Report On

Emergency Beacons Testing of the
Orolia SAS KANNAD ULTIMA-DT-05
In accordance with Cospas-Sarsat T.007

Document 75954288 Report 01 Issue 4 **June 2023**

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REPORT ON

Emergency Beacons Testing of the
Orolia SAS
KANNAD ULTIMA-DT-05

Document 75954288 Report 01 Issue 4

June 2023

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DATED

06 June 2023

UKAS TESTING 0141

CONTENTS

SECTION 1

REPORT SUMMARY

Emergency Beacons Testing of the
Orolia SAS
KANNAD ULTIMA-DT-05

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Orolia SAS KANNAD ULTIMA-DT-05 to the 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 SAS
Model Number(s)	KANNAD ULTIMA-DT-05
Serial Number(s)	TO0010000002
Number of Samples Tested	1
Test Specification/Issue/Date	Cospas-Sarsat T.007 Issue 5 Rev 7 June 2021
Date of Receipt of Test Samples	22 December 2021
Order Number Date	47713 07 January 2022
Start of Test	21 January 2022
Finish of Test	1 June 2023
Name of Engineer(s)	Christopher Bland
Related Documents	Cospas-Sarsat T.001 Issue 4 Revision 8 June 2021

1.2 APPLICATION FORM

G.1 - Beacon Manufacturer and Beacon Model	
Beacon Manufacturer	OROLIA SAS
Beacon Manufacturer's Address	ZI des 5 chemins 56520 GUIDEL
Beacon Model Name	KANNAD ULTIMA-DT-05
Additional Beacon Model Names	

G.1 - Beacon Type and Operational Configurations		
Beacon Type	Beacon Used While	Tick Where Appropriate (X)
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	
	On ground and above ground and floating in water	
	On ground, above ground, and on a personal floatation device*	
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	X ELT(DT) Specifically Designed to Withstand a Crash Impact (T.001 Section 4.5.10)
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)		

* Applicable only to PLBs with integral antennas operated while attached to personal flotation devices (e.g. lifejackets) where the PLB and its antenna are mounted on PFD in such a position, that, in the nominal mode of operation, they are kept above water.

G.1 - Beacon Characteristics		
Characteristic	Declared Value	
Operating frequency (406 MHz operating channel = 406.nnn)	406.031 MHz	
Operating temperature range	Tmin = -40 °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)	Tmin -40°C	
Manufacturer-declared Minimum Operating Lifetime* * this value is specified by National Administrations or International Organisations	Yes for 406MHz Yes for 121,5MHz N/A N/A	24 hours, or 48 hours, or 168 hours, or Other hours Other hours, (specify)
Beacon power supply type (internal non-rechargeable, internal re-chargeable, external, combined, other)	internal non-rechargeable	
External power supply parameters (AC/DC, nominimal voltage, nominal minimum and nominal maximum voltage)	Current (AC / DC):	DC
	Nominal Voltage (V):	28V
	Nominal Minimum Voltage (V):	17V
	Nominal Maximum Voltage (V):	32,5V
Is external power supply needed to energise the beacon or its ancillary devices in any of operational modes (N/A or Yes or No)	ARINC interface only GNSS before beacon activation Self-test / GNSS Self-test Not used for distress signal	
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	Cell Model Name:	LM 17500
	Cell Size:	A size
	Number of Cells in Battery Pack:	8
	Details of the battery pack electrical configuration:	2 parallel of 4 in series
Battery cell manufacturer	SAFT	
Battery pack manufacturer and part number	Battery Pack Manufacturer Name:	OROLIA
	Battery Pack Part Number:	S1865514-01
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	4	years
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	5	years

Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO	
Oscillator manufacturer	RAKON	
Oscillator model name/ part number	Model Name:	E7913LF
	Part Number:	E7913LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes	
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	External: tri-frequency antenna (406 MHz / 121.5MHz / GNSS)	
Antenna manufacturer	DAYTON GRANGER	
Antenna part name and part number (OEM, if applicable, and beacon manufacturer's)	OEM Model Name:	ELT10-903
	OEM Part Number:	ELT10-903
	Beacon Manufacturer's Model Name:	N/A
	Beacon Manufacturer's Part Number:	N/A
Antenna cable assembly min/max RF- losses at 406 MHz, if applicable	Minimum loss (dB):	0dB
	Maximum loss (dB):	1,8dB
Navigation device type (Internal, External or None)	Internal and External	
Features in beacon that prevent degradation to 406 MHz signal or other beacon performances 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)	In flight: GNSS permanently powered ON, permanent acquisition from GNSS and position encoded 2 seconds prior to every 406MHz burst Post-Crash: GNSS ON during 30 minutes, then 90sec every 15 min until 24h from beacon activation have passed	minutes
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)	No When beacon is turned in a ARM mode, the GNSS receiver cold start is forced. GNSS receiver remains ON and powered by the 28V aircraft power supply until the beacon is activated. Once distress is activated, the GNSS receiver cold start is not forced as beacon is an ELT-DT After Post-Crash, the GNSS cold start is not performed.	
Navigation device manufacturer	UBLOX	
Navigation device model name and part Number	Model Name:	NEO-M8N
	Part Number:	NEO-M8N
Internal navigation device antenna type(integrated, internal, external, passive/active) , manufacturer and model	External, passive	
GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS, Galileo	
For External Navigation Devices		
Data protocol for GNSS receiver to beacon interface	ARINC429 labels latitude/longitude 310/311, altitude 203, UTC :125/150	
Physical interface for beacon to navigation device	ARINC429 twisted pair	
Electrical interface for beacon to navigation device	Bipolar Return to Zero	
Part number of the external navigation interface device (if applicable)	From Aircraft	
Navigation device model and manufacturer (if beacon designed to use specific devices)	From Aircraft	

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 (if 28V presence ok)	Yes (if 28V presence ok)
Results of self-test / GNSS self-test are indicated by (provide details, e.g. Pass / Fail indicator light, strobe light, etc.)	Pass / Fail indicator light	Pass / Fail indicator light
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 (if 28V presence ok)	No
Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
List of Items checked by self-test	Battery Status RF Power External antenna presence CS identification code healthiness 28VDC presence ARINC429 Trigger-in-Flight ARINC429 lat/long GNSS interface	GNSS self-test limit number reached 28VDC presence GNSS failure

