



Product Service

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Report On

Limited Testing of the
Orolia Limited
SAFELINK SOLO PLB
In accordance with Cospas-Sarsat T.007

Document 75942209 Report 13 Issue 2

January 2019



Product Service

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REPORT ON

Limited Testing of the
Orolia Limited
SAFELINK SOLO

Document 75942209 Report 13 Issue 2

January 2019

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14 January 2019





Product Service

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Product Service

SECTION 1

Limited Testing of the
Orolia Limited
SAFELINK SOLO PLB



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of Orolia Limited SAFELINK SOLO PLB to limited requirements of Cospas-Sarsat T.007.

Objective	To perform Emergency Beacon Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Orolia Limited
Model Number(s)	SAFELINK SOLO
Serial Number(s)	#10 #18
Number of Samples Tested	2
Test Specification/Issue/Date	Cospas-Sarsat T.007 Issue 5 - Rev 2 June 2018
Incoming Release Date	Application Form 13 April 2018
Date of Receipt of Test Samples	28 June 2018
Order Number Date	AOR002 30/04/18
Start of Test	24 April 2018
Finish of Test	27 November 2018
Name of Engineer(s)	M Hardy N Grigsby S Jones
Related Documents	Cospas-Sarsat T.001 Issue 4, Rev 3 June 2018
TUV SUD original Testing Ref	75942209 Report 1 75942209 Report 14

The SAFELINK SOLO PLB is a variant of the Fastfind PLB 220, with minor variations as indicated in Annex A.

The original testing for the Fastfind PLB 220 can be found in TUV SUD document 75942209 Report 14.

TUV SUD document 75942209 Report 1 relates to the initial T.007 testing of the Fastfind PLB 220.



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1.2 APPLICATION FORM

G.1 INFORMATION PROVIDED BY THE BEACON MANUFACTURER

Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Orovia Ltd
Beacon Model Name	SAFELINK SOLO FAST FIND RANGER
Additional Beacon Model Names	Z424

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	
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	X
	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(DT)	Distress Tracking 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 MHz operating channel = 406.xxx)	406.031 MHz
Operating temperature range	Tmin= -20°C Tmax= +55°C
Temperature, at which minimum duration of continuous operation is expected (Submit C/S T.007 Section 5, part s, if applicable)	-20°C
Operating lifetime	24 hours
Beacon power supply type (internal non-rechargeable, internal re-chargeable, external, combined, other)	Internal non-rechargeable
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)	N/A
Battery cell chemistry	Lithium Manganese Dioxide
Battery cell model name, cell size, number of cells in a battery pack, and details of the battery pack electrical configuration	GPCR123A x4 cells in series
Battery cell manufacturer	GP
Battery pack manufacturer and part number	Oroliia Ltd
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	1 year
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	6 years
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon
Oscillator model name/ part number	E7472LF
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	Oroliia Ltd
Antenna part name and part number (OEM, if applicable, and beacon manufacturer's)	Fastfind PLB Antenna 91-206
Antenna cable assembly min/max RF- losses at 406 MHz, if applicable	N/A

Characteristic	Specification
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime 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)	> 5min to ~1h
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	UBLOX
– Navigation device model name and partNumber	NEO-M8N
– Internal navigation device antenna type(integrated, internal, external, passive/active) , manufacturer and model	Internal, taoglas, CGGP.18.2.A.02
– GNSSsystem supported (e.g. GPS, GLONASS, Galileo)	GPS, Galileo
For External Navigation Devices	N/A
– Data protocol for GNSS receiver to beacon interface	
– Physical interface for beacon to navigationdevice	
– Electrical interface for beacon to navigationdevice	
– Part number of the external navigation interface device (if applicable)	
– Navigation device model and manufacturer (if beacon designed to use specific devices)	

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.)	Pass/Fail LED	Pass/Fail LED
– The content of the encoded position data fields of the self-test message has default values	Yes	N/A
– 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	406/121.5 power, GNSS receiver, battery	GNSS position fix, GNSS self test limit
– Self-test/ GNSS self-test 406 MHz burst duration (440 or 520 ms)	520 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	17 s	320 s
– Maximum recommended number of self-tests / <i>GNSS self-tests</i> during battery pack replacement period (as applicable)	60	10
– 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	Yes
– Automatic termination of self-test mode immediately after completion of the self-test cycle (Yes or No)	Yes	Yes

Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-test Mode
– GNSS Self-test results in transmission of a single burst, irrespective of the test result (Yes or No)	N/A	Yes
– Self-test/ GNSS self-test can be activated from beacon remote activation points (Yes & details or No)	No	No
– List all methods of Self-test mode and GNSS Self-test modes activation. Provide details on a separate sheet to describe	Press TEST button >2s and <10s	Press & hold TEST button for 10 s
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)	☒	EPIRB with MMSI
	☒	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)	☒	National Location: EPIRB
	☐	National Location: ELT
	☒	National Location: PLB
ELT(DT) Location Protocol (tick where appropriate)	☐	ELT with Serial Number
	☐	ELT with Aircraft Operator and Serial Number
	☐	ELT with Aircraft 24-bit Address
RLS Location Protocol (tick where appropriate) *	☐	EPIRB



Product Service

	ELT
	PLB
User Location Protocol (tick where appropriate)	X Maritime with MMSI
	X Maritime with Radio Call Sign
	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
	X PLB with Serial Number
Beacon includes a homer transmitter(s) (Yes or No) - homer transmitter(s) frequency and power	Yes ☒ 121.5 MHz <u>19</u> dBm Yes ☐ 243.0 MHz _____ dBm Yes ☐ AIS _____ dBm Yes ☐ Other _____ MHz _____ dBm Description: _____
- homer transmitter(s) duty cycle	<u>99.13</u> %
- duty cycle of homer sweptone	<u>35</u> %
Beacon includes a high intensity flashing light (e.g. Strobe)	No
- light intensity	N/A
- flash rate	N/A
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.	None
Beacon includes automatic activation mechanism (Yes or No). Specify type of automatic beacon activation mechanism	No



Product Service

Beacon includes a voice-transceiver (Yes or No) - provides prevention against continuous operation of voice transmitter (Yes or No), and if Yes specify: - maximum continuous voice-transmission duration (limit), minutes - Manufacturer-specified total duration of voice-transmitter operation during the declared rated lifetime ("On time"), (hrs)	No
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
Beacon model hardware part number (P/N) and version	Z424
Beacon model software/firmware P/N, version, date of issue/releases	1001767 issue A01
Beacon model printed circuit board P/N and version	1001488 issue A
Known non-compliances with C/S T.001 requirements(Yes or No) If Yes, provide details (Submit C/S T.007 Section 5, part t, if applicable)	No
Beacon Manufacturer Point of Contact (POC) for this Type Approval application:	Name and Job Title: Erwan THOMAS Certification and Hardware Engineer Phone: +33 (0)2 91 02 49 83 E-mail: erwan.thomas@orolia.com

Dated: 11/01/2019

Signed: 

Stephane JINCHÉLAT, R&D Manager and Marine Design Authority
 (Name, Position and Signature of Beacon Manufacturer Representative)



Product Service

1.2.1 Information Provided by the Cospas-Sarsat Accepted Test Facility

Name and Location of Beacon Test Facility: TÜV SÜD Product Service, United Kingdom

Date of Submission for Testing: March 2018

Applicable C/S Standards:

Document	Issue	Revision	Date
C/S T.001	4	3	June-18
C/S T.007	5	2	June-18
C/S T.IP (TCXO)	1	5	Oct-13

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat Type Approval Standard (C/S T.007) and complies with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001) as demonstrated in the attached report.¹

Non-compliances:
None

Deviations:
None

Observations / Notes:

None

Signed:

Name:

Matthew Russell

Position Held:

Authorised Signatory

Date:

14 January 2019

¹ If the test results do not indicate full compliance to the above standards, or deviations from the standard test procedures took place during type approval testing, the test laboratory shall modify this statement to identify discrepancies. A complete explanation of such discrepancies should be provided in the test report and the report references identified in this statement.

