medium-term Stability – Residual	10.359E-11 / 81.644E-12
Spurious Emissions	See plot below

Spurious Emissions



Date: 8.APR.2015 11:31:08

Post-Functional Period Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.0401
121 MHz Presence	Pass

Post-test Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039974
121 MHz Presence	Pass

RLB-41 S/N: #9 (TUV Ref TSR0064)

Post-Functional Period Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.0400
121 MHz Presence	Pass

Post-test Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039981
121 MHz Presence	Pass

2.4 DAMP HEAT TEST

2.4.1 Specification Reference

IEC 60945, Clause 8.3

2.4.2 Equipment Under Test and Modification State

RLB-41 S/N: #15 (TUV Ref TSR0058) - Modification State 0
RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.4.3 Date of Test

08 April 2015 and 09 April 2015

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: 18.1 - 24.4 °C
Relative Humidity: 25.2 - 38.8 %

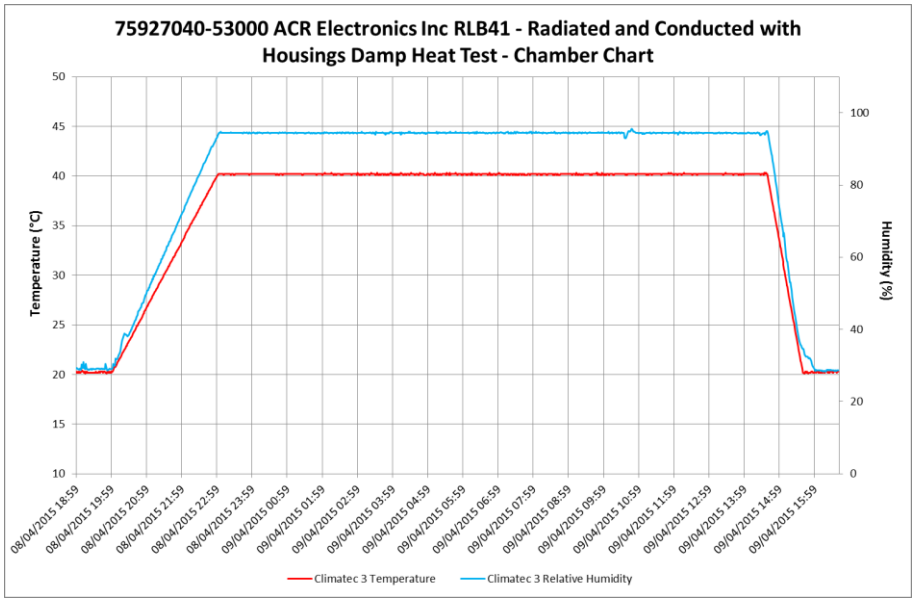
2.4.6 Test Setup

2.4.7 Test Method

The EUT was placed in a climatic chamber with the temperature increased to 40 °C and the relative humidity increased to 93 %. After 12 hours, the EUT was activated for at least 2 hours, during this period was subjected to a performance check.

2.4.8 Test Results

Temperature Plot



RLB-41 S/N: #15 (TUV Ref TSR0058)

Post-storage Period Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039962
121 MHz Presence	Pass

Post-test Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039968
121 MHz Presence	Pass

RLB-41 S/N: #9 (TUV Ref TSR0064)

Post-storage Period Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039964
121 MHz Presence	Pass

Post-test Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039982
121 MHz Presence	Pass

2.5 LOW TEMPERATURE TESTS

2.5.1 Specification Reference

IEC 60945, Clause 8.4

2.5.2 Equipment Under Test and Modification State

RLB-41 S/N: #15 (TUV Ref TSR0058) - Modification State 0
RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.5.3 Date of Test

09 April 2015 and 11 April 2015

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 19.0 - 22.2°C
Relative Humidity 32.2 – 33.7%

2.5.6 Test Setup

2.5.7 Test Method

Storage Test

The EUT was placed in a climatic chamber with the temperature reduced to -30°C. After 16 hours, the temperature was increased to ambient and the EUT was subjected to a performance check.

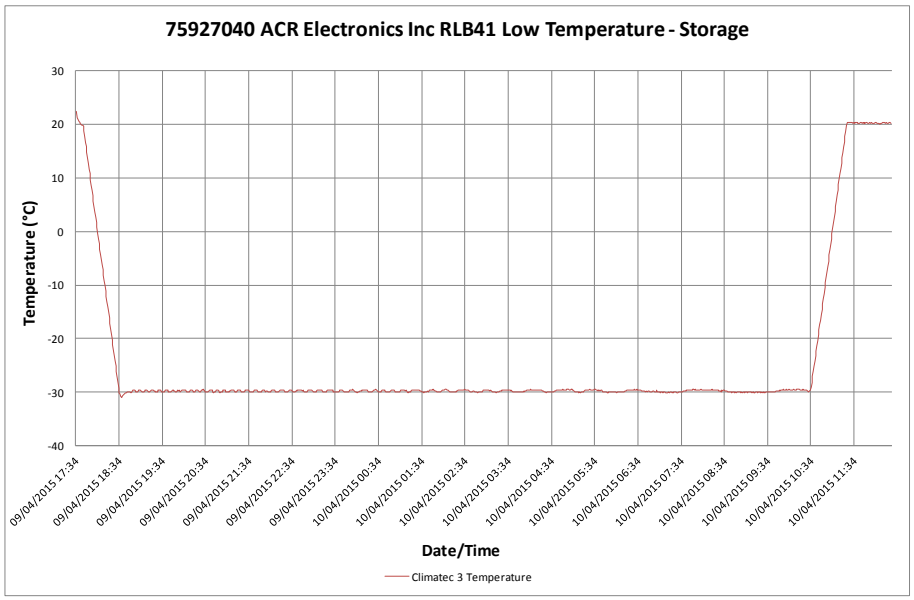
Functional Test

The EUT was placed in a climatic chamber with the temperature reduced to -20°C. After 14 hours, the EUT was activated for at least 2 hours and during this period was subjected to a performance check and performance test.

2.5.8 Test Results

Storage Test

Temperature Plot



Summary of Performance Check Results

S/N: #15 (TUV Ref TSR0058)

Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039967
121 MHz Presence	Pass

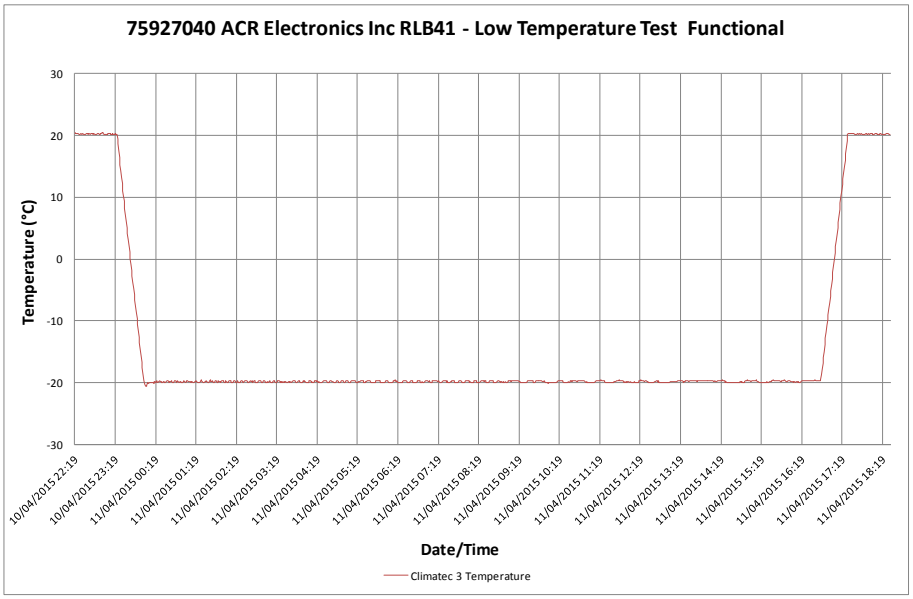
S/N: #9 (TUV Ref TSR0064)

Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039983
121 MHz Presence	Pass

Functional Test

Temperature Plot



S/N: #15 (TUV Ref TSR0058)

Performance Test

Parameter	Result (Max/Min)
Output Power	38.16 / 38.14
Digital Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
Bit Rate: (bps)	399.92 / 399.90
Modulation: Rise Time (uS)	199.4 / 171.3
Modulation: Fall Time (uS)	189.7 / 165.7
Positive Deviation (rad)	1.1850 / 1.0184
Negative Deviation (rad)	-1.2008* / -1.0427
Nominal Frequency (MHz)	406.0413324 / 406.0413233
Short-term Stability (/100ms)	17.602E-11 / 11.797E-11
Medium-term Stability – Slope (/minute)	28.537E-10 / 13.452E-11
Medium-term Stability – Residual Frequency Stability (no units)	38.591E-10 / 81.435E-11
Spurious Emissions	Pass

* Measurement within Test Facility Accuracy figure stated in T.008

Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.040041
121 MHz Presence	Pass

Performance Check

S/N: #9 (TUV Ref TSR0064)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.040033
121 MHz Presence	Pass

2.6 THERMAL SHOCK

2.6.1 Specification Reference

IEC 60945, Clause 8.5

2.6.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.6.3 Date of Test

11 May 2015

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 23.2 °C
Relative Humidity 46.6 %