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	32 seconds	190 seconds
Maximum recommended number of self-tests / GNSS self-tests during battery pack replacement period (as applicable)	One per month 60 (5 years*12months) over battery replacement period	60 over battery replacement period
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	N/A
Automatic termination of self-test mode immediately after completion of the self-test cycle (Yes or No)	Yes	Yes
GNSS Self-test results in transmission of a single burst, irrespectively 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)	Yes, activable from a Cockpit RCP switching test Manual EBIT (only performed with on 28V presence) : By short switching test button (< 5sec) Self-test : button >5sec & <10sec	Yes, activable from a Cockpit RCP switching test button >10sec
List all methods of Self-test mode and GNSS Self-test modes activation. Provide details on a separate sheet to describe	EBIT (executed on 28V power supply) : Manually by switching TEST button on RCP or beacon front panel less than 5sec Automatically with presence of 28V, after turning the beacon in ARM mode, the EBIT will start after 60 sec and run for 10 seconds SELF-TEST : Manually by switching TEST button on RCP or beacon front panel between > 5sec and < 10sec	GNSS SELF-TEST : Manually by switching TEST button on RCP or beacon front panel between > 10 sec

Repetitive Automated Interrogation of a Beacons Status (Yes & details per section 5.1, item (y), or No)	Yes	EBIT test
Message Coding Protocols	Protocol Option	Tick Where Appropriate (X)
User Protocol	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	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	National Location: EPIRB	
	National Location: ELT	
	National Location: PLB	
ELT(DT) Location Protocol	ELT with Serial Number	X
	ELT with Aircraft Operator and Serial Number	X
	ELT with Aircraft 24-bit Address	X
	ELT with Serial Number and 3LD in PDF-2	X
	ELT with Aircraft 24-bit Address and 3LD in PDF-2	X
RLS Location Protocol (TAC or NRN and Serial Number)	EPIRB	
	ELT	
	PLB	
RLS Location Protocol (MMSI)	EPIRB	
	PLB	

User Location Protocol	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		
Other Declarations	Declared Value		
Beacon includes a homer transmitter(s) (Yes or No)	Yes		
- homer transmitter(s) frequency and power	Frequency	Power (dBm)	Yes / No
	121.5 MHz	19 dBm minimum	Yes
	243.0 MHz	-	No
	AIS	-	No
	Other (MHz)		
	N/A	N/A	No
	Description:	N/A	
homer transmitter(s) duty cycle	37	%	
duty cycle of homer swept tone	37	%	
Beacon includes a high intensity flashing light (e.g. Strobe)	No		
- light intensity	N/A	cd	
- flash rate	N/A	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)	No, ELT(DT) repetition period is compliant with §2.2.1 of C/S T001 for ELT(DT)		

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.	Remote Control Panel RC820 P/N S1820513-29 Buzzer P/N S1820515-16 AIM Dongle P/N S1820514-15	
Beacon includes automatic activation mechanism (Yes or No). Specify type of automatic beacon activation mechanism	Yes / No :	Yes
	Description:	> By an automatic trigger event processed by aircraft avionics and transmitted on ARINC429 label 202 > loss of ARINC labels > loss of 28V > Crash sensor
Beacon includes a voice-transceiver (Yes or No), and if Yes specify:	Yes / No :	No
Voice transmitter nominal output power	If Yes, specify: (dBm)	N/A
Voice transmitter operating frequencies	If Yes, specify: (MHz)	N/A
- provides prevention against continuous operation of voice transmitter (Yes or No), and if Yes specify:	Yes / No :	N/A
- maximum continuous voice-transmission operation ("time-out timer")	"Time-out timer" (minutes):	N/A
- maximuim cumulative transmit-mode on-time ("On time")	On time (hours : minutes):	N/A
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	
	Description:	
Beacon model hardware part number (P/N) and version	S1865501-05 issue A	
Beacon model firmware P/N, version, date of issue/releases	uP : YLS1820 issue A 05JAN22; FPGA : FPGA_TRIGGER_IA028_001_AC	

Beacon model software P/N, version, date of issue/releases	N/A	
Beacon model printed circuit board P/N and version	S1865601-01 issue 10	
Beacon model multiple programmable options, except message coding protocols (Yes/No)	No	
	If Yes, List all programmable options associated with this type-approval application:	
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(*) Samuel DAVENEL 2022.05.11 17:24:13 +02'00'	<< Date >>
Signed(*)	<< Signature >>
(Name, Position and Signature of Beacon Manufacturer Representative)	Samuel DAVENEL - Design Authority

Information Provided by the Cospas-Sarsat Accepted Test Facility

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

Date of Submission for Testing: 22 December 2021

Applicable C/S ELT DT Location Protocols:

Document	Issue	Revision	Date
C/S T.001	4	8	June 2021
C/S T.007	5	7	June 2021
IP (TCXO)	Not Applicable to ELT DT		

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat Type Approval ELT DT Location Protocol (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

Detail any observed non-compliances and/or deviations from ELT DT Location Protocol test procedures here:

Non-compliances:

None

Deviations:

The battery current measurements were found to have been measured incorrectly. They have been repeated (see Annex B.). As the new measurements increased the discharge for F-E.2, the effective duration for Operating Lifetime has been re-calculated and reduced.

For all tests the EUT was activated from the front panel, unless otherwise stated.

Multiple self-discharge rates were used in F-E.2. These rates were supported by the battery data provided by the manufacturer.

Notes:

In the summary table, “Stored position cleared within interval” was changed from 10-10.25 to 5-5.25 to match the current values in T.007, section A.3.8.5 b).