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Orolia Limited SAFELINK SOLO PLB as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test

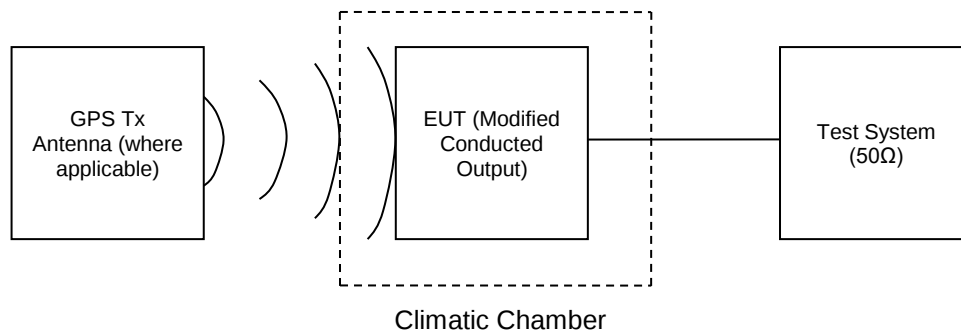
1.3.2 Physical Test Configuration

The Equipment Under Test (EUT) was operated using its own power source (internal battery). One EUT was configured so that the antenna port was connected to the 50 Ω test system using a coaxial cable. The test configuration for all tests is identical with the exception of Antenna Characteristics, Satellite Qualitative and Position Acquisition Time and Position Accuracy.

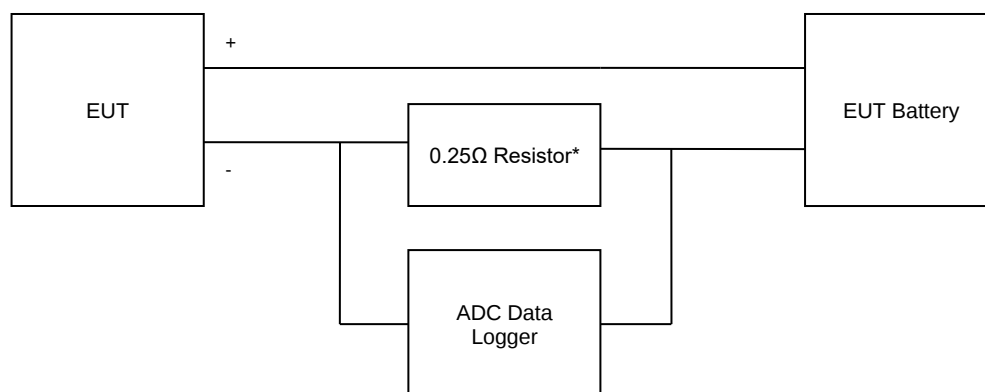
The second EUT was a fully packaged beacon, similar to the proposed production beacons equipped with its proper antenna. This EUT was used to perform Antenna Characteristics, Satellite Qualitative and Position Acquisition Time and Position Accuracy. The test configuration for these tests is a function of the beacon type and the operational environments supported by the beacon, as declared by the manufacturer.

System Configurations

Conducted Laboratory Tests



Battery Current Measurements



Note: The resistor in series with negative line of battery

* Removed for Standby mode measurements.

For other Navigation, Satellite and Antenna test configurations, see photographs in section 5 of this report.

Further Information

The EUT is fitted with an internal GPS receiver. From cold start, without GPS signal data present, the duty cycle of the receiver is as described in the manufacturer information. After a 15-minute warm up, electrical and functional tests were carried out for 30 minutes to ensure that measurements were made during periods when the GPS receiver was active and inactive.



Product Service

1.3.3 Modes of Operation

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

Off/Standby Mode

- Main switch to "OFF" position. (Activation button not depressed)
- No apparent activity

Self-test

- "TEST" button pressed and held for $> 2 < 10$ seconds
- List of items checked as per Customer Supplied Information (Application Form)
- Navigation data applied at ambient temperature

GNSS Self-test

- "TEST" button pressed and held for 10 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

- "ON" button pressed until strobe light indicated activation
- 121 Homer active and offset
- GPS operating in normal duty cycle for the following navigation input conditions
- No navigation data applied (unless otherwise stated)



Product Service

1.4 TEST LOCATIONS

Antenna Test: Hursley EMC Services Ltd. Hursley, Hants, UK
Satellite Qualitative/Navigation test A.3.8.2.1: Daedalus Airfield, Lee-on-the-Solent, Hants, UK
All other tests: Octagon House Laboratory, Fareham, Hampshire, UK

1.5 MODIFICATIONS

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable
1	Firmware update regarding: User Location test protocol, 121 homing transmitter, firmware update regarding PIE	TUV SUD	06 August 2018

1.6 REPORT MODIFICATION RECORD

Issue 1 – First Issue

Issue 2 – Revised EUT name format. Application form updated as per Manufacturer supplied document. Annex A (manufacturer document) updated as supplied.



Product Service

SECTION 2

TEST DETAILS

Limited Testing of the
Orolia Limited
SAFELINK SOLO PLB



Product Service

TEST RESULTS TABLE

Parameters to be Measured	Range of Specification	Units	Test Results			Comments	
			Tmin	Tamb	Tmax		
			(-20°C)	(+21°C)	(+55°C)		
1. Power Output						Result: Pass	
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0							
Transmitter power output	(maximum)	35 - 39	dBm	-	37.44	-	
	(minimum)			-	37.42	-	
Power output rise time	(maximum)	< 5	ms	-	0.07	-	
	(minimum)			-	0.06	-	
Power output 1ms before burst	(maximum)	< -10	dBm	-	-39.51	-	
	(minimum)			-	-40.81	-	
2. Digital Message Coding						Result: Pass	
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0							
Bit Sync	1 - 15	15 bits “1”	P / F	-	P	-	
Frame sync	16 - 24	“000101111”	P / F	-	P	-	
Format flag	25	1 bit	bit value	-	1	-	
Protocol flag	26	1 bit	bit value	-	0	-	
Identification / position data	27 - 85	59 bits	P / F	-	P	-	
BCH code	86 -106	21 bits	P / F	-	P	-	
Emerg. Code/nat. use/supplem. Data	107 - 112	6 bits	bit value	-	110111	-	
Additional data / BCH (if applicable)	112 - 144	32 bits	P / F	-	P	-	
Position Error (if applicable)		< 5	km	-	N/A	-	



Product Service

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
3. Digital Message Generator						Result: Pass
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0						
Repetition rate, T _R :						
Average T _R	48.5 ≤ T _{Ravg} ≤ 51.5	seconds	-	49.993	-	
Minimum T _R	47.5 ≤ T _{Rmin} ≤ 48.0	seconds	-	47.689	-	
Maximum T _R	52.0 ≤ T _{Rmax} ≤ 52.5	seconds	-	52.214	-	
Standard deviation	0.5 - 2.0	seconds	-	1.31	-	
Bit rate						
Minimum fb	≥ 396	bits/sec	-	400.02	-	
Maximum fb	≤ 404	bits/sec	-	400.02	-	
Total transmission time						
Short message	(maximum)		-	N/A	-	
	(minimum)	435.6 - 444.4	ms	-	N/A	-
Long message	(maximum)		-	522.69	-	
	(minimum)	514.8 - 525.2	ms	-	522.64	-
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	-	160.09	-	
Maximum T1	≤ 161.6	ms	-	160.14	-	
First burst delay	≥ 47.5	seconds	-	50	-	