2.6.6 Test Setup

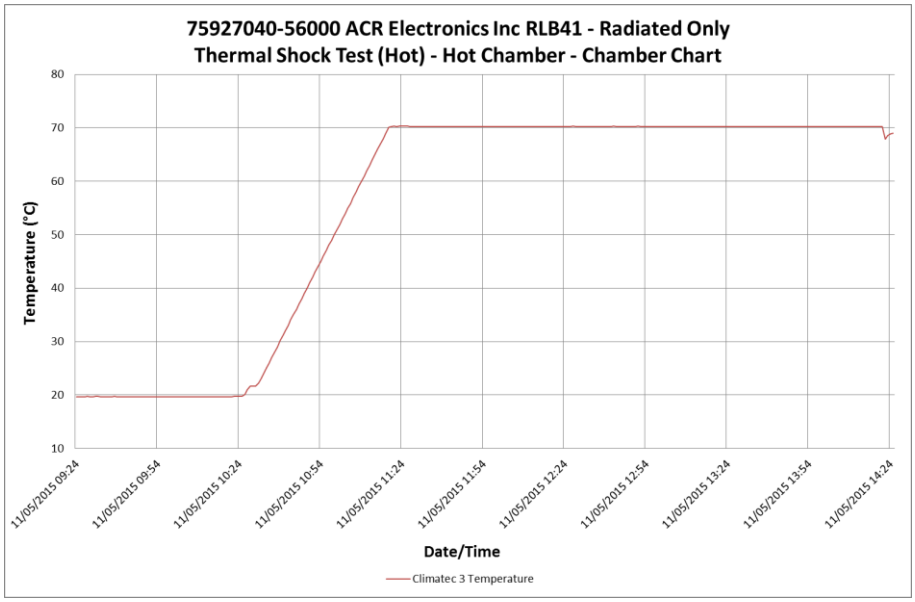
2.6.7 Test Method

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

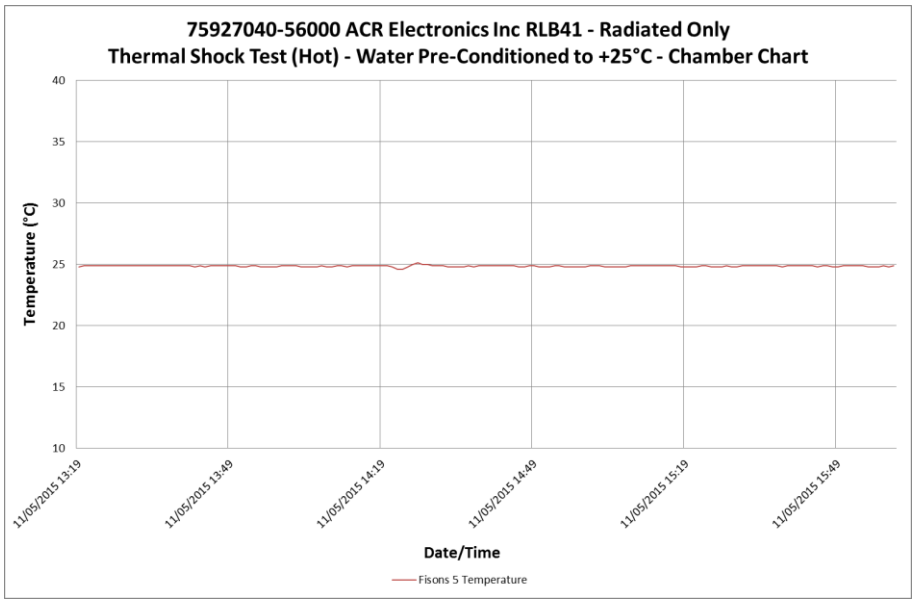
The EUT was then immersed in a water vessel (preconditioned for approximately 1 hour) at 25°C, at a level of 100mm below the surface of the water (measured to the highest point of the EUT).

2.6.8 Test Results

Preconditioning Temperature Plot



Water Temperature Plot



Performance Check

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message 406 MHz Frequency 121 MHz Presence	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C 406.0400 Pass

2.7 DROP TEST

2.7.1 Specification Reference

IEC 60945, Clause 8.6

2.7.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.7.3 Date of Test

27 April 2015

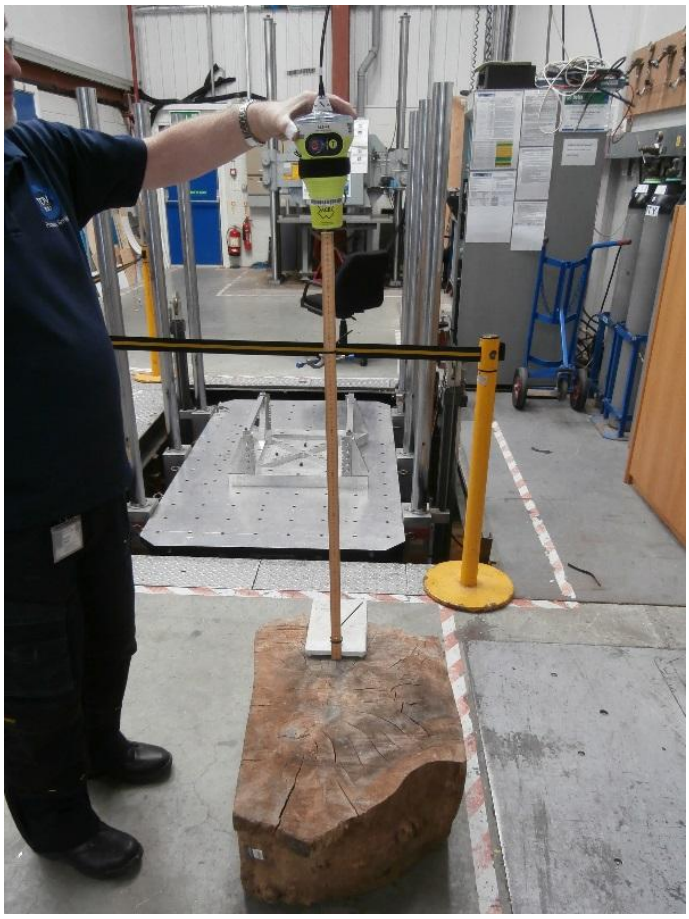
2.7.4 Test Equipment Used

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

2.7.5 Environmental Conditions

Ambient Temperature 21.5 °C
Relative Humidity 21.5 %

2.7.6 Test Setup



2.7.7 Test Method

The EUT was dropped 6 times, one on each face, from a height of 1000 mm ± 10 mm onto the test surface (solid piece of hardwood).

2.7.8 Test Results

EUT Response

The EUT did not activate during the test.

Performance Check – Post-test

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039958
121 MHz Presence	P

Observation: The EUT was subjected to an external visual examination post-test. The antenna was damaged as shown in the photograph below. It was considered that the damage 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 TUV SUD document 75927040 Report 3 section 2.13 and Annex A for test data.

The damage to the antenna's black sleeve above was noted to worsen (split) over the following 2 days as shown in the photograph below.

2.8 DROP TEST IN WATER (NUA)

2.8.1 Specification Reference

IEC 60945, Clause 8.6

2.8.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.8.3 Date of Test

30 April 2015

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 19.4 °C
Relative Humidity 34.9 %

2.8.6 Test Method

The EUT was dropped three times from a height of 20 m into water. The EUT was orientated once with the antenna vertically up, once vertically down, and once horizontally.

2.8.7 Test Results

Setup Photo

EUT Response

The EUT activated after each drop when contact with the water was made and deactivated shortly after being removed from the water.

Examination

The EUT was subjected to an external visual inspection post-test and no signs of ingress or external damage were observed.

Summary of Performance Check Results

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C06332E0227236F796A6B046
406 MHz Frequency	406.039961
121 MHz Presence	P

Message content indicates that a position was acquired. The Performance Check was carried out outdoors so the ambient signals were likely detected by the EUT.

2.9 VIBRATION TESTS

2.9.1 Specification Reference

IEC 60945, Clause 8.7

2.9.2 Equipment Under Test and Modification State

RLB-41 S/N: #15 (TUV Ref TSR0058) - Modification State 0
RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.9.3 Date of Test

21 April 2015 and 29 April 2015
23 September 2015

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 18.4 - 19.0°C
Relative Humidity 45.9 – 57.9%

2.9.6 Test Setup

2.9.7 Test Method

The EUT's were 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.

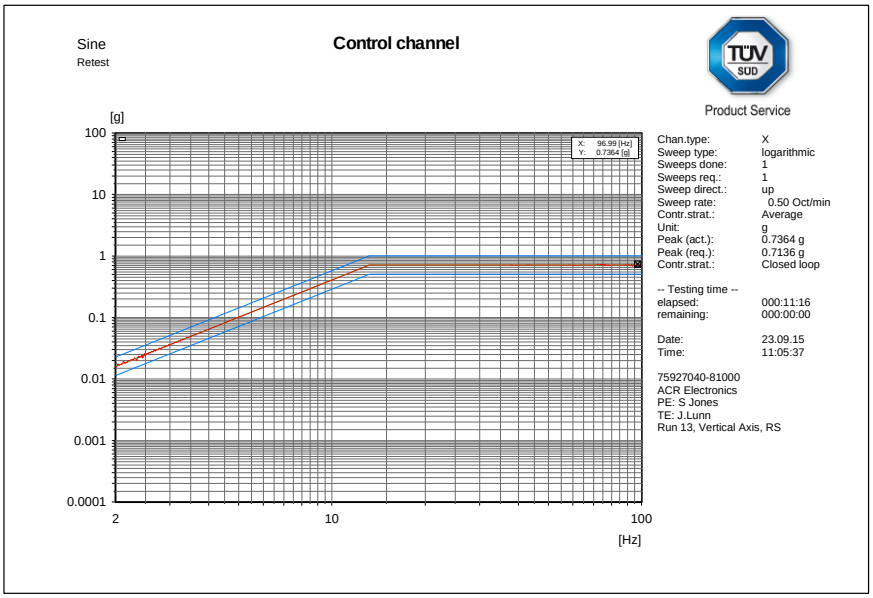
One sweep was performed at a rate of 0.5 octaves / minute.

The following resonant frequencies were found

Up and Down EUT in float free housing: 78.59 Hz
Side to Side EUT in float free housing: 81.97 Hz
Front and Back EUT in float free housing: 81.03 Hz
Up and Down EUT in manual release bracket: 48.37 Hz
Side to Side EUT in manual release bracket: 26.0 Hz
Front and Back EUT in manual release bracket: 39.33 Hz

Where a resonance frequency was found the EUT was subject to the 2 hour endurance run at that frequency. If not frequency was found the EUT endurance run was carried out at 30 Hz. At the end of the test, each EUT was subjected to a Performance Check.

Up and Down (Float Free Housing) Res Search – Control and EUT



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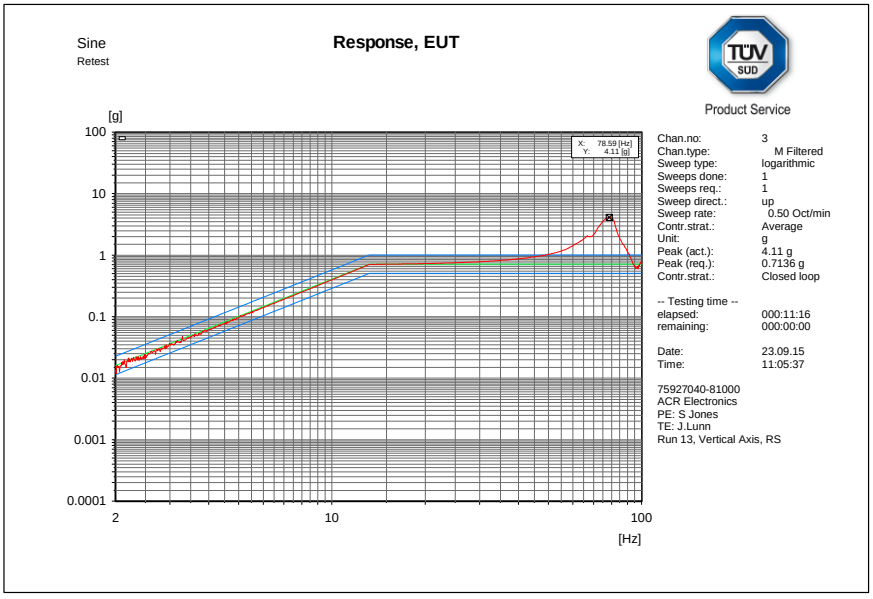