Signed: 

Name: Martin Hardy

Position Held: Authorised Signatory

Date: 06 June 2023

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Orolia SAS KANNAD ULTIMA-DT-05 as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

ULTIMA-DT-05 Front View

ULTIMA-DT-05 Side View

ULTIMA-DT-05 Bottom View

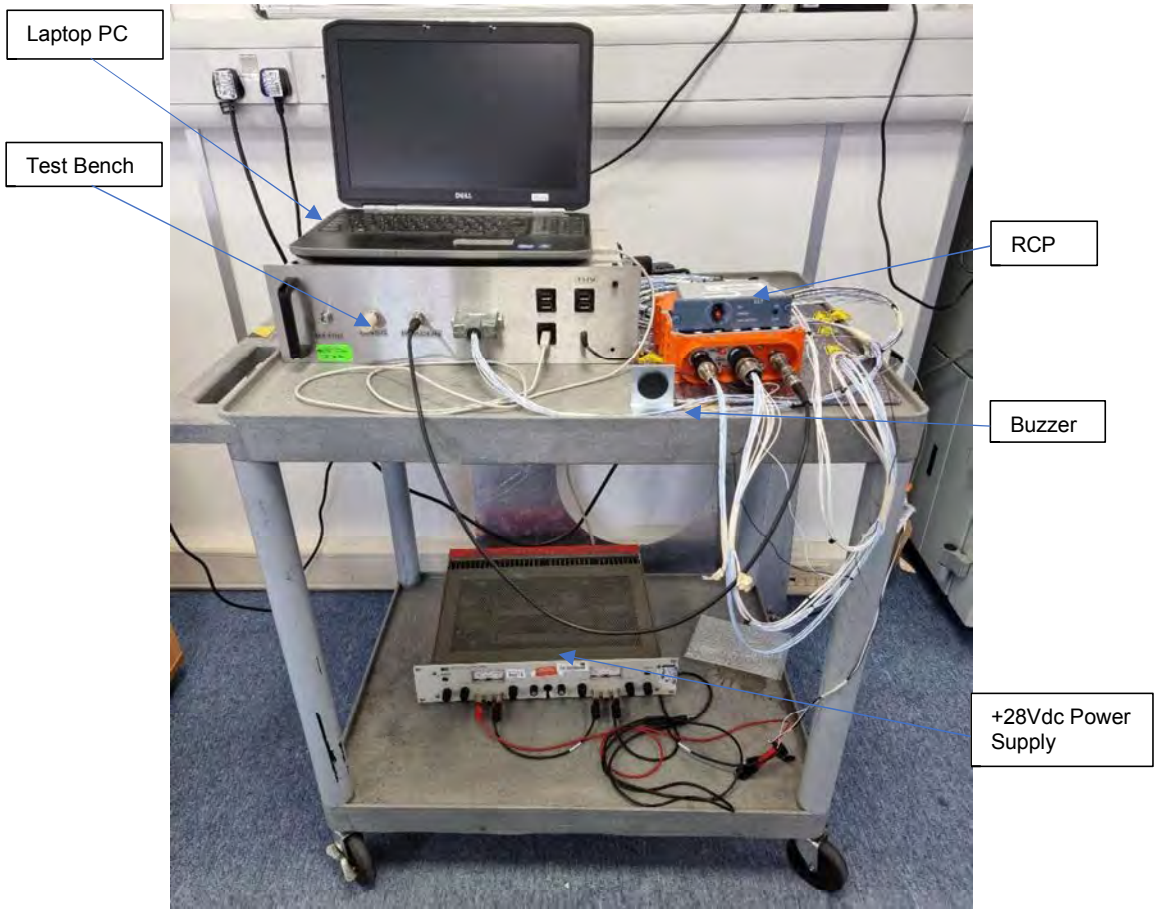
ULTIMA-DT-05 Top View

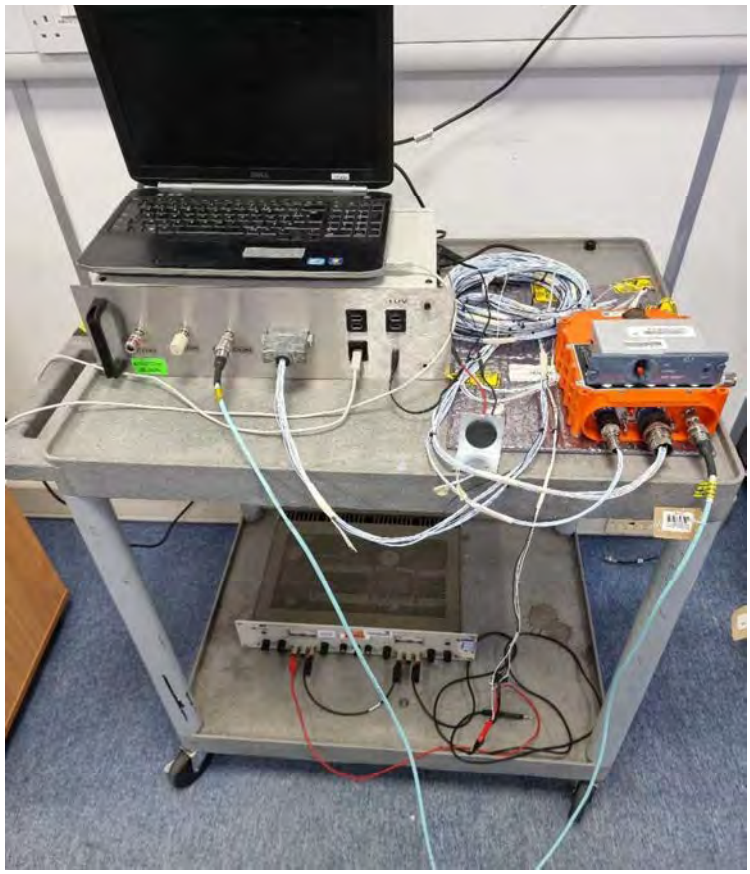
1.3.2 Physical Test Configuration

The Equipment Under Test (EUT) was operated using its own power source (internal battery). No other power source is required to operate the EUT. For conducted tests, the EUT was configured so that the antenna port was connected to the 50Ω test system using a coaxial cable. For radiated tests, the EUT was fitted with its proper antenna via a 3-meter coaxial cable.

The EUT was configured with a manufacturer supplied Test Bench, representative of an aircraft instrument panel. External Navigation data was supplied (where appropriate) to the test bench from a PC via an ARINC interface. This data was then relayed to the EUT from the test bench. The PC was also used to activate the EUT TIF (Triggered In Flight) feature when required. The ARINC interface required +28Vdc which was provided by an external power supply.
The EUT is also fitted with an internal GNSS receiver. Navigation data to the internal navigation device can be provided across a radiated link to the EUT (when configured with its antenna), or via the Test Bench and GNSS Simulator.
A Programming Dongle (Aircraft Identification Module – AIM), which contains the EUT's programming information was connected to the EUT throughout the entire sequence of testing. The Programming Dongle was connected to the EUT's DIN 12 socket on the side of the EUT.