Product Service

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
4. Modulation						Result: Pass
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0						
Biphase-L	P / F	P / F	-	P	-	
Rise time (maximum)	50 - 250	µs	-	197.4	-	
(minimum)	50 - 250	µs	-	195.4	-	
Fall time (maximum)	50 - 250	µs	-	197.7	-	
(minimum)	50 - 250	µs	-	195.6	-	
Phase deviation: positive (maximum)	+(1.0 to 1.2)	radians	-	1.1356	-	
(minimum)	+(1.0 to 1.2)	radians	-	1.0836	-	
Phase deviation: negative (maximum)	-(1.0 to 1.2)	radians	-	-1.1271	-	
(minimum)	-(1.0 to 1.2)	radians	-	-1.0739	-	
Symmetry measurement	≤ 0.05		-	0.0028	-	
5. 406 MHz Transmitted Frequency						Result: Pass
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0						
Nominal Value (maximum)	C/S T.001	MHz	-	406.0310767	-	
(minimum)			-	406.0310765	-	
Short-term stability (maximum)	≤ 2x10 ⁻⁹	/100ms	-	75.959E-12	-	
(minimum)			-	58.067E-12	-	
Medium-term stability – Slope (maximum)	(-1 to +1)x10 ⁻⁹	/minutes	-	52.096E-12	-	
(minimum)			-	-84.652E-12	-	
Medium-term stability – Residual (maximum)	≤ 3x10 ⁻⁹		-	17.016E-11	-	
frequency variation (minimum)			-	10.806E-11	-	
6. Spurious Emissions into 50ohms						Result: Pass
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 0						
In band (406.0 – 406.1 MHz)	C/S T.001 mask	P / F	-	P	-	



Product Service

Parameters to be Measured	Range of Specification	Units	Test Results				Comments		
14. Satellite Qualitative Tests							Result: Pass		
Model: SAFELINK SOLO, S/N:#10, TUV Ref: TSR41 and Modification State 1									
Test Configuration	As per C/S T.007		Configuration						
			5	6	7	8			
			15 Hex ID Decoded by LUT	correct	P / F	-		-	P
Doppler Location results with error ≤ 5km	≥ 80	%	-	-	95.00	83.33			
15. Antenna Characteristics (EIRP re-calculation only)							Result: Pass		
Model: SAFELINK SOLO, S/N: #18, TUV Ref: TSR2 and Modification State 0									
Test Configuration	As per C/S T.007		Configuration						
			1	2	3	4			
			Polarisation	linear or RHCP	-	-		Linear	Linear
			VSWR	≤ 1.5	-	-		N/A	N/A
			EIRP _{LOSS}	-	-	2.27		2.27	
			EIRP _{maxEOL}	≤ 43	-	-		42.9	38.8
EIRP _{minEOL}	≥ 32	dBm	-	-	32.9	31.7			
							Detachable Antennas Only		
							EIRP _{minEOL} limit decreases to 30 dBm for Configuration 4		



Product Service

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
17. Navigation System					Result: Pass	
Model: SAFELINK SOLO, S/N: #10, TUV Ref: TSR41 and Modification State 1						
Location protocol	C/S T.001		National	Standard	User	
Configuration 7						
Position accuracy - A.3.8.2.1	C/S T.001	m	24.2	24.2	1553.3	
Position Acquisition Time - A.3.8.2.1	<10/1	min	51	51	51	
Position accuracy - A.3.8.2.2	C/S T.001	m	35.6	35.6	1553.3	
Position Acquisition Time - A.3.8.2.2	<10/1	min	51	51	51	
Configuration 8						
Position accuracy - A.3.8.2.1	C/S T.001	m	24.2	24.2	1597.4	
Position Acquisition Time - A.3.8.2.1	<10/1	min	51	51	51	
Position accuracy - A.3.8.2.2	C/S T.001	m	24.2	35.6	1597.4	
Position Acquisition Time - A.3.8.2.2	<10/1	min	51	51	51	



Product Service

2.1 POWER OUTPUT

2.1.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (a)

2.1.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 0

2.1.3 Date of Test

04 July 2018

2.1.4 Test Equipment Used

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

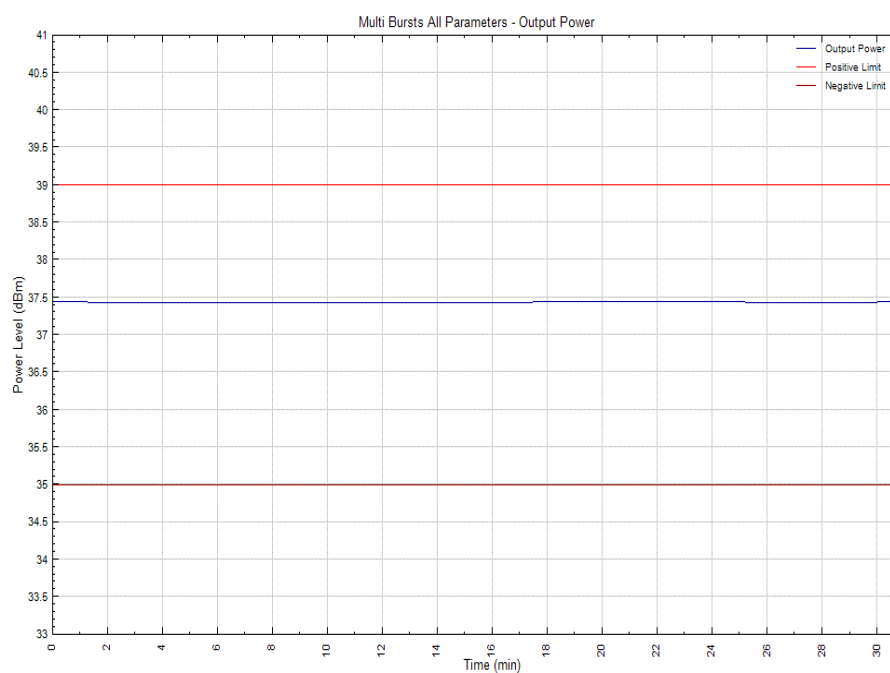
2.1.5 Environmental Conditions

Ambient Temperature 24.0°C

Relative Humidity 44.6%

2.1.6 Test Results

Ambient Temperature



Summary

The EUT complies with clause A.3.2.2 of Cospas-Sarsat T.007.



Product Service

2.2 DIGITAL MESSAGE

2.2.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (b)

2.2.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 0

2.2.3 Date of Test

04 July 2018

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 24.0°C

Relative Humidity 44.6%



Product Service

2.2.6 Test Results

Test Duration: 30 minutes

No. of bursts: 38

Ambient Temperature

Message	FFFE2F8C9F70465FC0FF01F754779F3C0010		
Hex ID	193EE08CBF81FE0		
Position	None - Default Values		
Parameter	Bit	Data Bits	Decoded Value
Bit synchronization	1-15	1111111111111111	1111111111111111
Frame synchronization	16-24	000101111	000101111
Format Flag	25	1	1
Protocol Flag	26	0	0
Country Code	27-36	0011001001	Albania (Republic of)
Protocol Code	37-40	1111	National Test Location Protocol
National ID Number	41-58	011100000100011001	011100000100011001
N/S	59	0	Default
Latitude Degrees	60-66	1111111	Default
Latitude Minutes	67-71	00000	Default
E/W	72	0	Default
Longitude Degrees	73-80	11111111	Default
Longitude Minutes	81-85	00000	Default
BCH Code (21 Bit)	86-106	001111101110101010001	001111101110101010001
Calculated BCH Code (21 Bit)	-	001111101110101010001	001111101110101010001
Supplementary Data Fixed	107-109	110	110
Additional Data Flag	110	1	Delta Position
Encoded Position Data Source	111	1	Internal
121.5 MHz Homing	112	1	Yes
Delta Latitude +/-	113	1	Default
Delta Latitude Minutes	114-115	00	Default
Delta Latitude Seconds	116-119	1111	Default
Delta Longitude +/-	120	1	Default
Delta Longitude Minutes	121-122	00	Default
Delta Longitude Seconds	123-126	1111	Default
National Use	127-132	000000	000000
BCH Code (12 Bit)	133-144	000000010000	000000010000
Calculated BCH Code (12 Bit)	-	000000010000	000000010000

Summary

The EUT complies with clause A.3.1.4 of Cospas-Sarsat T.007.