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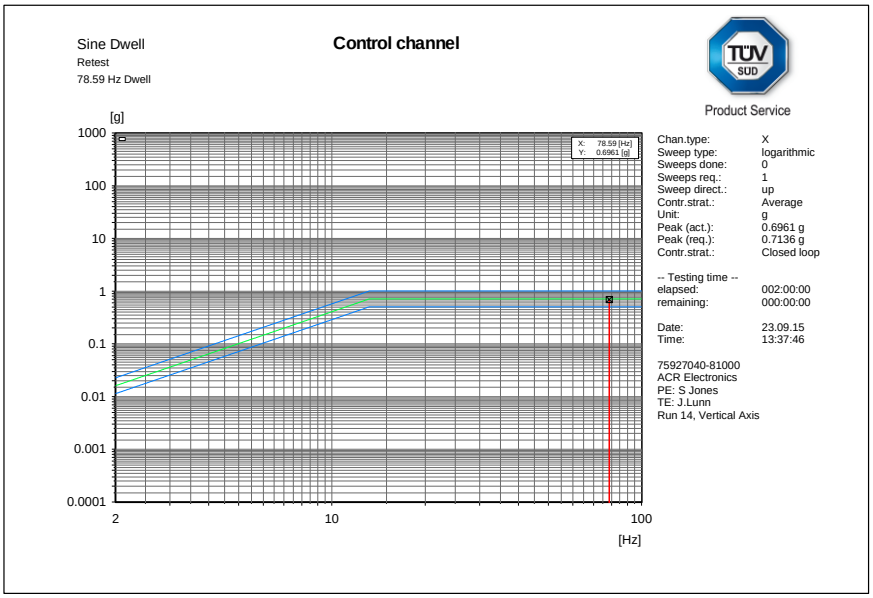
Up and Down (Float Free Housing) Endurance Run (78.59 Hz) – Control and EUT



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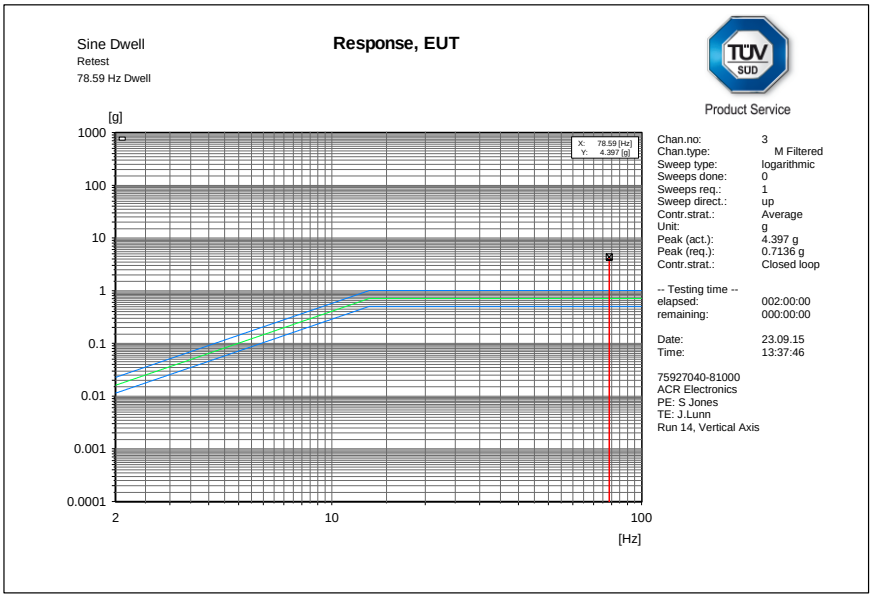

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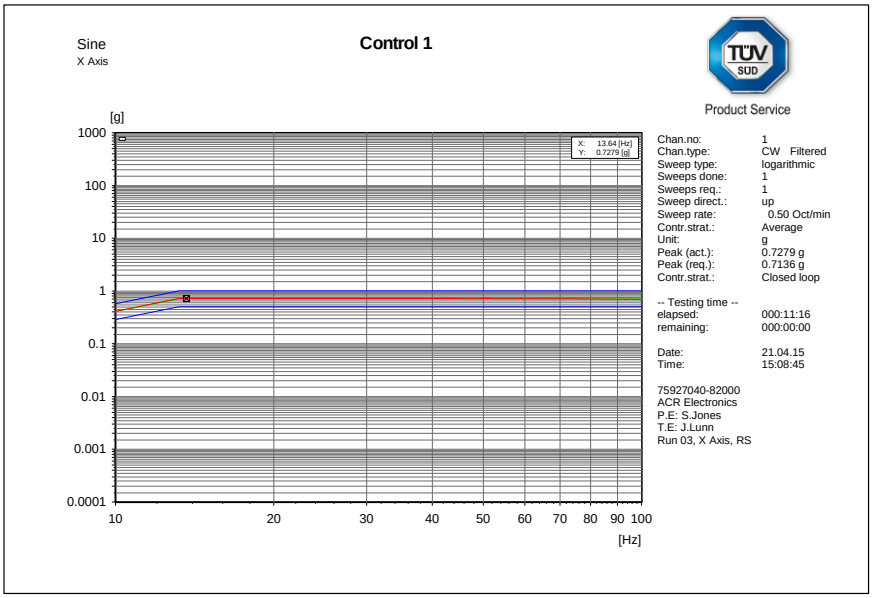
Side to Side (Float Free Housing) Res Search – Control and EUT



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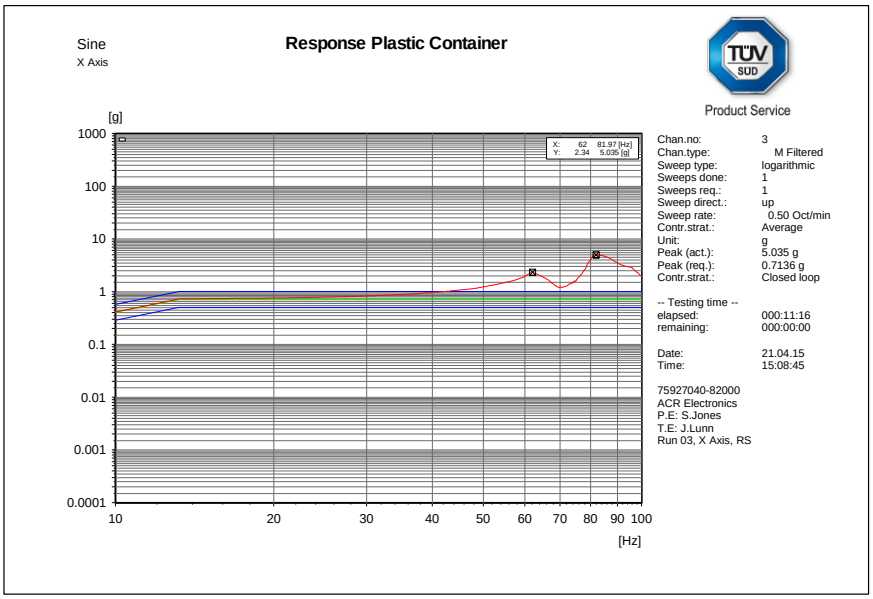

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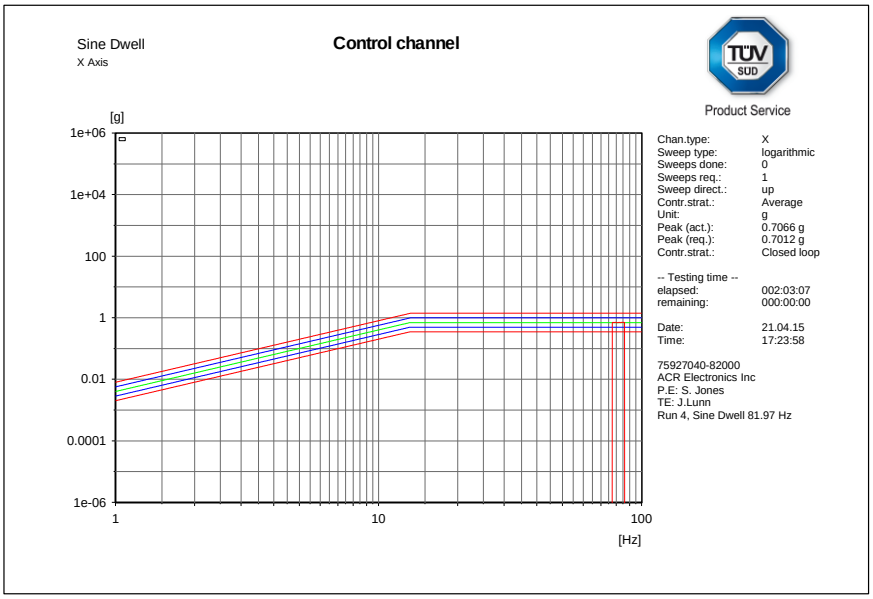
Side to Side (Float Free Housing) Endurance Run (81.97 Hz) – Control and EUT



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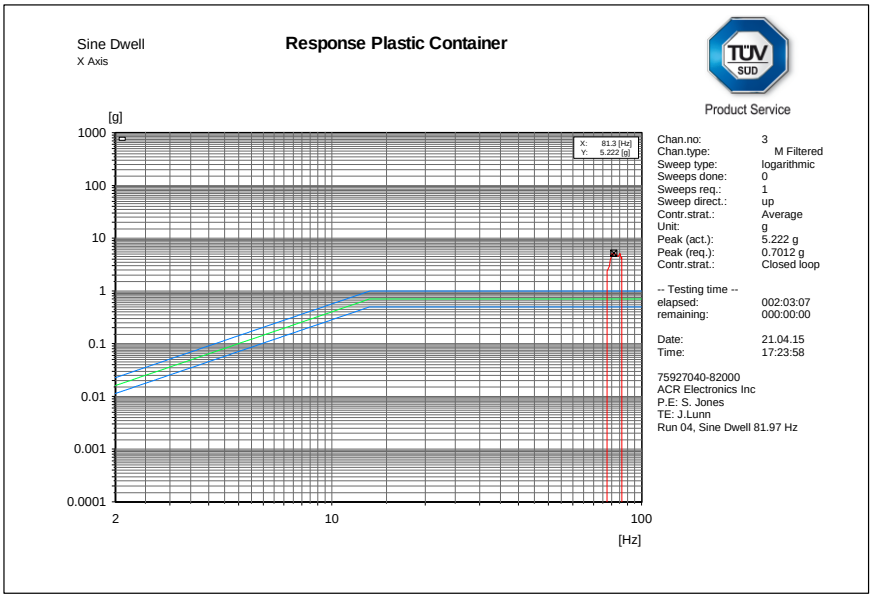
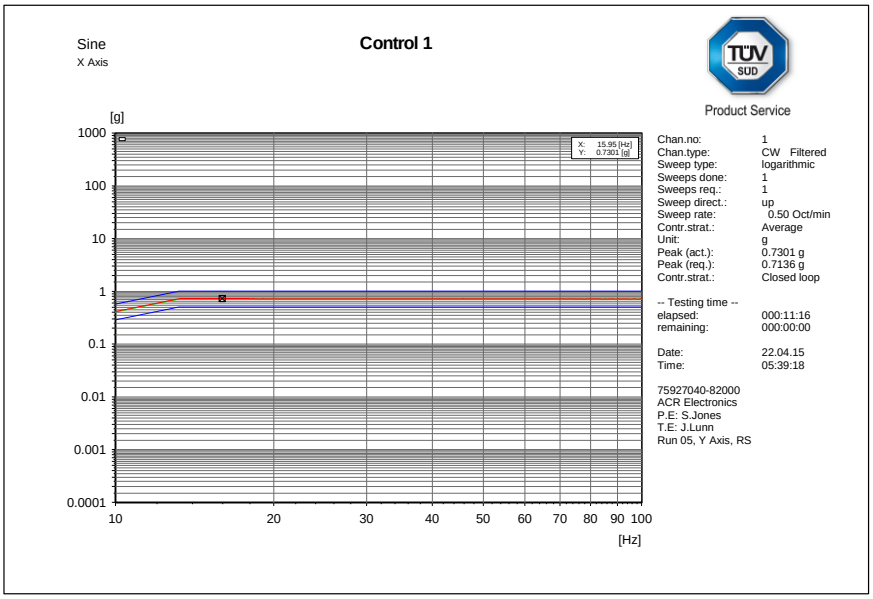