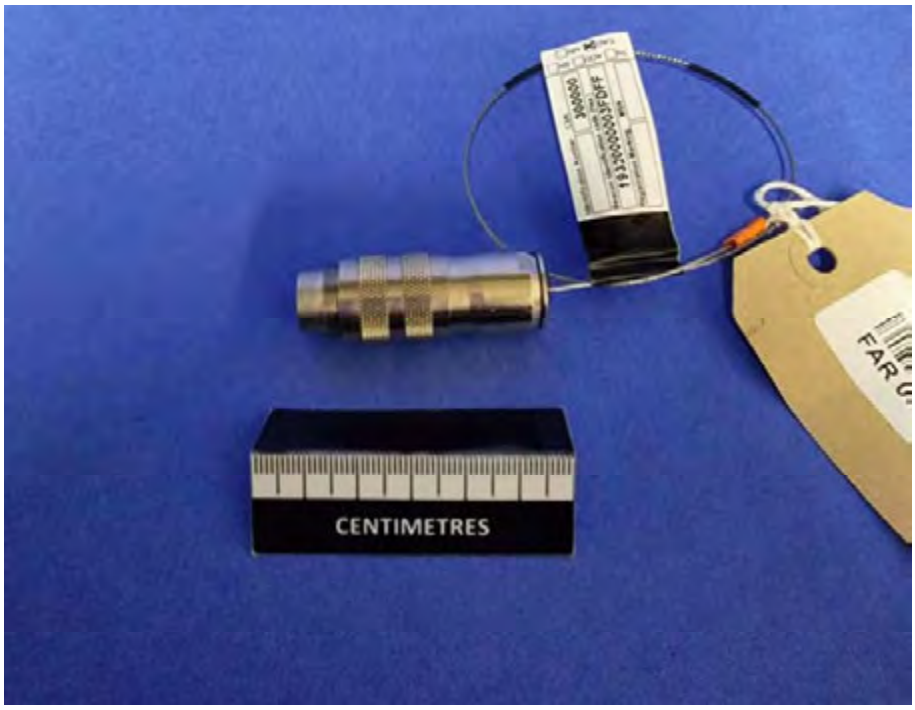
To ensure ancillaries were active during tests, external navigation data was provided via the ARINC interface. Photographs below:



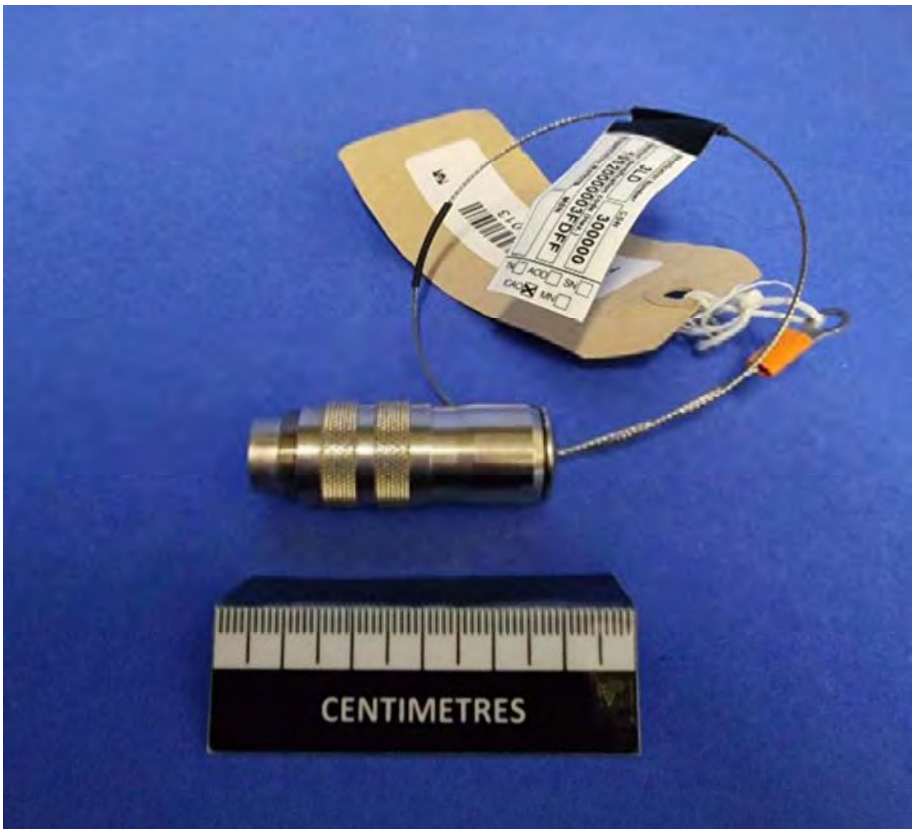


Test Configuration for Conducted RF Tests

Test Configuration for Conducted RF Tests (EUT, RCP and Buzzer placed in Climatic Chamber for temperature tests)