Product Service

2.3 MODULATION

2.3.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (d)

2.3.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 0

2.3.3 Date of Test

04 July 2018

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 24.0°C

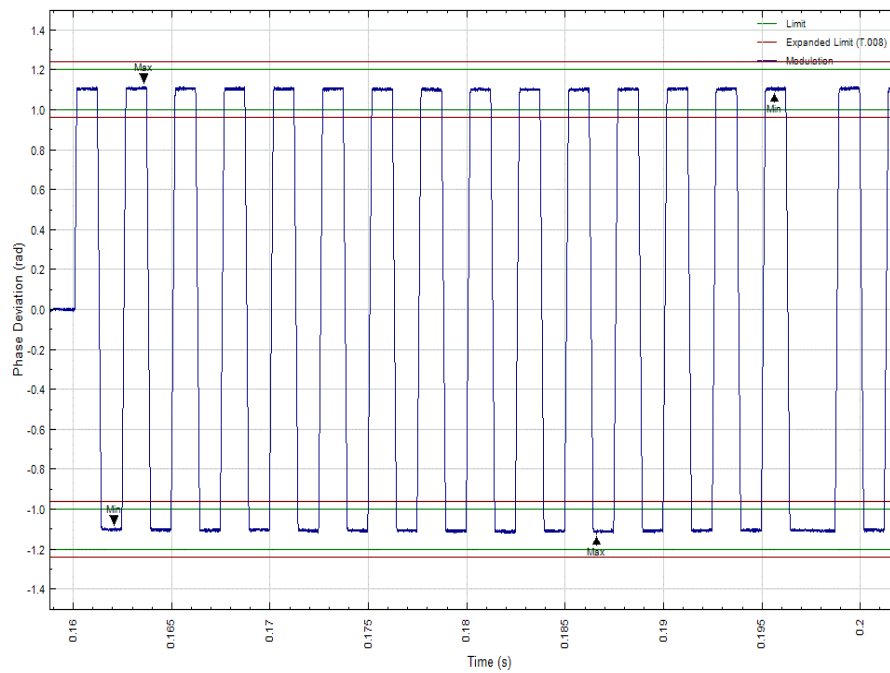
Relative Humidity 44.6%

2.3.6 Test Results

Test Duration: 30 minutes

No. of bursts: 38

Ambient Temperature



Summary

The EUT complies with clause A.3.2.3 of Cospas-Sarsat T.007.



Product Service

2.4 406 MHZ TRANSMITTED FREQUENCY

2.4.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (e)