J:\759270xx\75927040\Testing_Logbooks\Environmental\8 82000 - Vibration NR\RawData\81.97Hz_002.rsd

Front and Back (Float Free Housing) Res Search – Control and EUT



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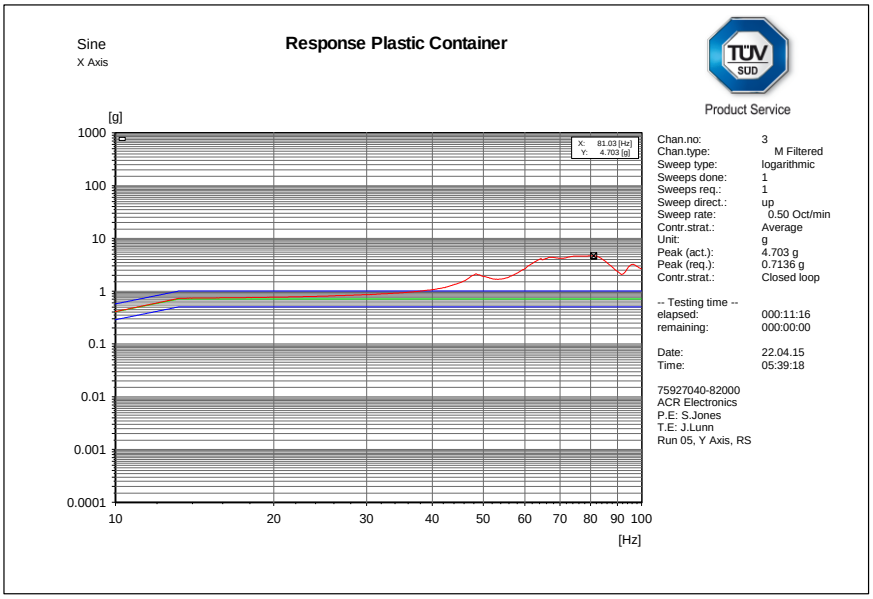

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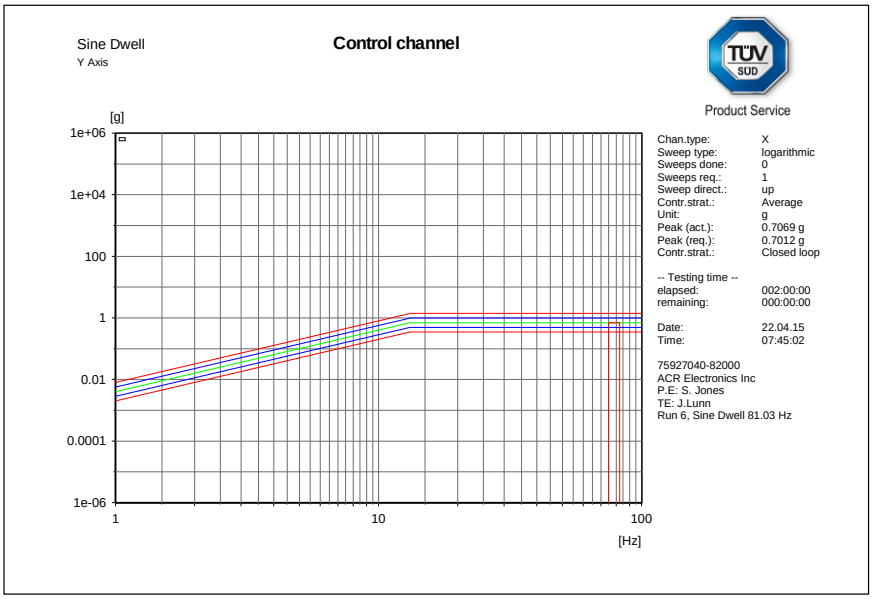
Front and Back (Float Free Housing) Endurance Run (81.03 Hz) – Control and EUT



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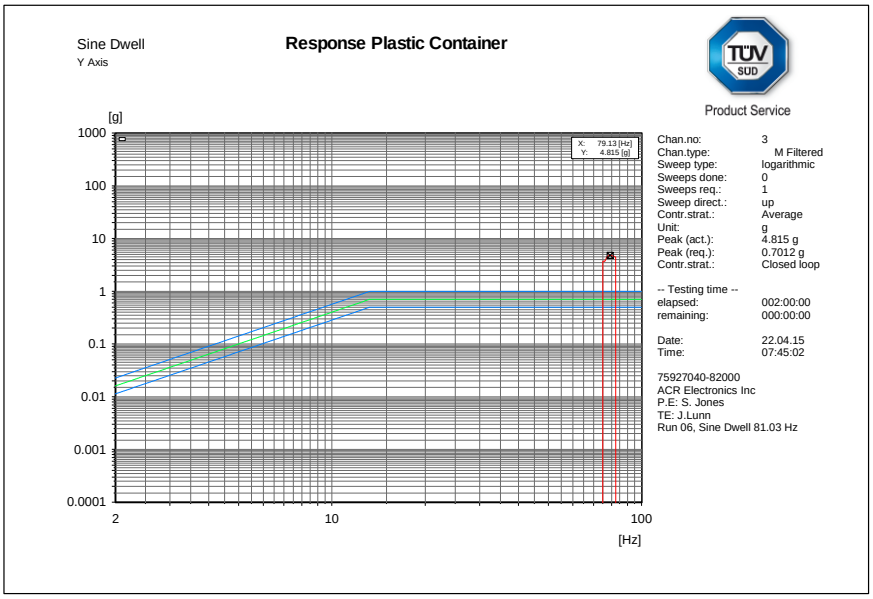

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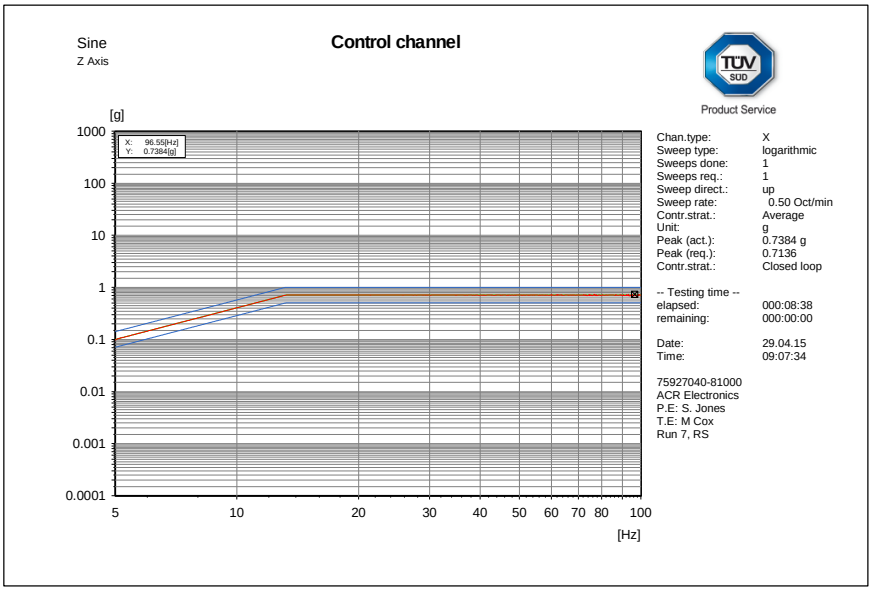
Up and Down (Manual Bracket) Res Search – Control and EUT



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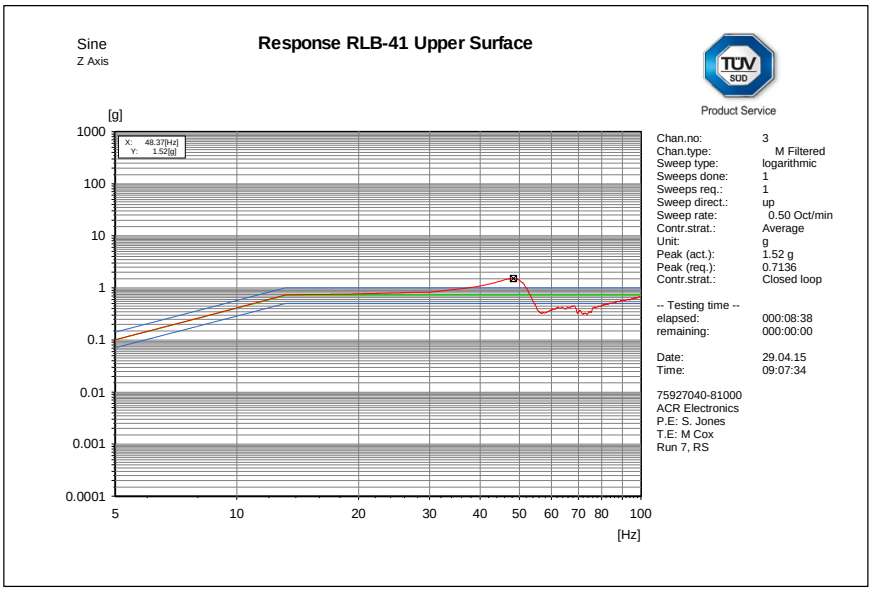

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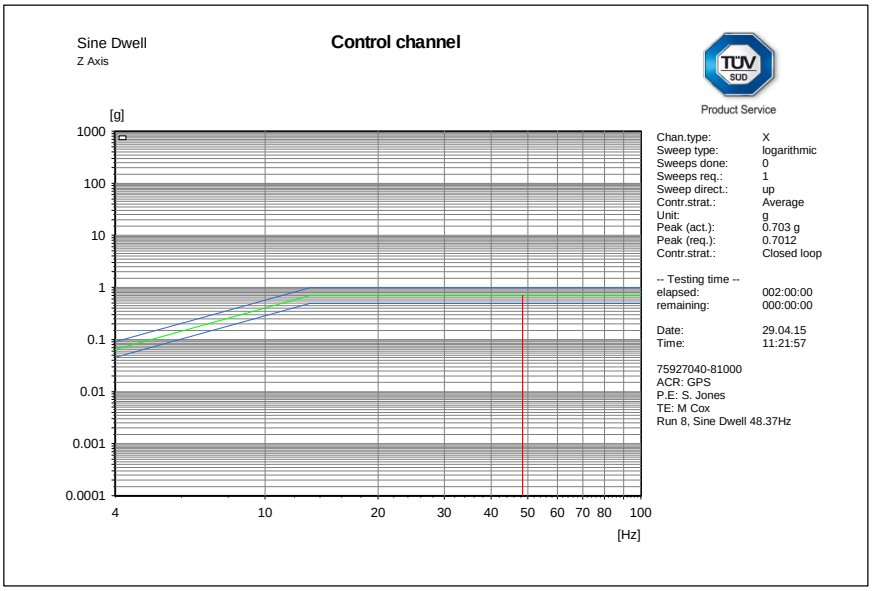
Up and Down (Manual Bracket) Endurance Run (48.37 Hz) – Control and EUT