ELT DT Location Protocol Programming Dongle

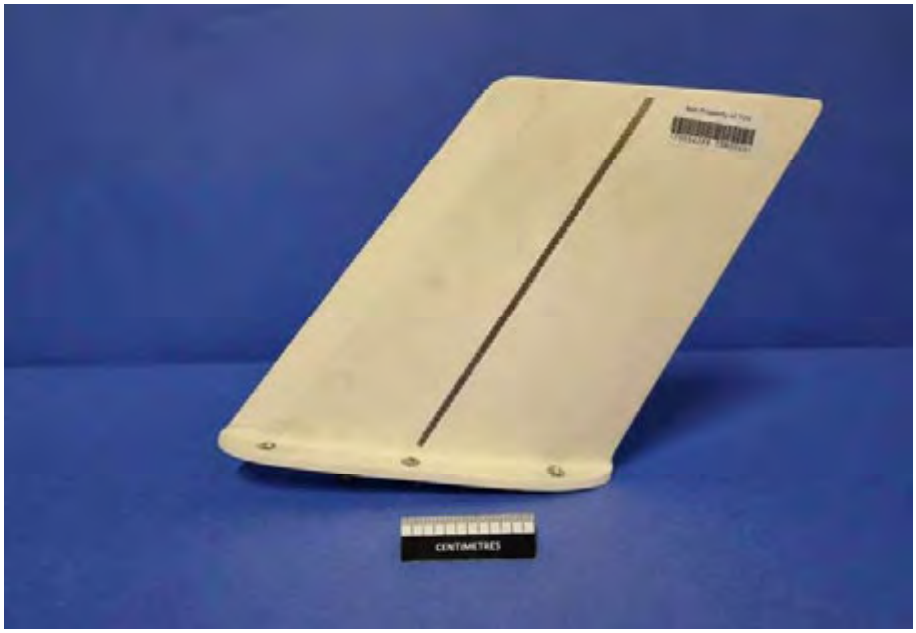


ELT DT Location Protocol with 3LD Programming Dongle

Remote Switch

Buzzer

Test Bench



EUT Antenna Side View

EUT Antenna Bottom View

System Configurations

Figure 1: Conducted Laboratory Tests

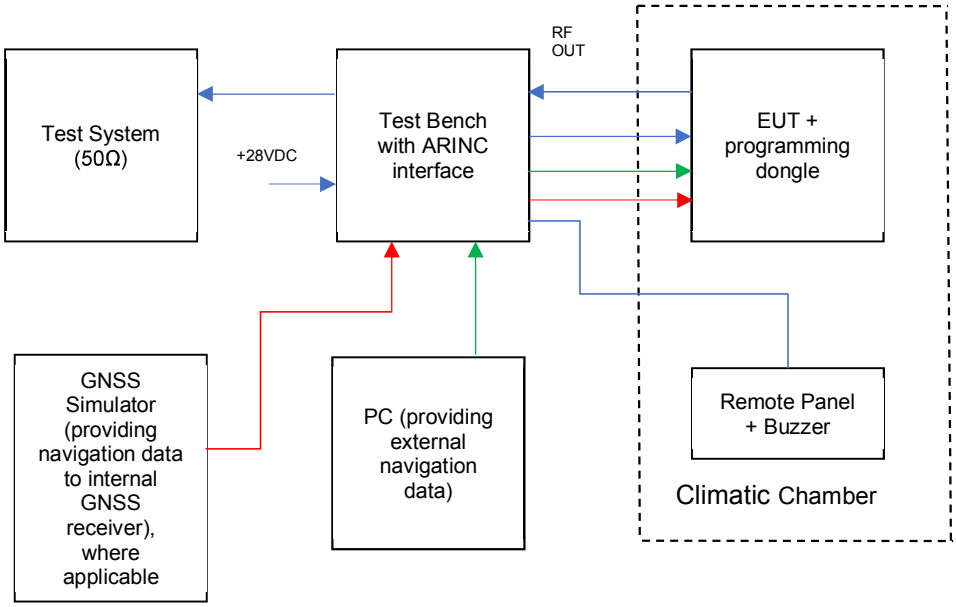
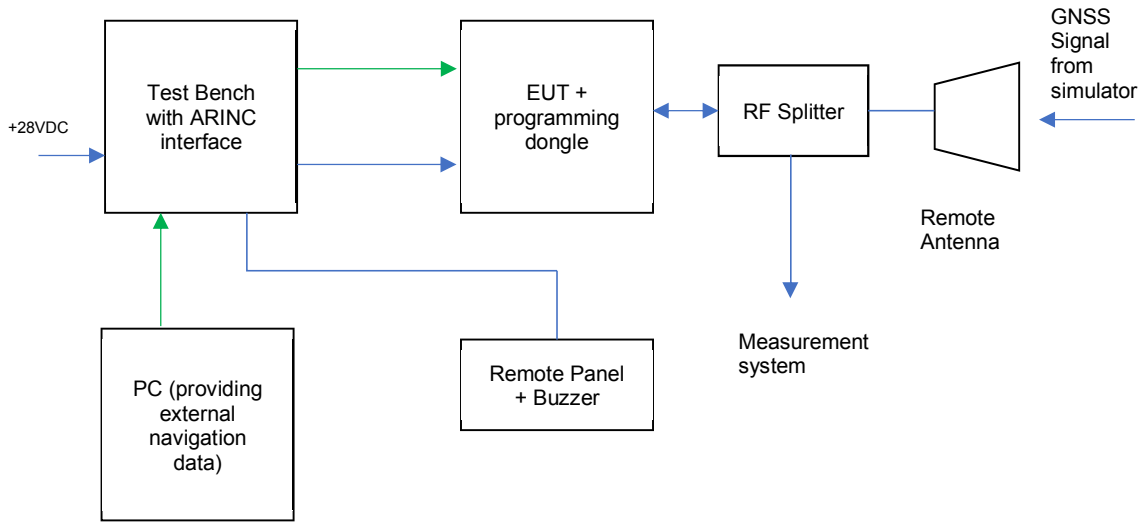
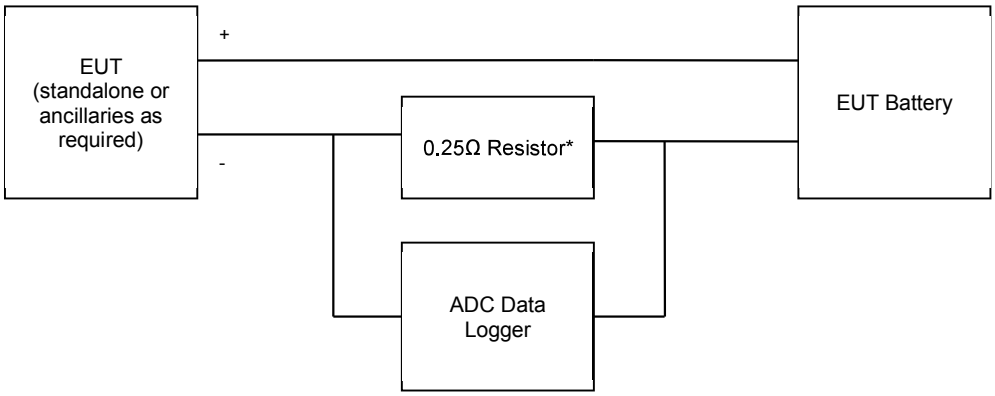


Figure 2: A.3.8.3 Navigation Test (See Note)



Note: The above configuration was used for Navigation tests where a GNSS Simulator and calibrated level were required at the EUT. The additional loss provided by the RF splitter was included as part of the calibrated level.