2.4.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 0

2.4.3 Date of Test

04 July 2018

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

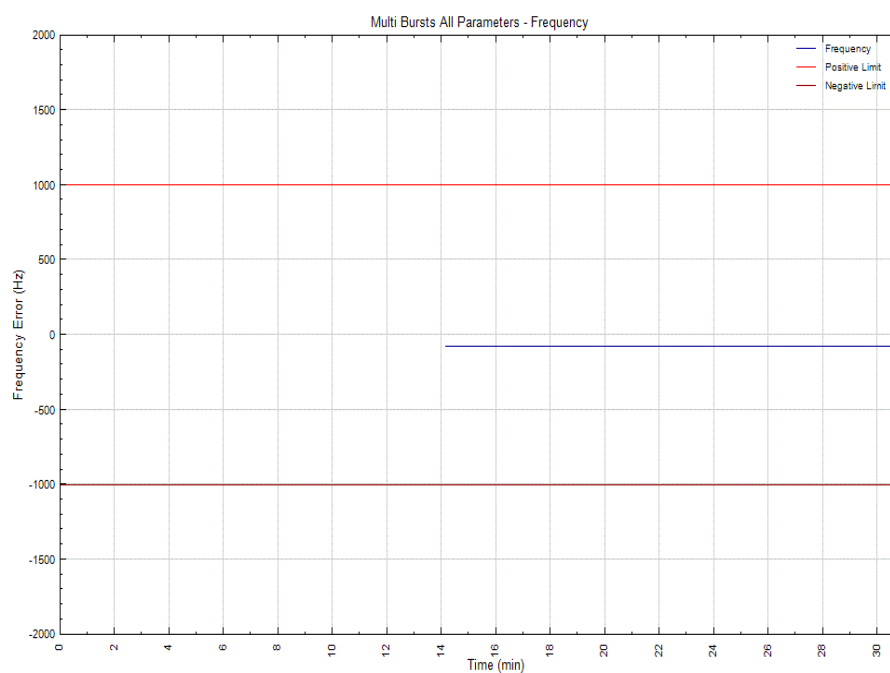
Ambient Temperature 24.0°C

Relative Humidity 44.6%

2.4.6 Test Results

Ambient Temperature

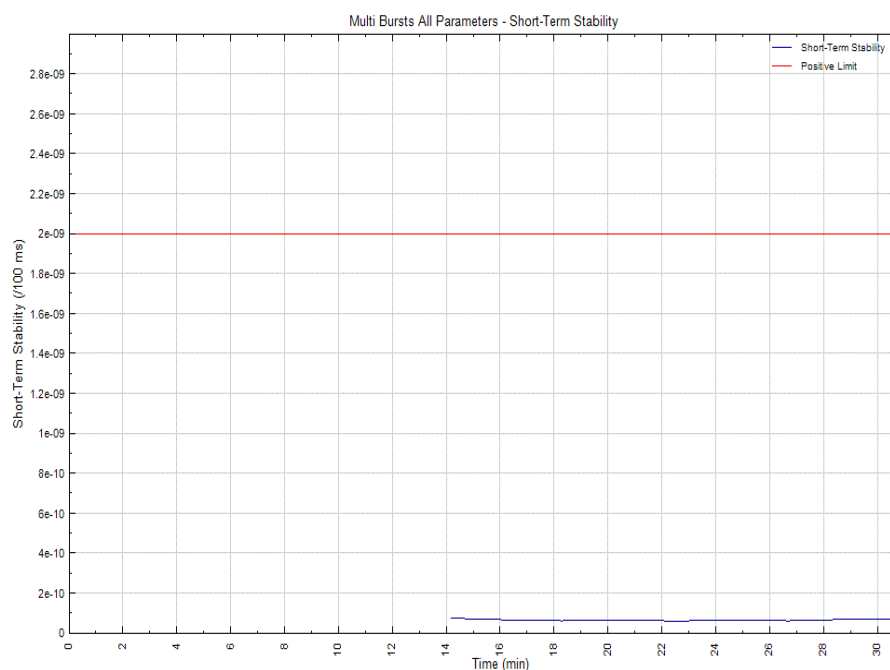
Nominal Frequency



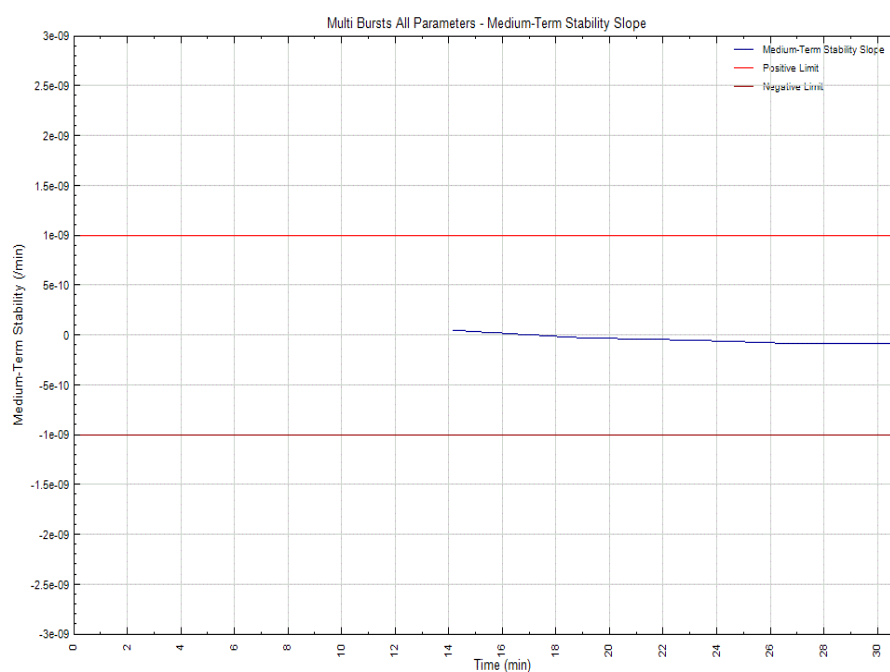


Product Service

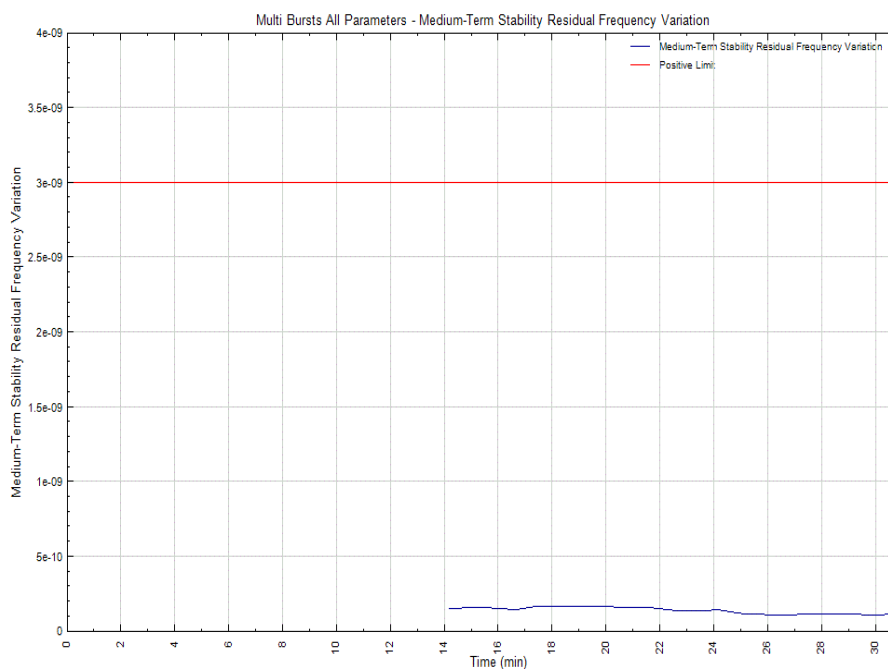
Short Term Stability



Medium Term Stability – Slope



Medium Term Stability, Residual Frequency Variation



Summary

The EUT complies with clause A.3.2.1 of Cospas-Sarsat T.007.



Product Service

2.5 SPURIOUS EMISSION INTO 50 OHMS

2.5.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (f)

2.5.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 0

2.5.3 Date of Test

04 July 2018

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 24.0°C

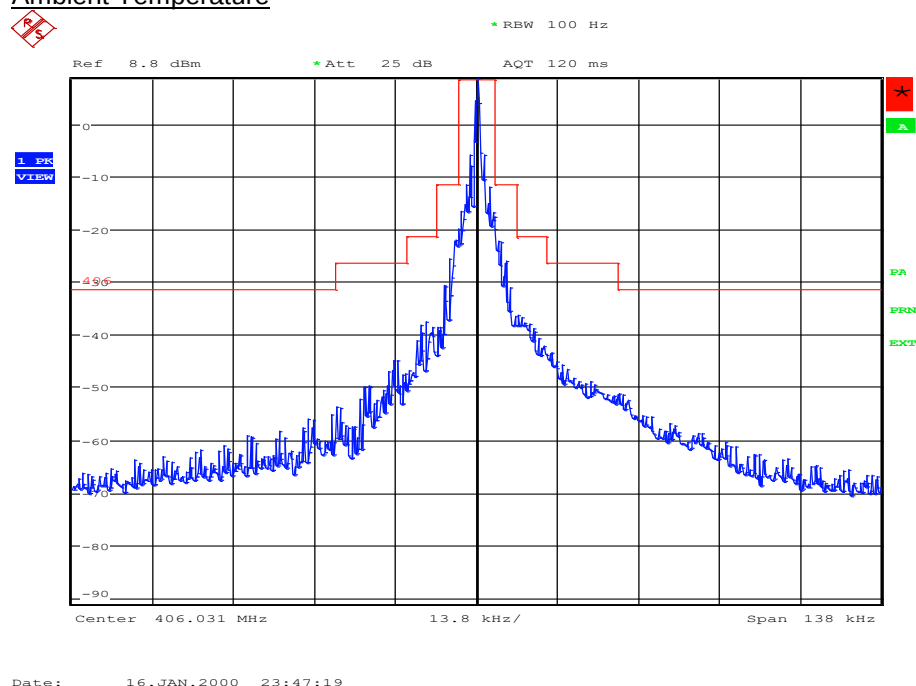
Relative Humidity 44.6%

2.5.6 Test Results

Test Duration: 30 minutes

No. of bursts: 38

Ambient Temperature



Date: 16.JAN.2000 23:47:19

Summary

The EUT complies with clause A.3.2.2.4 of Cospas-Sarsat T.007.



Product Service

2.6 SATELLITE QUALITATIVE TESTS

2.6.1 Specification

Cospas-Sarsat T.007, Clause A.2.5

2.6.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 1

2.6.3 Date of Test

29 October 2018

26 November 2018 – 27 November 2018

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 6.0 – 10.2°C

Relative Humidity 49.9 – 93.2%



Product Service

2.6.6 Test Results

Configuration 7

Test Start: 2018-11-26 15:20:00
 Test End: 2018-11-27 10:13:00
 15 Hex ID: 193DF380C6FFBFF

Actual location of the test beacon: 50.814305
 (Daedalus Airfield, Lee-on-the-Solent, Central) -1.2017598

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S12	50512	193DF 380C6 FFBFF	50.81367	-1.13411	-130.10	17:45:44	-18.940	4.749
S13	32126	193DF 380C6 FFBFF	50.83242	-1.17216	-140.18	22:59:15	-20.405	2.890
S13	32125	193DF 380C6 FFBFF	50.81833	-1.19741	-126.18	21:17:58	-4.415	0.538
S11	62810	193DF 380C6 FFBFF	50.82143	-1.19022	-126.74	21:54:05	-12.061	1.130
S11	62809	193DF 380C6 FFBFF	50.81817	-1.20525	-118.06	20:13:36	3.633	0.493
S11	62808	193DF 380C6 FFBFF	50.81959	-1.20569	-121.05	18:34:30	17.382	0.647
S10	69674	193DF 380C6 FFBFF	50.82700	-1.20151	-128.79	20:07:56	-5.183	1.408
S13	32124	193DF 380C6 FFBFF	50.81920	-1.22091	-133.90	19:38:10	10.567	1.451
S7	6819	193DF 380C6 FFBFF	50.82455	-1.19729	-128.85	18:57:40	-7.781	1.178
S10	69673	193DF 380C6 FFBFF	50.82441	-1.21842	-130.93	18:27:29	9.915	1.620
S12	50511	193DF 380C6 FFBFF	50.77910	-0.86564	-130.65	16:04:00	-3.050	23.930
S7	6818	193DF 380C6 FFBFF	50.82579	-1.21486	-129.33	17:17:53	7.511	1.571
S7	6817	193DF 380C6 FFBFF	50.82404	-1.22388	-136.35	15:39:27	20.354	1.892
S7	6827	193DF 380C6 FFBFF	50.80259	-1.20480	-128.69	08:46:47	10.658	1.323
S10	69681	193DF 380C6 FFBFF	50.80363	-1.20867	-131.47	08:24:31	-6.316	1.285
S12	50520	193DF 380C6 FFBFF	50.80712	-1.20327	-130.67	07:40:48	19.768	0.809
S7	6826	193DF 380C6 FFBFF	50.80477	-1.21480	-127.71	07:07:17	-4.258	1.404
S12	50519	193DF 380C6 FFBFF	50.81074	-1.19710	-128.86	06:01:26	6.753	0.515
S7	6825	193DF 380C6 FFBFF	50.81108	-1.20359	-139.96	05:26:21	-20.179	0.384
S12	50518	193DF 380C6 FFBFF	50.80897	-1.20522	-130.20	04:20:40	-8.713	0.644