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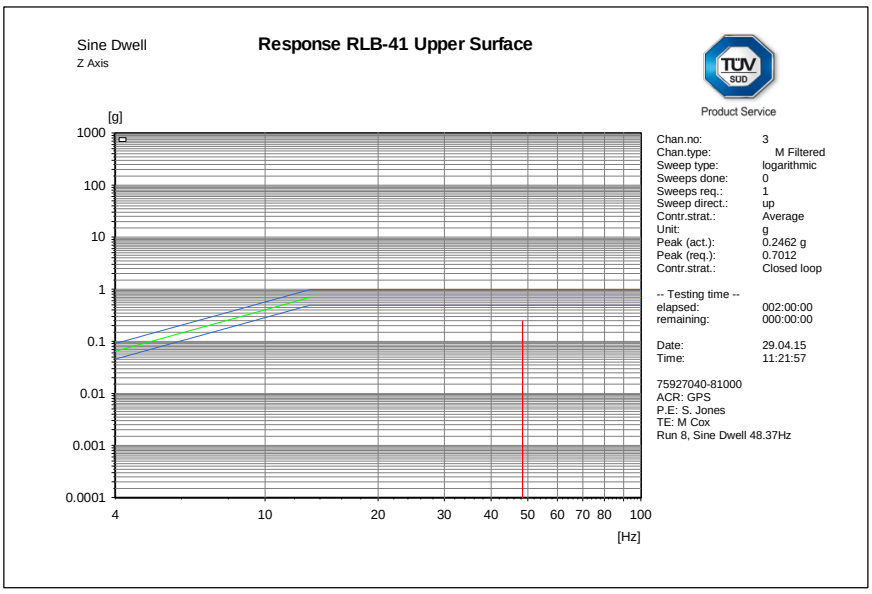
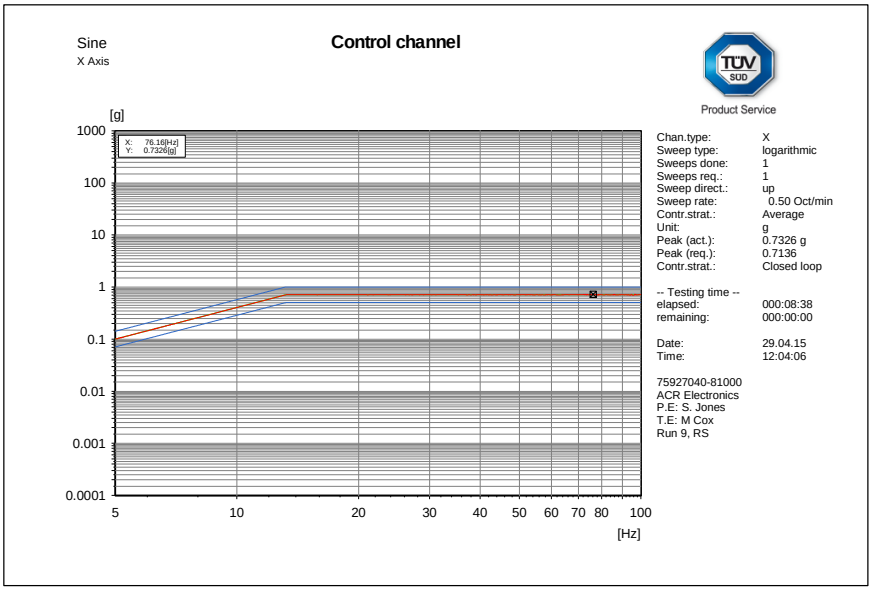


C:\VcpNT\Daten\m+p\ACR\75927040-81000\48.37Hz_001.rsd

Side to Side (Manual Bracket) Res Search – Control and EUT



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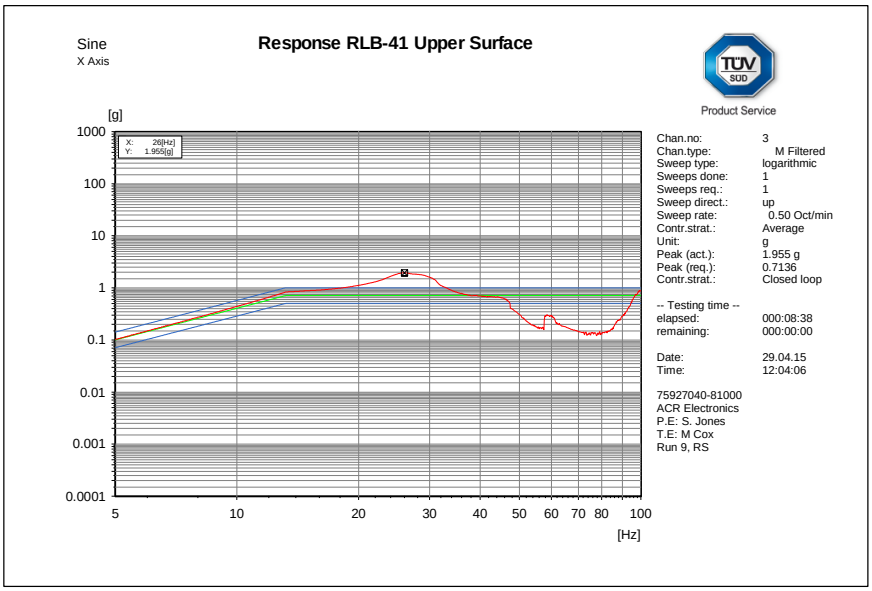

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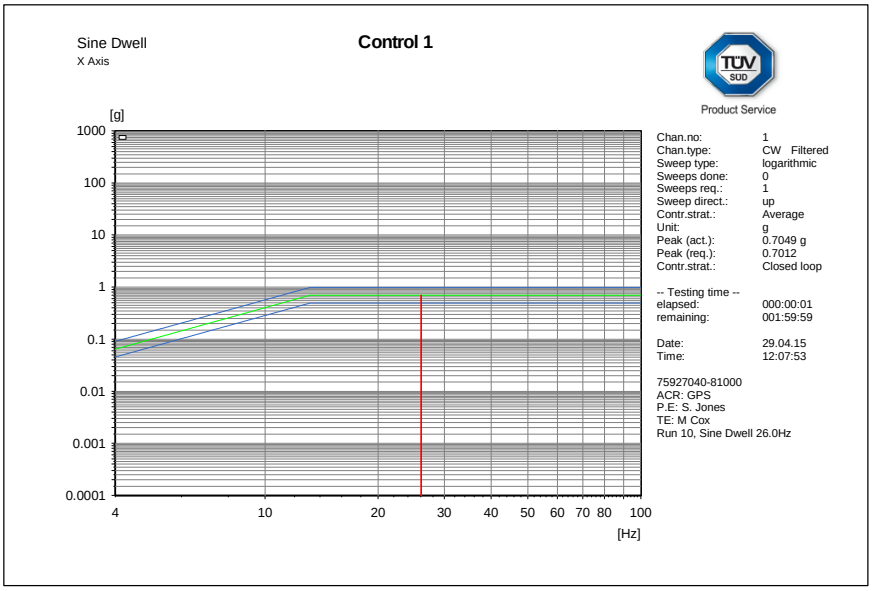
Side to Side (Manual Bracket) Endurance Run (26.0 Hz) – Control and EUT



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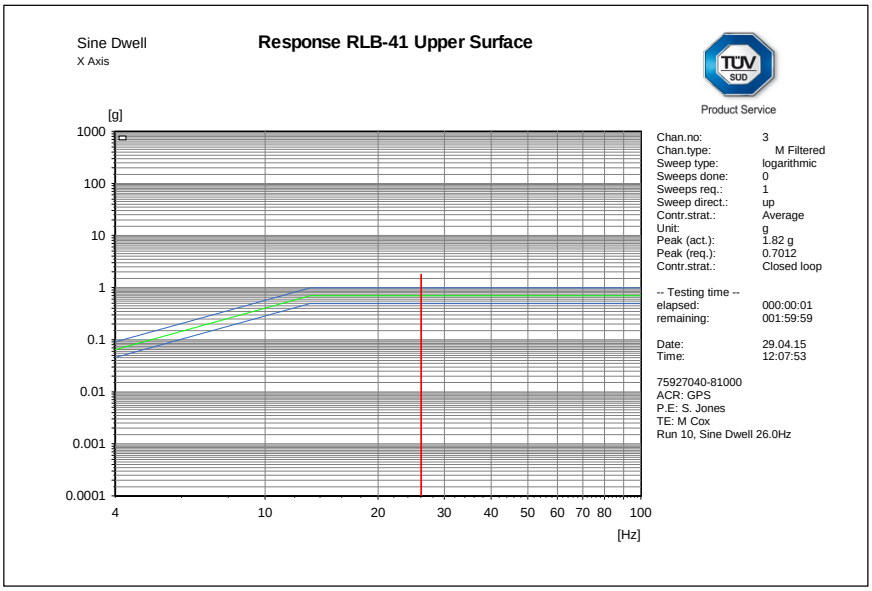
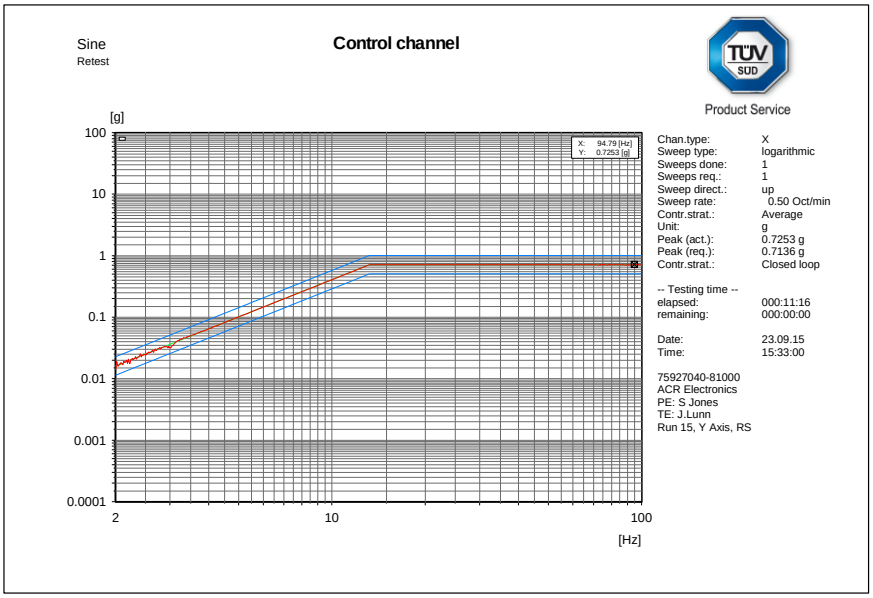