Figure 3: 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 4 of this report.

Further Information

All tests were carried out with all ancillaries connected and by activating the EUT from the EUT switch, unless otherwise stated.

At the beginning of each test, the EUT is in armed mode for 100 seconds and measurements commence immediately after the EUT is activated.

The EUT is fitted with a TCXO. The model and serial number of this oscillator used for this Type Approval is: Model: E7913, S/No: TE0139.

Power Alignment

Only one conducted test sample was submitted by the manufacturer, therefore the power alignment measurement is not applicable.

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
- Remote Control Panel switch to “ARMED” position
- No apparent activity

Armed Mode
- Main switch to “ARM” position
- Remote Control Panel switch to “ARMED” position

Armed Mode (EBIT)
- Main switch to “ARM” position
- Remote Control Panel switch to “ARMED” position
- ADT not enabled on ARINC

Self-test
- Main switch to “ARM” position
- Test Switch to “RESET/TEST” position for between 5-10 seconds
- List of items checked as per Customer Supplied Information (Application Form)
- No navigation data applied (unless otherwise stated)

GNSS Self-test
- Main switch to “ARM” position
- Test Switch to “RESET/TEST” position 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 or data applied for ‘fast acquisition’)

Operating (Active)
- Main or Remote switch to “ON” position
- 121.65 MHz Homer active and offset
- External Navigation Input active
- GNSS receiver active

Alternative activation methods
- Crash Sensor
- In Flight Activation – with the following means of activation:
  a) Automatic activation via TiF (Triggered in Flight)
  b) Loss of ARINC429
  c) Loss of 28Vdc

When activation occurs ‘in flight’ via modes a), b) or c) listed above, there are no 121.5 MHz homing transmissions (406 MHz only). All other modes of activation include both 406 MHz and 121.5 MHz homing transmissions. If the EUT is activated via modes a), b) or c), then activated further via another method (Main or Remote Switch), the 406 MHz transmitter will continue without resetting the repetition rate and add 121.5 MHz homing transmissions. If the further activation method is through the Crash Sensor, the 406 MHz repetition rate is restarted as per C/S T.001.

1.3.4 Items List

Description	Manufacturer	Model No.	Serial No.
Test Bench	Orolia SAS	ELT-DT	MTS1960-4
Power Supply	TENMA	72-2700	Not Serialised
Laptop PC	DELL	Latitude	PC494
Remote Switch	*OROLIA SAS*	*S1820513-29*	*PROTO 0038*
Buzzer	*Sonitron*	*S1820515-16*	*PROTO 10*
Programming Dongle (ICAO)	*Orolia SAS*	*S1820514-15*	*TM0000221660*
Programming Dongle (ELT DT Location Protocol with 3LD)	*Orolia SAS*	*S1820514-15*	*TM0000221669*
ELT DT Antenna	*Dayton Granger*	*ELT10-903*	*SN:E0067*

Note: items listed in *italics* form part of the nominal EUT configuration and were considered to be 'under test'. Other items were support equipment provided by the manufacturer to assist with testing.

1.4 TEST LOCATIONS

Navigation test A.3.8.2.2: Daedalus Airfield, Lee-on-the-Solent, Hants, UK
All other tests: Octagon House Laboratory, Fareham, Hampshire, UK

1.5 MODIFICATIONS

Modification 0 - No modifications were made to the test sample during testing.

Modification State (Mod State)	Date of Implementation	Reasons for modification	Description of modification, HW/FW P/Ns, SW version/release after modification
0	22 December 2021	-	

1.6 REPORT MODIFICATION RECORD

Issue 1 – First Issue
Issue 2 – Second Issue to include:
- Deviation Information about Battery discharge,
- Updated Annex G Application Form,
- Amended Table F-E.3 and Table F-E.4,
- Temperature plot added to Section 2.10
- Test method added to operating lifetime test results section.
- Armed Mode (EBIT) added to Section 1.3.3
- Encoding protocol made clearer in each section
- Starting and ending azimuth and elevation of each MEOSAR satellite tracked during the Satellite Qualitative test added to test results section.

Issue 3 – Third Issue to update typo in Section 2.13 Navigation System Test - Annex K, Test 2: Longitude column.
Issue 4 – Fourth Issue to include Annex B with Battery Current re-measurement results.

SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
Orolia SAS
KANNAD ULTIMA-DT-05