Location Errors greater than 5 km are marked in red text.

$$\begin{aligned}
 \text{Ratio of Successful Solutions} &= \frac{\text{number of Doppler solutions within 5 km with } 1^\circ < \text{CTA} < 21^\circ}{\text{number of satellite passes over test duration with } 1^\circ < \text{CTA} < 21^\circ} \\
 &= \frac{19}{20} \\
 &= 95.0\%
 \end{aligned}$$



Product Service

Configuration 8

Test Start: 2018-10-29 16:05:00
 Test End: 2018-10-29 22:45:00
 15 Hex ID: 193E0031BF81FE0

Actual location of the test beacon: 50.814305
 (Daedalus Airfield, Lee-on-the-Solent, Central) -1.2017598

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	Mean Rx Power (dBm)	TCA	CTA (deg)	Location Error (km)
S13	31728	193DF 380C6 FFBFF	50.80907	-1.20403	-127.53	22:37:41	-17.057	0.607
S11	62412	193DF 380C6 FFBFF	50.82295	-1.19123	-125.11	21:34:19	-8.745	1.209
S13	31727	193DF 380C6 FFBFF	50.82271	-1.12475	-126.45	20:56:45	-1.192	5.485
S10	69279	193DF 380C6 FFBFF	50.82821	-1.18934	-125.77	20:33:23	-9.786	1.771
S11	62411	193DF 380C6 FFBFF	50.82639	-1.20987	-125.12	19:54:07	6.698	1.456
S11	62410	193DF 380C6 FFBFF	50.82104	-1.21259	-116.98	18:15:19	19.805	1.066
S13	31726	193DF 380C6 FFBFF	50.81859	-1.21778	-129.26	19:17:14	13.403	1.222
S7	6420	193DF 380C6 FFBFF	50.85904	-1.34299	-126.27	18:59:49	-8.281	11.088
S10	69278	193DF 380C6 FFBFF	50.83228	-1.21664	-125.51	18:52:31	5.783	2.252
S10	69277	193DF 380C6 FFBFF	50.82235	-1.21005	-119.08	17:13:03	19.027	1.065
S7	6419	193DF 380C6 FFBFF	50.82472	-1.21743	-125.43	17:19:57	6.978	1.596
S12	50116	193DF 380C6 FFBFF	50.82219	-1.19575	-125.87	16:27:16	-7.133	0.969

Location Errors greater than 5 km are marked in red text.

$$\begin{aligned}
 \text{Ratio of Successful Solutions} &= \frac{\text{number of Doppler solutions within 5 km with } 1^\circ < \text{CTA} < 21^\circ}{\text{number of satellite passes over test duration with } 1^\circ < \text{CTA} < 21^\circ} \\
 &= \frac{10}{12} \\
 &= 83.33\%
 \end{aligned}$$

Summary

The EUT complies with clause A.2.5 of Cospas-Sarsat T.007.



Product Service

2.7 BEACON ANTENNA TEST

2.7.1 Specification

Cospas-Sarsat T.007, Clause A.2.6

2.7.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #18 - Modification State 0

2.7.3 Date of Test

24 April 2018

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 17.3°C

Relative Humidity 54.6%

2.7.6 Test Results

Configuration 3

Legend: **Strikeout** **Under-range** **Over-range** **Vv-Vh < 10 dB**

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	39.1	1.6	41.3	3.9	42.8	5.4	37.4	0.0	35.2	-2.2
30	38.9	1.5	41.1	3.7	42.7	5.3	37.4	-0.1	35.3	-2.1
60	38.9	1.4	41.3	3.9	42.8	5.4	37.6	0.1	35.7	-1.8
90	38.9	1.4	41.3	3.9	42.8	5.4	37.6	0.1	35.4	-2.1
120	38.8	1.3	41.3	3.9	42.9	5.5	37.7	0.2	35.2	-2.3
150	38.8	1.3	41.2	3.8	42.9	5.5	37.5	0.1	35.4	-2.0
180	38.9	1.4	41.3	3.9	42.8	5.4	37.6	0.2	35.4	-2.0
210	38.9	1.4	41.3	3.9	42.7	5.3	37.2	-0.2	35.2	-2.2
240	39.0	1.5	41.4	4.0	42.8	5.4	37.4	0.0	35.6	-1.9
270	39.2	1.7	41.5	4.1	42.8	5.4	37.4	0.0	35.4	-2.0
300	39.0	1.5	41.4	4.0	42.8	5.4	37.5	0.1	35.3	-2.1
330	39.1	1.6	41.5	4.1	42.9	5.5	37.4	0.0	35.5	-2.0

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh
0	111.1	93.8	113.0	93.6	113.8	92.0	107.3	90.3	103.6	82.2
30	111.0	93.4	112.8	93.9	113.7	91.9	107.2	90.9	103.7	81.1
60	110.9	93.6	113.0	94.2	113.8	91.5	107.4	91.5	104.1	75.3
90	110.9	93.8	113.0	93.8	113.8	91.2	107.4	92.0	103.8	73.0
120	110.8	93.8	113.0	93.5	113.9	91.1	107.5	91.6	103.6	73.3
150	110.8	93.9	112.9	93.3	113.9	90.7	107.4	90.6	103.8	78.1
180	110.9	93.6	113.0	93.1	113.8	90.4	107.5	90.0	103.8	82.1
210	110.9	93.6	113.0	92.8	113.7	90.7	107.1	89.7	103.6	79.4
240	111.0	93.6	113.1	92.3	113.8	90.8	107.3	89.6	103.9	88.0
270	111.2	93.7	113.2	92.8	113.8	91.5	107.3	89.5	103.8	85.3
300	111.0	93.6	113.1	93.1	113.8	91.6	107.4	89.9	103.7	84.0
330	111.1	93.8	113.2	93.2	113.9	91.6	107.3	90.1	103.8	86.3
Min (Vv-Vh)	16.9		18.8		21.8		15.4		15.9	

$$\text{EIRP}_{\text{LOSS}} = P_{\text{tambient}} - P_{\text{tEOL}} = 37.44 - 35.17 = 2.27 \text{ dB}$$

$$\text{EIRP}_{\text{maxEOL}} = \text{Max}[\text{EIRP}_{\text{max}}, (\text{EIRP}_{\text{max}} - \text{EIRP}_{\text{LOSS}})] = \text{Max}[42.9, 40.6] = 42.9 \text{ dBm}$$

$$\text{EIRP}_{\text{minEOL}} = \text{Min}[\text{EIRP}_{\text{min}}, (\text{EIRP}_{\text{min}} - \text{EIRP}_{\text{LOSS}})] = \text{Min}[35.2, 32.9] = 32.9 \text{ dBm}$$



Product Service

Configuration 4

Legend: **Strikeout** **Under-range** **Over-range** $V_v - V_h < 10 \text{ dB}$

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	33.9	-3.5	37.1	-0.3	36.4	-1.1	34.7	-2.8	31.4	-6.0
90	34.2	-3.2	38.0	0.5	37.8	0.3	36.1	-1.3	34.3	-3.1
180	34.9	-2.6	38.5	1.1	38.8	1.4	37.8	0.3	36.2	-1.2
270	34.8	-2.7	38.0	0.6	38.1	0.7	37.2	-0.2	34.4	-3.0

$$\text{EIRP}_{\text{LOSS}} = P_{\text{tambient}} - P_{\text{tEOL}} = 37.44 - 35.17 = 2.27 \text{ dB}$$

$$\text{EIRP}_{\text{maxEOL}} = \text{Max}[\text{EIRP}_{\text{max}}, (\text{EIRP}_{\text{max}} - \text{EIRP}_{\text{LOSS}})] = \text{Max}[38.8, 36.5] = 38.8 \text{ dBm}$$

$$\text{EIRP}_{\text{minEOL}} = \text{Min}[\text{EIRP}_{\text{min}}, (\text{EIRP}_{\text{min}} - \text{EIRP}_{\text{LOSS}})] = \text{Min}[33.9, 31.7] = 31.7 \text{ dBm}$$

NOTE: The final results shown for Configurations 3 and 4 have been calculated using the P_{tEOL} value taken from TUV document 75942209 Report 14.