C:\VcpNT\Daten\m+p\ACR\75927040-81000\48.37Hz_002.rsd

Front and Back (Manual Bracket) Res Search – Control and EUT



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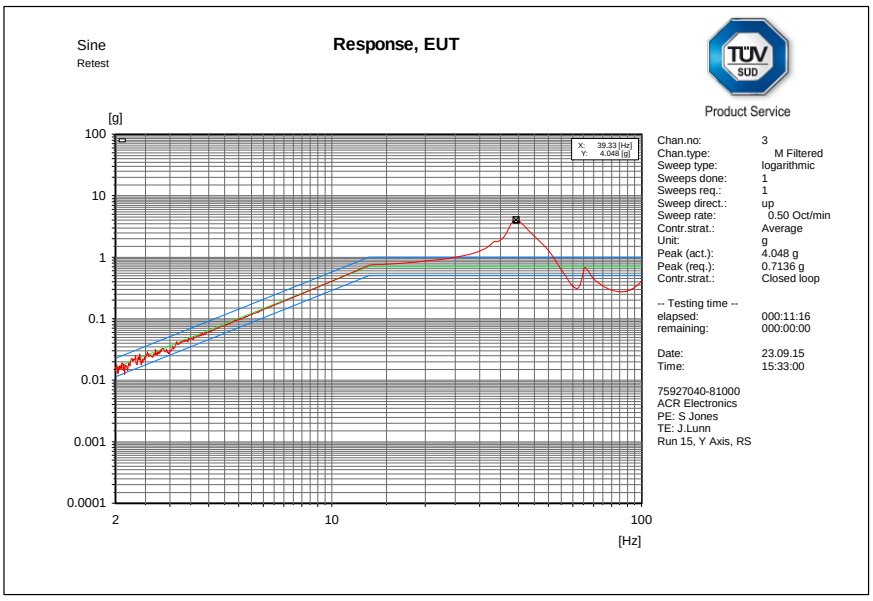
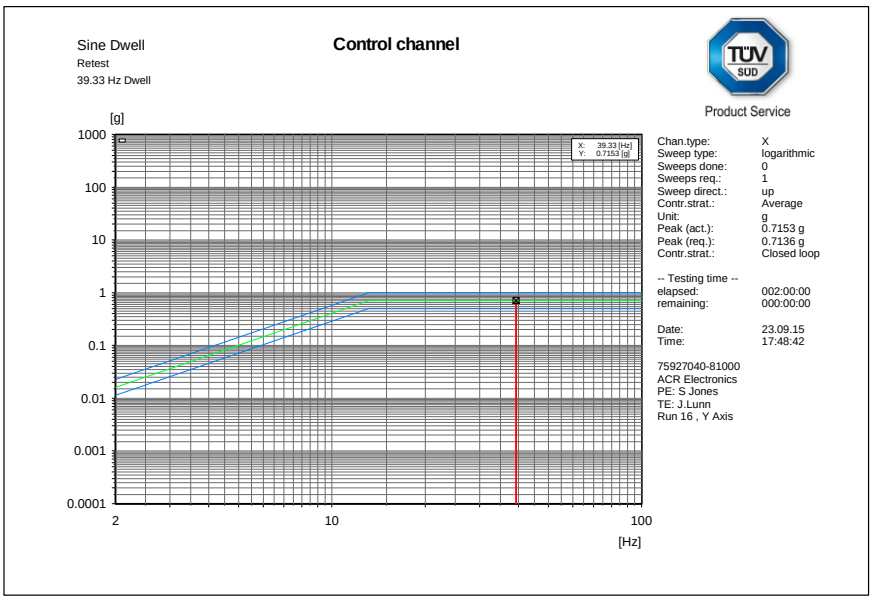
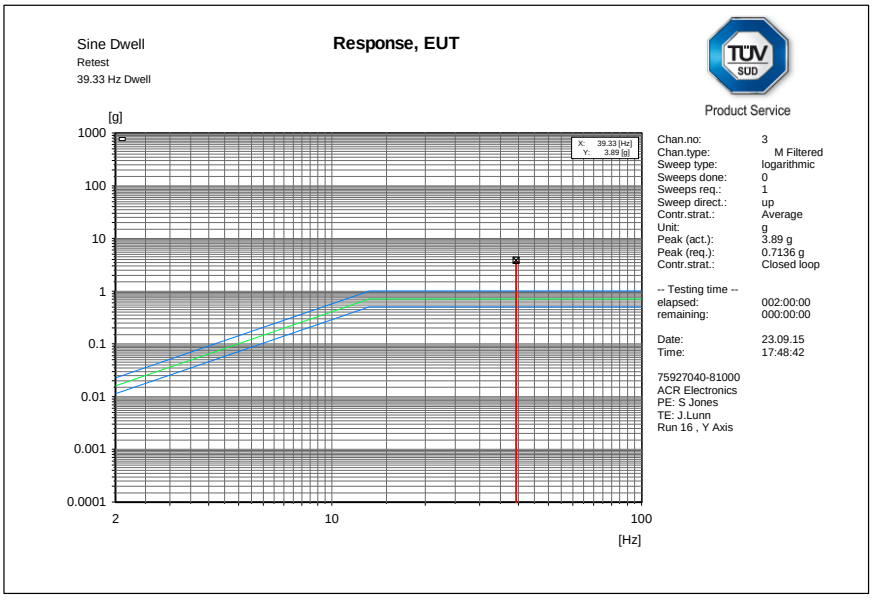


C:\VcpNT\Daten\m+p\ACR\75927040 - Retest 23.09.15\RS_004.rsn

Front and Back (Manual Bracket) Endurance Run (39.33 Hz) – Control and EUT



C:\VcpNT\Daten\m+p\ACR\75927040 - Retest 23.09.15\Dwell @ 38.Hz_002.rsd



C:\VcpNT\Daten\m+p\ACR\75927040 - Retest 23.09.15\Dwell @ 38.Hz_002.rsd

2.9.8 Test Results

Performance Check Results

RLB-41 S/N: #9 (TUV Ref TSR0064)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039965
121 MHz Presence	P

RLB-41 S/N: #15 (TUV Ref TSR0058)

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.0400
121 MHz Presence	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.

2.10 IMMERSION TEST

2.10.1 Specification Reference

IEC 60945, Clause 8.9

2.10.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.10.3 Date of Test

11 May 2013

2.10.4 Test Equipment Used

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

2.10.5 Environmental Conditions

Ambient Temperature 23.4 °C
Relative Humidity 46.6 %

2.10.6 Test Method

The EUT was completely submerged in a vessel of water and then positioned in an overpressure chamber. A gauge pressure corresponding to a 10 m head of water was applied for a period of 5 minutes.

2.10.7 Test Results

Setup Photo

Examination

On completion of the test the EUT was inspected. No signs of water ingress were found.

Performance Check Results

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039965
121 MHz Presence	P

Observation: the EUT failed to switch off after the immersion test. The Manufacturer advised that this was most likely caused by pressure differential between the inside and outside of the EPIRB, thus causing the membrane On/Off switch to remain in the depressed state. The EUT was switched off manually by TÜV SÜD engineers.

2.11 SOLAR RADIATION TEST

2.11.1 Specification Reference

IEC 60945, Clause 8.10

Manufacturer waiver request - see Annex A.

2.12 OIL RESISTANCE TEST

2.12.1 Specification Reference

IEC 60945, Clause 8.11

Manufacturer waiver request - see Annex A.

2.13 CORROSION TEST

2.13.1 Specification Reference

IEC 60945, Clause 8.12

2.13.2 Equipment Under Test and Modification State

RLB-41 S/N: #20 (TUV Ref TSR0036) - Modification State 0

2.13.3 Date of Test

17 November to 17 December 2014

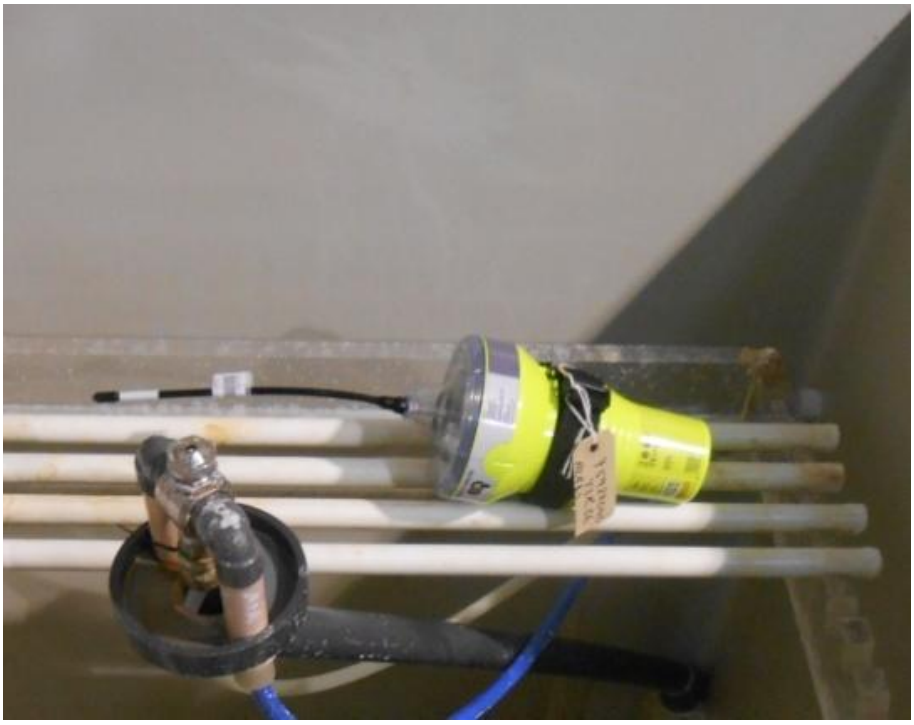
2.13.4 Test Equipment Used

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

2.13.5 Environmental Conditions

Ambient Temperature 22.2 – 23.7°C
Relative Humidity 28.8 - 45.7%

2.13.6 Test Setup



2.13.7 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.

2.13.8 Test Results

Inspection

On completion of the test the EUT was subjected to an inspection. No sign of water ingress was found. There were signs of some corrosion around water activation contacts, as shown below:

Corrosion on water contacts

Summary of Performance Check Results

Parameter	Result
Self-test Mode:	
Self-test Message	FFFED08C9EF9C0637FDFF83D15B7
Normal Mode:	
Normal Message	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
406 MHz Frequency	406.039951
121 MHz Presence	P

2.14 RADIATED EMISSIONS

2.14.1 Specification Reference

IEC 60945, Clause 9.3

According to the product specific standard, IEC 61097-2, the radiated emissions test of IEC 60945 is not applicable.

2.15 IMMUNITY TO RADIATED RF

2.15.1 Specification Reference

IEC 60945, Clause 10.4

2.15.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.15.3 Date of Test

18 June 2015

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 21.0°C
Relative Humidity 42.0%

2.15.6 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 both Idle (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 EN 60945.

Off / Standby Mode

Amplitude Modulation	Frequency	400Hz	
	Depth	80%	
Stepped Frequency Increments		1% with respect to last momentary frequency	
Dwell Time		3 Seconds 80MHz to 1GHz – 5 Seconds 1GHz to 2GHz	
Frequency Range (MHz)		80 – 1000	
Field Strength (V/m)		12.6 (10V/m + MU)	
Frequency Range (MHz)		1000 – 2000	
Field Strength (V/m)		12.6 (10V/m + MU)	
		Result	
Orientation of EUT		Vertical Polarisation	Horizontal Polarisation
Front		Pass	Pass
Right Side		Pass	Pass
Rear		Pass	Pass
Left Side		Pass	Pass
Top		Pass	Pass
Underside		Pass	Pass

Operating Mode

Amplitude Modulation	Frequency	400Hz	
	Depth	80%	
Stepped Frequency Increments		1% with respect to last momentary frequency	
Dwell Time		3 Seconds 80MHz to 1GHz – 5 Seconds 1GHz to 2GHz	
Frequency Range (MHz)		80 – 1000	
Field Strength (V/m)		12.6 (10V/m + MU)	
Frequency Range (MHz)		1000 – 2000	
Field Strength (V/m)		12.6 (10V/m + MU)	
		Result	
Orientation of EUT		Vertical Polarisation	Horizontal Polarisation
Front		Pass	Pass
Right Side		Pass	Pass
Rear		Pass	Pass
Left Side		Pass	Pass
Top		Pass	Pass
Underside		Pass	Pass

2.16 IMMUNITY TO ESD

2.16.1 Specification Reference

IEC 60945, Clause 10.9

2.16.2 Equipment Under Test and Modification State

RLB-41 S/N: #9 (TUV Ref TSR0064) - Modification State 0

2.16.3 Date of Test

22 June 2015

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 21°C
Relative Humidity 42%

2.16.6 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 both Off / Standby and Operating modes.