TEST RESULTS TABLE

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
1. Power Output							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
Transmitter power output	(maximum)	36 - 39	dBm	38.33	38.00	37.63	
	(minimum)			38.23	37.91	37.54	
Power output rise time	(maximum)	< 2	ms	0.105	0.078	0.086	
	(minimum)			0.092	0.074	0.083	
Power output 1ms before burst	(maximum)	< -10	dBm	-28.7	-27.3	-26.79	
	(minimum)			-44.68	-43.59	-42.66	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
Transmitter power output	(maximum)	36 - 39	dBm	38.29	37.52	37.57	
	(minimum)			38.12	37.46	37.43	
Power output rise time	(maximum)	< 2	ms	0.112	0.077	0.086	
	(minimum)			0.087	0.074	0.082	
Power output 1ms before burst	(maximum)	< -10	dBm	-28.39	-17.39	-28.51	
	(minimum)			-42.54	-36.79	-44.02	
2. Digital Message Coding							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
Bit Sync	1 - 15	15 bits “1”	P / F	P	P	P	
Frame sync	16 - 24	“000101111”	P / F	P	P	P	
Format flag	25	1 bit	bit value	1	1	1	
Protocol flag	26	1 bit	bit value	0	0	0	
Identification / position data	27 - 85	59 bits	P / F	P	P	P	
BCH code	86 -106	21 bits	P / F	P	P	P	
Emerg. Code/nat. use/supplem. Data	107 - 114	8 bits	bit value	01010100	01010100	01010100	
Additional data / BCH (if applicable)	115 - 144	30 bits	P / F	P	P	P	
Position Error (if applicable)		< 5	km	0	0	0	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
Bit Sync	1 - 15	15 bits “1”	P / F	P	P	F	
Frame sync	16 - 24	“000101111”	P / F	P	P	P	
Format flag	25	1 bit	bit value	1	1	1	
Protocol flag	26	1 bit	bit value	0	0	0	
Identification / position data	27 - 85	59 bits	P / F	P	P	P	
BCH code	86 -106	21 bits	P / F	P	P	P	
Emerg. Code/nat. use/supplem. Data	107 - 114	8 bits	bit value	00010111	00010111	00010111	
Additional data / BCH (if applicable)	115 - 144	30 bits	P / F	P	P	P	
Position Error (if applicable)		< 5	km	0	0	0	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
3. Digital Message Generator						**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD						
Repetition period TR (burst 1 to burst 24 after beacon activation)	4.8≤ TR ≤5.0	seconds	4.90187	4.901043	4.901043	
Repetition period TR (burst 24 to burst 42 after beacon activation)	9.8≤ TR ≤10.0	seconds	9.901278	9.901167	9.901222	
Repetition rate T_R, (after burst 42 after beacon activation) :						
Average T_R	Observed T_R	seconds	28.46629	28.42169	29.901	Record the actual value of the observed average T_R
Minimum T_R	$27.0 \le T_{Rmin} \le 27.2$	seconds	27.101	27.1	27.101	
Maximum T_R	$29.8 \le T_{Rmax} \le 30.0$	seconds	29.901	29.901	29.901	
ELT DT Location Protocol deviation	>0.8	seconds	0.85956	0.851879	0.851796	
Bit rate						
Minimum fb	≥ 399.6	bits/sec	399.91	399.91	399.91	
Maximum fb	≤ 400.4	bits/sec	400	400	400	
Total transmission time						
Long message (maximum)	514.8 - 525.2	ms	520.633	520.695	520.719	
Long message (minimum)		ms	520.586	520.68	520.703	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	160.586	160.672	160.695	
Maximum T1	≤ 161.6	ms	160.625	160.688	160.719	
First burst delay	≤5	seconds	4.84	4.90	4.83	
(Additionally, for ELT(DT)s with a rotating PDF-2 field)						
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 1 and 24)	19.2≤TR≤20.0	seconds	19.604	19.604	19.6042	
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 25 and 45)	58.3≤TR≤60.5	seconds	59.4075	59.4075	59.407	
Repetition rate of ELT DT Location Protocol with 3LD bursts (from burst 46 onwards)	809.5≤TR≤900.5	seconds	854.524	852.381	852.382	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol						
Repetition period TR (burst 1 to burst 24 after beacon activation)	4.8≤ TR ≤5.0	seconds	4.901	4.901	4.901	
Repetition period TR (burst 24 to burst 42 after beacon activation)	9.8≤ TR ≤10.0	seconds	9.901	9.901	9.901	
Repetition rate T_R, (after burst 42 after beacon activation) :						
Average T_R	Observed T_R	seconds	28.505	28.495	28.526	Record the actual value of the observed average T_R
Minimum T_R	$27.0 \le T_{Rmin} \le 27.2$	seconds	27.101	27.101	27.101	
Maximum T_R	$29.8 \le T_{Rmax} \le 30.0$	seconds	29.901	29.902	29.903	
ELT DT Location Protocol deviation	>0.8	seconds	0.8701	0.8496	0.8484	
Bit rate						
Minimum fb	≥ 399.6	bits/sec	399.91	399.91	399.91	
Maximum fb	≤ 400.4	bits/sec	400	400	400	
Total transmission time						
Long message (maximum)	514.8 - 525.2	ms	520.633	520.695	520.719	
Long message (minimum)		ms	520.594	520.68	520.703	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	160.594	160.672	160.695	
Maximum T1	≤ 161.6	ms	160.625	160.695	160.711	
First burst delay	≤5	seconds	4.81	4.87	4.88	
(Additionally, for ELT(DT)s with a rotating PDF-2 field)						
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 1 and 24)	19.2≤TR≤20.0	seconds	N/A	N/A	N/A	
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 25 and 45)	58.3≤TR≤60.5	seconds	N/A	N/A	N/A	
Repetition rate of ELT DT Location Protocol with 3LD bursts (from burst 46 onwards)	809.5≤TR≤900.5	seconds	N/A	N/A	N/A	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
3c. Digital Message Generator (for ELT(DT) specifically designed to withstand crash)						**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD						
Repetition period TR (burst 1 to burst 24 after beacon activation by crash sensor)	4.8≤ TR ≤5.0	seconds	4.901	4.901	4.901	
Repetition period TR (after burst 24 to burst 42 seconds after beacon activation by crash sensor)	9.8≤ TR ≤10.0	seconds	9.901	9.901	9.901	
Repetition rate T_R, (after burst 42 to burst 95 after beacon activation by crash sensor)						
Minimum T_R	27.0 ≤ T_{Rmin} ≤ 27.2	seconds	27.101	27.1	27.101	
Maximum T_R	29.8 ≤ T_{Rmax} ≤ 30.0	seconds	29.901	29.901	29.901	
ELT DT Location Protocol deviation	>0.8	seconds	0.859	0.851	0.851	
Repetition rate T_R, (greater than 30 minutes after beacon activation by crash sensor)						
Minimum T_R	115.0≤ T_{Rmin} ≤ 115.2	seconds	115.1	115.1	115.1	
Maximum T_R	124.8≤ T_{Rmax} ≤ 125.0	seconds	124.9	124.9	124.9	
ELT DT Location Protocol deviation	>2.5	seconds	3.069	3.059	3.060	
Bit Rate (minimum)	≥399.6	bit/sec	399.91	399.91	399.91	
Bit Rate (maximum)	≤400.4	bit/sec	400	400	400	
Long message (maximum)	514.8 - 525.2	ms	520.633	520.695	520.719	
Long message (minimum)			520.586	520.68	520.703	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	160.586	160.672	160.695	
Maximum T1	≤ 161.6	ms	160.625	160.688	160.719	
First burst delay	≤5	seconds	4.84	4.9	4.83	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD						
(Additionally, for ELT(DT)s with a rotating PDF-2 field)						
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 1 and 24)	19.2≤TR≤20.0	seconds	19.604	19.604	19.6042	
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 25 and 45)	58.3≤TR≤60.5	seconds	59.4075	59.4075	59.407	
Repetition rate of ELT DT Location Protocol with 3LD bursts (from burst 46 onwards)	809.5≤TR≤900.5	seconds	854.524	852.381	852.382	No 3LD messages transmitted after burst 95 in post-crash mode