Summary

The EUT complies with clause A.2.6 of Cospas-Sarsat T.007.



Product Service

2.8 NAVIGATION SYSTEM TEST

2.8.1 Specification

Cospas-Sarsat T.007, Clause A.2.7

2.8.2 Equipment Under Test and Modification State

SAFELINK SOLO S/N: #10 - Modification State 1

2.8.3 Date of Test

15 November 2018

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 13.2 – 14.8°C

Relative Humidity 86.1 – 90.8%

2.8.6 Test Results

Position Acquisition Time and Position Accuracy (C/S T.007 A.3.8.2)

Locations:

A.3.8.2.1: 50° 52.121' N 1° 14.685'W ①

A.3.8.2.2: 50° 48.860'N 1° 12.104'W ①

The appropriate position was applied, the EUT activated and time to first message containing valid position data timed.

National Protocol

Configuration as per C/S T.007	C/S T.007 Section A.3.8.2.1		C/S T.007 Section A.3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Configuration 7	51	24.2	51	35.6
Configuration 8	51	24.2	51	35.6



Product Service

Standard Protocol

Configuration as per C/S T.007	C/S T.007 Section A.3.8.2.1		C/S T.007 Section A.3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Configuration 7	51	24.2	51	35.6
Configuration 8	51	24.2	51	35.6

User Protocol

Configuration as per C/S T.007	C/S T.007 Section A.3.8.2.1		C/S T.007 Section A.3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Configuration 7	51	1553.3	51	1597.4
Configuration 8	51	1553.3	51	1597.4

Positional accuracy was calculated using the Haversine Formula, The Earth's radius was taken as 6367 km.

① GPS Site Survey – Live Location

Summary

The EUT complies with clause A.2.7 of Cospas-Sarsat T.007.



Product Service

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 2.7 Beacons - Antenna Characteristics					
Antenna, (Tuned Dipole Set)	Roberts Antenna	A-100	569	-	TU
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	07-Nov-2018
Roberts Antenna 406MHz	Compliance Design		1860	24	06-Apr-2020
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Humidity & Temperature Meter	Radio Spares	1361C	4420	12	21-Jun-2018
Section 2.1, 2.2, 2.3, 2.4 Beacons - Constant Temperature Tests					
Power Meter	Hewlett Packard	436A	47	12	03-Aug-2018
Signal Generator	Hewlett Packard	8644A	96	12	04-May-2019
Time Interval Analyser	Yokogawa	TA720	181	12	20-Apr-2019
Termination (50ohm)	Diamond Antenna	DL-30N	337	12	19-Dec-2018
Termination (50ohm)	Radio Spares	613-690	353	12	26-Jun-2019
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	18-Dec-2018
Attenuator: 10dB/20W	Narda	766-10	480	12	18-Dec-2018
Power Sensor	Hewlett Packard	8481A	1338	12	31-Oct-2018
Stop Clock	R.S Components	RS328 061	2674	12	13-Jul-2018
Hygrometer	Rotronic	I-1000	2829	12	29-Nov-2018
Beacon RF Unit	TUV SUD Product Service	N/A	3066	-	TU
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	08-Jan-2019
Short Circuit	TUV SUD Product Service	Short Circuit	3272	-	TU
Rubidium Frequency Standard	Symmetrcom	8040C	3490	12	11-May-2019
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	12-Sep-2018
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4510	12	10-Jun-2019
Oscilloscope	Yokogawa	DL750	4552	12	09-Apr-2019
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4602	12	13-Jul-2018
GPS/SBAS Simulator	Spirent	STR4500	3056	12	09-Oct-2018
Section 2.8 Beacons - Navigation System					
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Humidity & Temperature Meter	Rotronic	HP21	4410	12	24-May-2019
Section 2.5 Beacons - Spurious Emissions					
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	18-Dec-2018
Attenuator: 10dB/20W	Narda	766-10	480	12	18-Dec-2018
Hygrometer	Rotronic	I-1000	2829	12	29-Nov-2018
Beacon RF Unit	TUV SUD Product Service	N/A	3066	-	TU
Bandpass Filter	Trilithic	5BE406/35-1-AA	3205	12	08-Jan-2019
Rubidium Frequency Standard	Symmetrcom	8040C	3490	12	11-May-2019
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	14-Mar-2019



Product Service

Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	12-Sep-2018
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4509	12	14-Jun-2018
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4510	12	10-Jun-2019
Section 2.6 Beacons - Satellite Qualitative Test					
Non Conductive Standoff Box	TUV SUD Product Service	-	4966	-	TU
Copper GRP	TUV SUD Product Service	27cm Diameter	3538	-	TU
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Humidity & Temperature Meter	Rotronic	HP21	4410	12	24-May-2019

Note: some tests took place over one or more days and consequently it may appear that some of the test equipment could have been outside of the valid calibration period at the time of testing. However, we confirm that all equipment held a valid and in-date calibration when used, and we hold this information on record.

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment



Product Service

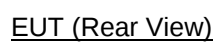
SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)



EUT (Front View)