2.16.7 Test Results

Test Results

For the period of test the EUT continued to operate as intended and therefore met the requirements of EN 60945 for Immunity to Electrostatic Discharge (Enclosure Port).

Off / Standby Mode

		Contact Discharges (kV)								Air Discharge (kV)							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
B	Power button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Test button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	AE	N/A	N/A	N/A	N/A	N/A	N/A	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 test point when the ESD pulse was applied.
N/A Test not applicable as defined in the specification.

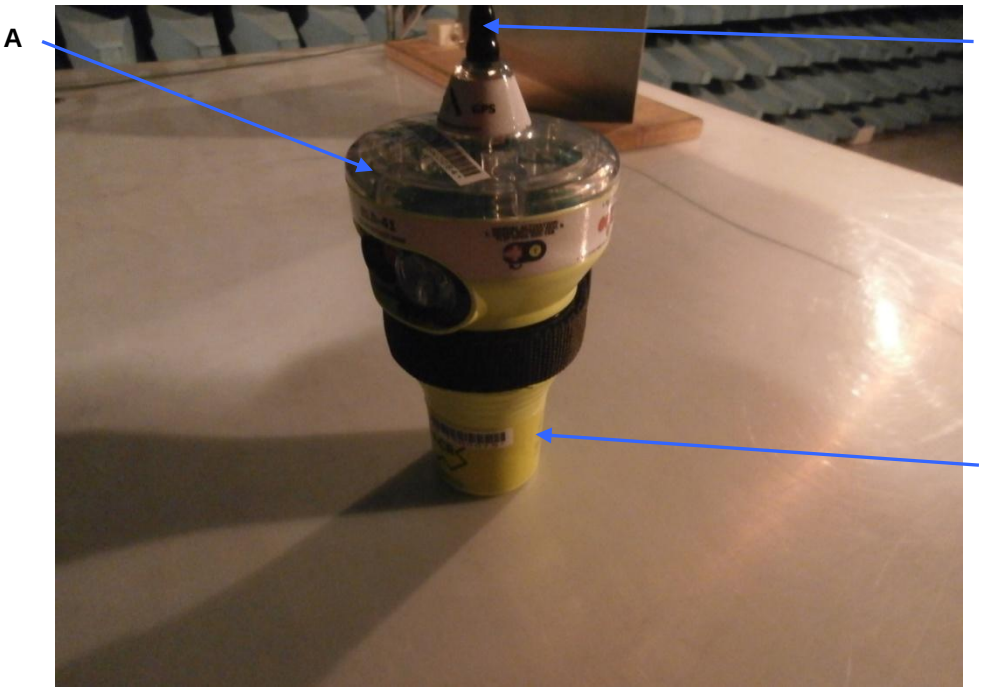
Operating Mode

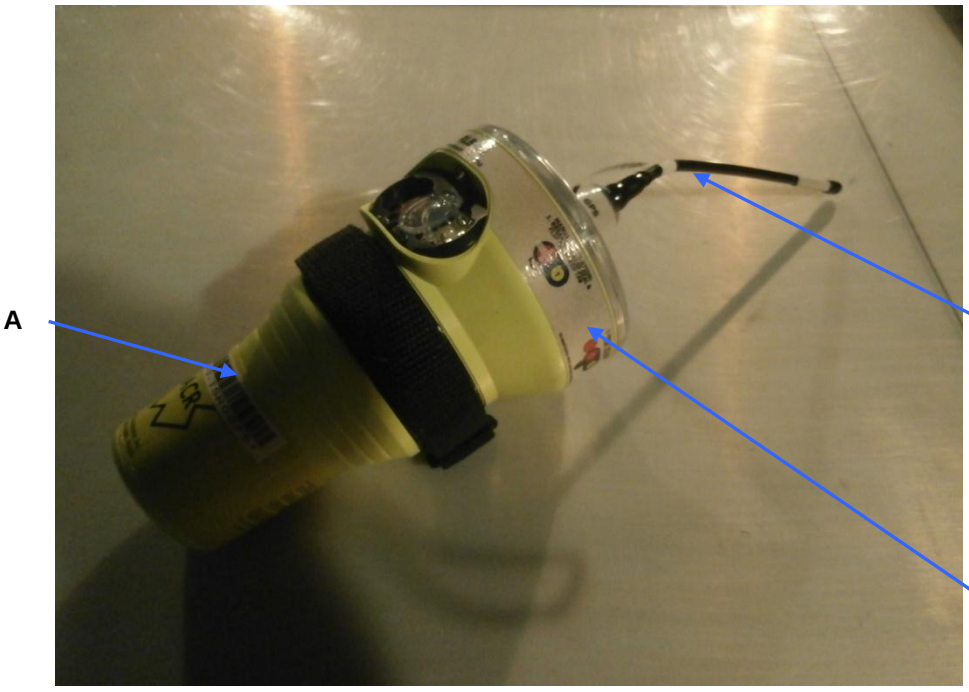
		Contact Discharges (kV)								Air Discharge (kV)							
		2		4		6		8		2		4		8		15	
Test Points		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Horizontal Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Coupling Plane		✓	✓	✓	✓	✓	✓	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A	Case	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
B	Power button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
C	Test button	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A
D	AE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	✓*	✓*	✓*	✓*	✓*	✓*	N/A	N/A

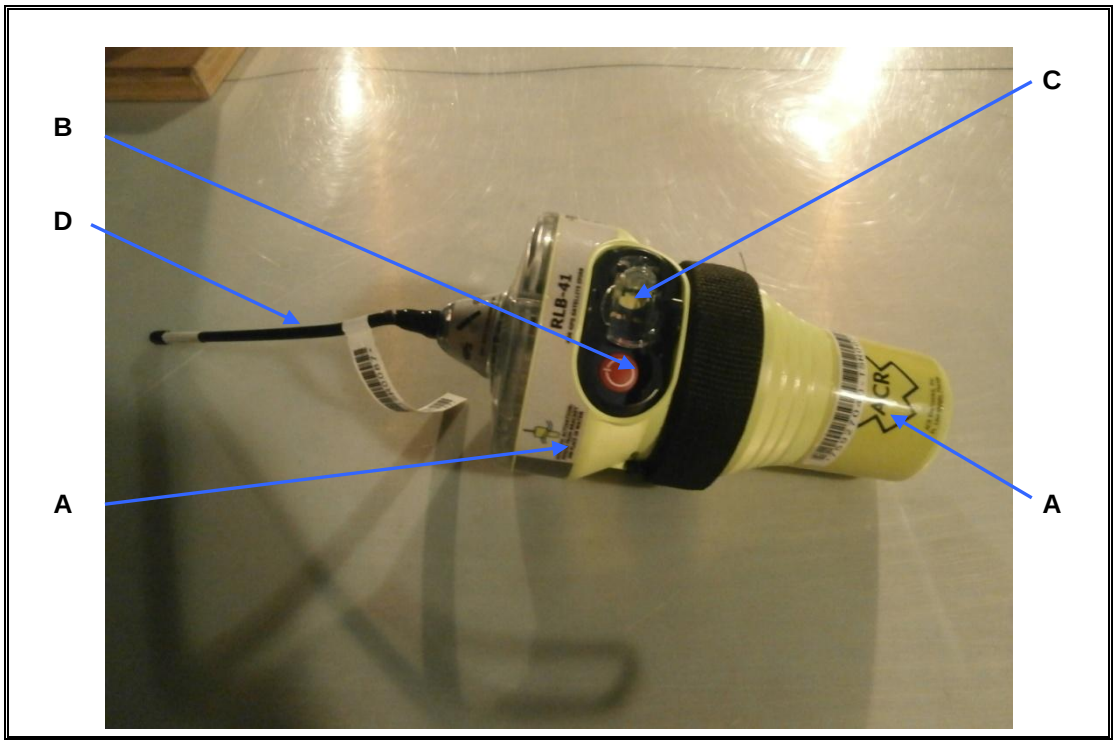
Key to Results

✓ The EUT's performance was not impaired at this test point when the ESD pulse was applied.
✓* No discharge occurred at this test point when the ESD pulse was applied.
N/A Test not applicable as defined in the specification.

ESD Test Points






B
D
A
C
A
RLB-41
ACR

2.17 COMPASS SAFE DISTANCE TEST

2.17.1 Specification Reference

IEC 60945, Clause 11.2

2.17.2 Equipment Under Test and Modification State

RLB-41 S/N: #26 (TUV Ref TSR0051) - Modification State 0

2.17.3 Date of Test

05 March 2015

2.17.4 Test Equipment Used

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

2.17.5 Environmental Conditions

Ambient Temperature 15.5°C
Relative Humidity 39.4%

2.17.6 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 61097-2.

The test was performed with the EUT in both idle (Standby) and active (Operating) modes.

2.17.7 Test Results

Standard Compass safe distance (mm)	600
Emergency Compass safe distance (mm)	400

Horizontal maximum flux density, Magnetic North (H)	H	19.448
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	370	270	430	300	420	300
Top	470 to tip of antenna	340 to tip of antenna	520 to tip of antenna	360 to tip of antenna	590 to tip of antenna	370 to tip of antenna
Left Hand Side	360	270	430	300	430	300
Right Hand Side	430	305	430	315	440	320
Underside	170, No deflection	170, No deflection	170, 0.2° deflection	170, 0.2° deflection	170, 0.2° deflection	170, 0.2° deflection
Rear	410	310	435	300	445	310

2.18 SAFETY PRECAUTIONS

2.18.1 Specification Reference

IEC 60945, Clauses 12.1, 12.2, 12.3, 12.4

The EUT has no parts or wiring in which the direct or alternating voltages or both combined to give a peak voltage greater than 50 V. Therefore clause 12.1 (Protection against accidental access to dangerous voltages) is not applicable.

The following clauses are also not applicable to the RLB-41:

12.2 Electromagnetic radio frequency radiation
12.3 Emission from VDU
12.4 X radiation.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.2 Pretest Checks					
Power Meter	Hewlett Packard	436A	83	12	29-Aug-2015
Signal Generator	Hewlett Packard	8644A	96	12	23-Apr-2015
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
Termination (50ohm)	Diamond Antenna	DL-30N	226	12	6-Feb-2016
Termination (50ohm)	Diamond Antenna	DL-30N	337	12	8-Oct-2015
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Stop Clock	R.S Components	RS328 061	2674	12	30-Jun-2015
Hygromer	Rotronic	I-1000	2829	12	27-Oct-2015
Termination (50ohm, 6W)	Microndе	R404613	3074	12	27-Mar-2015
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	4-Jun-2015
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	4-Jun-2015
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3163	12	16-Sep-2015
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	17-Sep-2015
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	11-Nov-2015
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2015
Beacon Tester	WS Technologies	BT100S	3263	-	TU
RF Short Circuit	TUV SUD Product Service	Short Circuit	3268	-	TU
Short Circuit	TUV SUD Product Service	Short Cicuit	3272	-	TU
Power Sensor	Agilent Technologies	8482A	3290	12	16-Jan-2016
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	12	29-Apr-2015
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3357	12	29-Apr-2015

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 Climatic - High Temperature (Functional)					
Power Meter	Hewlett Packard	436A	83	12	29-Aug-2015
Signal Generator	Hewlett Packard	8644A	96	12	23-Apr-2015
Termination (50ohm)	Diamond Antenna	DL-30N	337	12	8-Oct-2015
Attenuator (10dB, 10W)	Texscan	HFP-50N	468	12	23-Jun-2015
Signal Generator	Hewlett Packard	8663A	765	12	4-Nov-2015
Attenuator (10dB, 10W)	Trilithic	HFP-50N	1377	12	22-Oct-2015
Chamber	Heraeus	HC 4033	2174	12	20-May-2015
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	2-Jun-2015
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	4-Mar-2016
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	4-Jun-2015
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3162	12	18-Nov-2015
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	17-Sep-2015
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	11-Nov-2015
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2015
Beacon Tester	WS Technologies	BT100S	3263	-	TU
RF Short Circuit	TUV SUD Product Service	Short Circuit	3268	-	TU
Short Circuit	TUV SUD Product Service	Short Cicuit	3272	-	TU
Power Sensor	Agilent Technologies	8482A	3290	12	16-Jan-2016
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	3-Dec-2015
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3361	12	24-Jul-2015
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4517	12	29-Jan-2016
Section 2.3 Climatic - High Temperature (Storage)					
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
Climatic Chamber	Unitemp	Ministrat	2129	12	30-Nov-2014
Chamber	Heraeus	HC 4033	2174	12	20-May-2015
Hygromer	Rotronic	I-1000	2829	12	30-Oct-2015
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	2-Jun-2015
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	4-Jun-2015
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3352	12	29-Apr-2015
Section 2.4 Climatic - Humidity					
Chamber	Heraeus	HC 4033	2174	12	20-May-2015
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	2-Jun-2015
Section 2.5 Climatic - Low Temperature					
Chamber	Heraeus	HC 4033	2174	12	20-May-2015
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	2-Jun-2015

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 Climatic - Low Temperature (Functional)					
Power Meter	Hewlett Packard	436A	83	12	29-Aug-2015
Climatic Chamber	Heraeus Votsch	VM 04/100	85	-	O/P Mon
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	11-Feb-2016
Time Interval Analyser	Yokogawa	TA720	181	12	24-Apr-2016
Attenuator (10dB, 10W)	Texscan	HFP-50N	468	12	23-Jun-2015
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	9-Apr-2016
Attenuator (10dB, 10W)	Trilithic	HFP-50N	1377	12	22-Oct-2015
Chamber	Heraeus	HC 4033	2174	12	20-May-2015
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	20-Jan-2016
Beacon RF Unit	TUV SUD Product Service	N/A	3066	-	TU
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	4-Jun-2015
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3163	12	16-Sep-2015
Thermocouple Thermometer	Fluke	51	3172	12	24-Sep-2015
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	17-Sep-2015
Power Sensor	Agilent Technologies	8482A	3290	12	16-Jan-2016
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Bandpass Filter	Trilithic	5BE121.55/35-3-BA	3410	12	15-Sep-2015
ScopeCorder	Yokogawa	DL750	4175	12	28-Jan-2016
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4509	12	20-May-2016
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	29-Jan-2016
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4513	12	29-Jan-2016
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	12	29-Jan-2016
Section 2.6 Climatic - Thermal Shock					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Climatic Chamber	Fisons	Fisons 5	2123	12	10-Dec-2015
Balance	Geniweigher	GM-11K	2334	12	12-Mar-2016
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	2-Jun-2015
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Section 2.8 Drop Into Water					
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Humidity & Temperature Meter	Radio Spares	1361C	4420	12	1-May-2015
Section 2.9 Vibration					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Charge Amplifier	Endevco	133	2499	12	2-Dec-2015
Charge Amp	Endevco	133	2500	12	27-Nov-2015
Vibration System	Ling Dynamic Systems	LDS V964	2515	6	12-Jun-2015
Isotron Accelerometer	Endevco	256-10	3112	-	17-Jun-2015
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	30-Jun-2015
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Vibration Controller	m + p International	Vibpilot 8	3768	12	12-May-2015
Accelerometer	Endevco	256-10	3992	6	8-May-2015
Accelerometer	PCB Piezotronic	352C03	4337	6	8-May-2015

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.9 Vibration					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Charge Amplifier	Endevco	133	2499	12	2-Dec-2015
Charge Amplifier	Endevco	133	2506	12	28-Nov-2015
Vibration System	Ling Dynamic Systems	LDS V964	2515	6	2-Dec-2015
Isotron Accelerometer	Endevco	256-10	3112	-	17-Jun-2015
Isotron Accelerometer	Endevco	256-10	3113	6	16-Jun-2015
Vibration System	Ling Dynamic Systems	875	3170	6	30-Sep-2015
Charge Amplifier	Endevco	133	3189	12	18-Jul-2015
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Cable (3m, N-type)	Rhophase	NPS-1601-3000-NPS	3361	12	24-Jul-2015
Vibration Controller	m + p International	Vibpilot 8	3768	12	12-May-2015
Vibration Controller	m + p International	Vibpilot 8	3769	12	17-Apr-2015
Vibration Controller (8 Ch)	m + p International	VibPilot 8	3777	12	23-Jun-2016
Isotron Accelerometer	Endevco	256-10	3806	6	9-Jul-2015
Accelerometer	Endevco	256-10	3987	6	28-Oct-2015
Accelerometer	Meggitt	256-10	4222	6	9-Jul-2015
Accelerometer	Meggitt Endevco	256-10	4272	6	15-Nov-2015
Accelerometer	Meggitt Endevco	256-10	4306	6	15-Jun-2015
Accelerometer	PCB Piezotronic	352C03	4338	6	18-Jun-2015
Accelerometer	PCB Piezotronic	352C03	4475	6	2-Jul-2015
Isotron Accelerometer	PCB Piezotronic	M353B18	4568	12	26-May-2016
Section 2.10 Climatic - Wet Tests					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Over Pressure (T)	ASL (TUV)	0 TO 15 PSI	2125	-	TU
Pressure Indicator	Druck	DPI 700	2343	12	23-Dec-2015
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	5-Sep-2015
Section 2.13 Climatic - Corrosion					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	21-Aug-2015
Section 2.15 EMC - Radiated Immunity					
Signal Generator 10kHz to 2.7GHz	Marconi	2031	19	12	16-Mar-2016
Antenna (Bilog)	Schaffner	CBL6143	316	-	TU
Power Meter	Rohde & Schwarz	NRVD	747	-	TU
Spectrum Analyser	Hewlett Packard	8591A	771	12	22-Jul-2015
Screened Room (1)	Rainford	Rainford	1541	-	TU
Amplifier (1kW)	EMV	1000W1000M7	1633	-	TU
Laser Powered Electric Field Sensor	Dare Development	RadiSense VI - CTR1001A	2148	12	17-Jul-2015
Directional Coupler	Amp Research	DC6180	2763	-	TU
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Microwave Amplifier 1GHz - 2.5GHz; 500W; CW	Thorn	PTC6440	3736	-	TU
Power Sensor; 100kHz - 6GHz/500pW - 20mW	Rohde & Schwarz	NRV-Z4	3815	-	TU
Section 2.16 EMC - Electrostatic Discharges					
Multimeter	Iso-tech	IDM101	2418	12	26-Sep-2015
ESD Gun	Schloder	SESD 30000	4319	12	13-Oct-2015

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.17 EMC - Compass Safe Distance					
Sussex Helmholtz Coil	Various	88771	327	-	TU
Magnetometer	Bartington	MAG01	671	36	24-Feb-2018
Multimeter	Iso-tech	IDM101	2422	12	22-Jan-2016
Compass Verification Unit	TUV SUD Product Service	CVU	3579	-	TU
Marine Binacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU

TU – Traceability Unscheduled
OP MON – Output Monitored with Calibrated Equipment

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Radiated sample

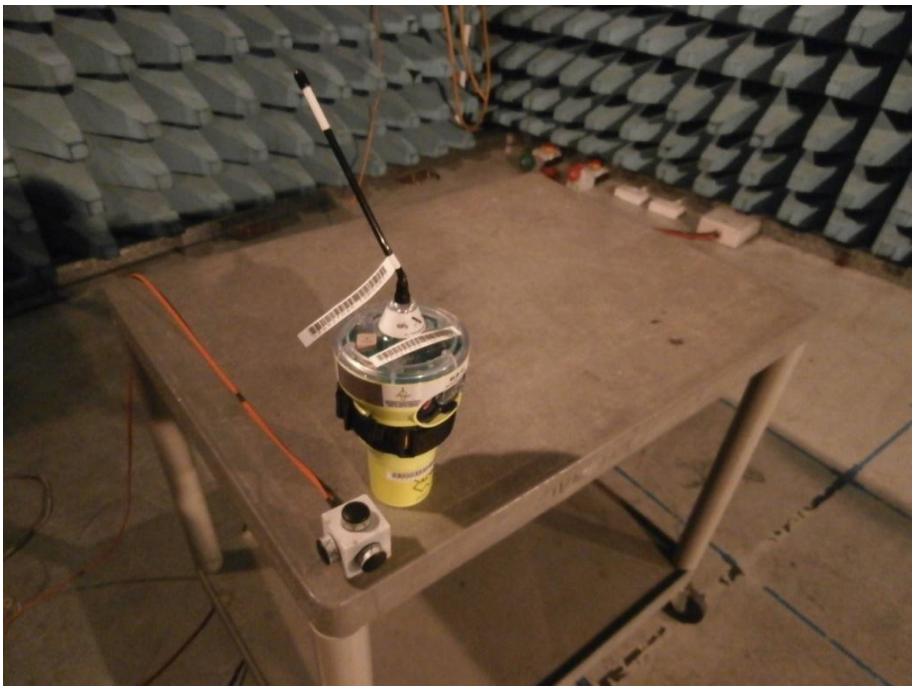
Conducted Sample

Float Free Case View 1

Float Free Case View 2

Non-Float Free Bracket 1

4.2 TEST SET UP PHOTOGRAPHS



Immunity to Radio Frequency Electromagnetic Field (Enclosure Port)

Compass Safe Distance (Enclosure Port)

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

CUSTOMER SUPPLIED INFORMATION

Product Service

October 19, 2015

Subject: ACR RLB-41 EPIRB Waiver Information

To Whom It May Concern:

ACR Electronics, Inc. hereby declares that all components and materials (including the labeling) on the exterior of the RLB-41 are of identical material used on the RLB-36, which has been fully tested and type approved, and has been in production for years. The only changes between the currently approved RLB-36 and the RLB-41 are in shape and internal to the EPIRB housing.

Based on the above information, ACR Electronics, Inc. requests that the following tests be waived:

TEST	IEC 61097-2: 2008	ETSI EN 300 066: 2001	AS/NZS 4280.1: 2003
Solar Radiation	A.2.7 (5.17.9)	6.11	5.5.1.2
Oil Resistance	A.2.8 (5.17.10)	6.12	5.5.1.2

Please feel free to contact me if additional information is required.

Signed on behalf of ACR Electronics, Inc.

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