EUT with antenna deployed



Satellite Qualitative – Configuration 8



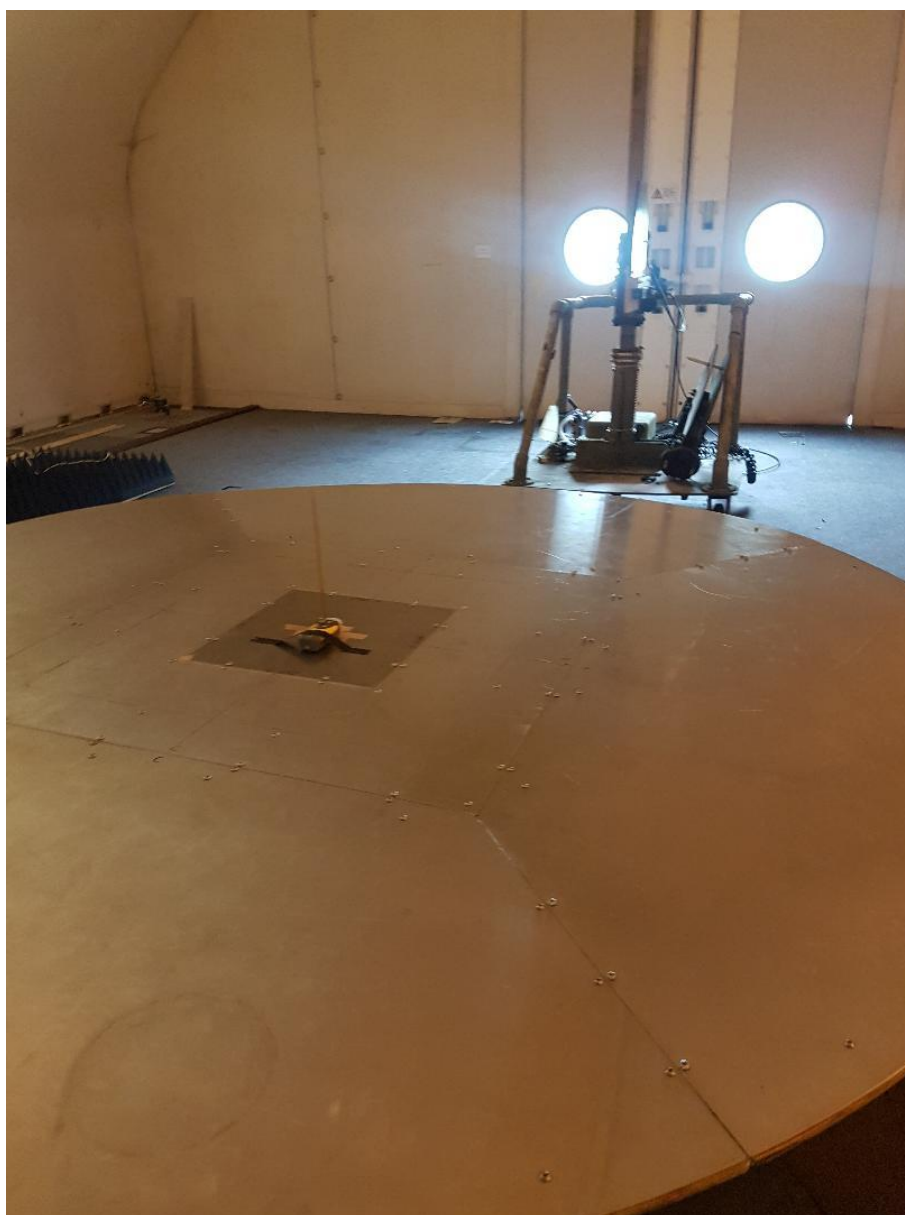
Satellite Qualitative – Configuration 7



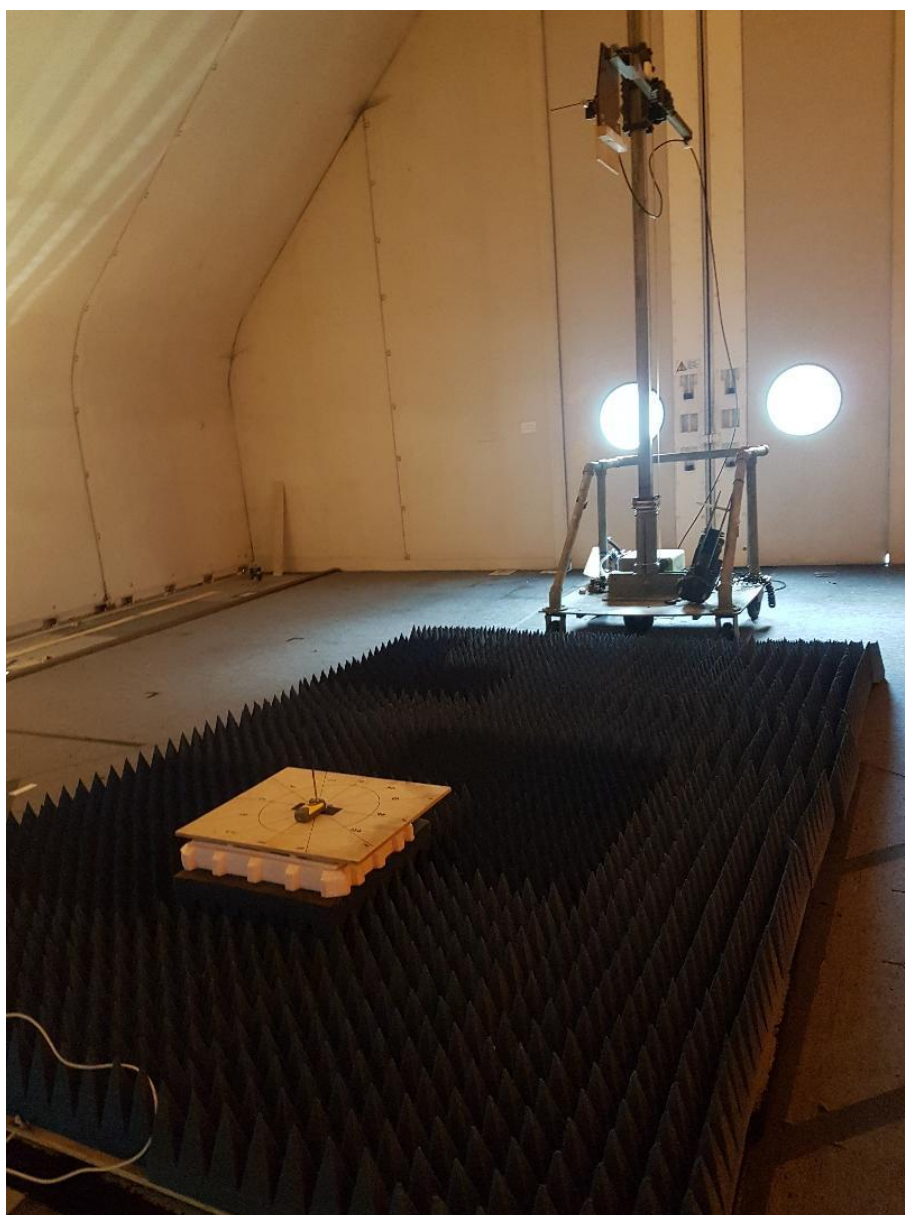
Position Time and Position Accuracy – Configuration 7



Position Time and Position Accuracy – Configuration 8



Antenna Characteristics – Configuration 3



Antenna Characteristics – Configuration 4



Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

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).

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ANNEX A

MANUFACTURER SUPPLIED DATA

Exhibit 5q – Variants Description

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for beacon models with several variants, a comprehensive description of differences between these variants;

The **FAST FIND** Personal Locator Beacon (PLB) uses the dedicated 406MHz frequency to transmit a unique ID and precise GNSS location to the global network of search and rescue satellites. It also integrates a 121.5MHz homing transmission to help local rescue researches.

The **FAST FIND** PLB has 3 existing variants, where electronics is exactly the same :

- Fastfind 220 (Z423)
- **FAST FIND RANGER (Z424)**
- **SAFELINK SOLO (Z424)**

There are no functional differences or performance differences between the beacons with different Beacon Model Names.

The differences between those variants consist on minor modifications of the mechanical parts. The **FAST FIND RANGER** and **SAFELINK SOLO** are identical, except for the label and color.

Between all these variants, there are two existing mechanical parts with minor modifications as described below:

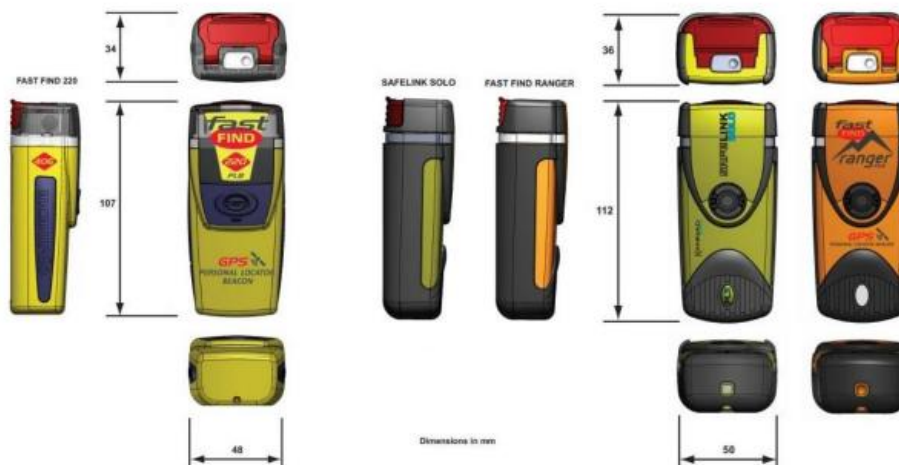


Figure 1

Z423 (FF220) 91-100-xxxB	Z424 FAST FIND RANGER SAFELINK SOLO 91-103-xxxB
PCB and components	Identical
Battery	Identical
Programming software	Identical
Beacon firmware	Identical
Antenna	Identical
Antenna connection to PCB	Identical
Plastic material - Cylcoloy	Identical
Weight = 150g	Weight = 165g
Dimensions LxWxD in mm = 107x48x34	Dimensions LxWxD in mm = 112x50x36
cover moulding	Minor change to external shape, dimensions see figure 1 below
Silicon keypad	Minor change to external shape see figure 1 above
Base plastic moulding	Minor change to external shape, dimensions see figure 1 above
Silicon side grips	None on FF220 see figure 1 above
Lever moulding	identical
Top moulding	identical
Sealing gasket	identical

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