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol						
Repetition period TR (burst 1 to burst 24 after beacon activation by crash sensor)	4.8≤ TR ≤5.0	seconds	4.900	4.901	4.900	
Repetition period TR (after burst 24 to burst 42 seconds after beacon activation by crash sensor)	9.8≤ TR ≤10.0	seconds	9.901	9.901	9.901	
Repetition rate T_R, (after burst 42 to burst 95 after beacon activation by crash sensor)						
Minimum T_R	27.0 ≤ T_{Rmin} ≤ 27.2	seconds	27.101	27.101	27.102	
Maximum T_R	29.8 ≤ T_{Rmax} ≤ 30.0	seconds	29.901	29.901	29.901	
ELT DT Location Protocol deviation	>0.8	seconds	0.869	0.867	0.864	
Repetition rate T_R, (greater than 30 minutes after beacon activation by crash sensor)						
Minimum T_R	115.0≤ T_{Rmin} ≤ 115.2	seconds	115.1	115.101	115.1	
Maximum T_R	124.8≤ T_{Rmax} ≤ 125.0	seconds	124.9	124.901	124.9	
ELT DT Location Protocol deviation	>2.5	seconds	3.063	3.025	2.916	
Bit Rate (minimum)	≥399.6	bit/sec	399.91	399.91	399.91	
Bit Rate (maximum)	≤400.4	bit/sec	400	400	400	
Long message (maximum)	514.8 - 525.2	ms	520.633	520.687	520.711	
Long message (minimum)			520.617	520.68	520.703	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	160.617	160.672	160.703	
Maximum T1	≤ 161.6	ms	160.625	160.688	160.711	
First burst delay	≤5	seconds	4.88	4.76	4.83	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol						
(Additionally, for ELT(DT)s with a rotating PDF-2 field)						
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 1 and 24)	19.2≤TR≤20.0	seconds	N/A	N/A	N/A	
Repetition rate of ELT DT Location Protocol with 3LD bursts (between bursts 25 and 45)	58.3≤TR≤60.5	seconds	N/A	N/A	N/A	
Repetition rate of ELT DT Location Protocol with 3LD bursts (from burst 46 onwards)	809.5≤TR≤900.5	seconds	N/A	N/A	N/A	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
4. Modulation							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
Biphase-L		P / F	P / F	P	P	P	
Rise time	(maximum)	50 - 150	µs	108.6	115.4	114.1	
	(minimum)	50 - 150	µs	105.5	112.5	110.7	
Fall time	(maximum)	50 - 150	µs	107.2	112.3	110	
	(minimum)	50 - 150	µs	104.3	109.4	106.9	
Phase deviation: positive	(maximum)	+(1.0 to 1.2)	radians	1.086	1.079	1.078	
	(minimum)	+(1.0 to 1.2)	radians	1.052	1.048	1.047	
Phase deviation: negative	(maximum)	-(1.0 to 1.2)	radians	-1.082	-1.094	-1.104	
	(minimum)	-(1.0 to 1.2)	radians	-1.05	-1.059	-1.047	
Symmetry measurement		≤ 0.05		0.03025	0.03505	0.03704	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
Biphase-L		P / F	P / F	P	P	P	
Rise time	(maximum)	50 - 150	µs	108.5	116.4	114.8	
	(minimum)	50 - 150	µs	105.8	113.3	110.9	
Fall time	(maximum)	50 - 150	µs	107.3	112	110.8	
	(minimum)	50 - 150	µs	104.8	108.5	107.1	
Phase deviation: positive	(maximum)	+(1.0 to 1.2)	radians	1.086	1.076	1.077	
	(minimum)	+(1.0 to 1.2)	radians	1.051	1.044	1.047	
Phase deviation: negative	(maximum)	-(1.0 to 1.2)	radians	-1.086	-1.095	-1.104	
	(minimum)	-(1.0 to 1.2)	radians	-1.049	-1.062	-1.073	
Symmetry measurement		≤ 0.05		0.03112	0.03542	0.03679	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
5. 406 MHz Transmitted Frequency							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
Nominal Value	(maximum)	C/S T.001	MHz	406.03108	406.0310333	406.0309719	
	(minimum)			406.031069	406.0310278	406.0309686	
Short-term stability	(maximum)	≤ $2x10^{-9}$	/100ms	2.13E-10	1.91E-10	1.78E-10	
	(minimum)			1.04E-10	1.21E-10	9.00E-11	
Medium-term stability – Slope	(maximum)	(-1 to +1)$x10^{-9}$	/minutes	N/A	N/A	N/A	Not applicable to ELT(DT)
	(minimum)			N/A	N/A	N/A	
Medium-term stability – Residual frequency variation	(maximum)	≤ $3x10^{-9}$		N/A	N/A	N/A	
	(minimum)			N/A	N/A	N/A	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
Nominal Value	(maximum)	C/S T.001	MHz	406.0311003	406.0310223	406.0309747	
	(minimum)			406.0310755	406.0310158	406.0309691	
Short-term stability	(maximum)	≤ $2x10^{-9}$	/100ms	1.64E-10	2.08E-10	2.06E-10	
	(minimum)			1.12E-10	1.16E-10	1.34E-10	
Medium-term stability – Slope	(maximum)	(-1 to +1)$x10^{-9}$	/minutes	N/A	N/A	N/A	Not applicable to ELT(DT)
	(minimum)			N/A	N/A	N/A	
Medium-term stability – Residual frequency variation	(maximum)	≤ $3x10^{-9}$		N/A	N/A	N/A	
	(minimum)			N/A	N/A	N/A	
6. Spurious Emissions into 50ohms							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
In band (406.0 – 406.1 MHz)		C/S T.001 mask	P / F	P	P	P	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
In band (406.0 – 406.1 MHz)		C/S T.001 mask	P / F	P	P	P	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
7. 406 MHz VSWR Check							**Result: Pass**
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol with 3LD							
Nominal Value	(maximum)	C/S T.001	MHz	406.0310773	406.0310275	406.0309719	
	(minimum)			406.0310761	406.031027	406.03039714	
Modulation rise time	(maximum)	50-150	µs	108.3	115.4	114.5	
	(minimum)	50-150	µs	106	112.9	111.5	
Modulation fall time	(maximum)	50-150	µs	107.5	113	111.8	
	(minimum)	50-150	µs	105.1	110.2	108.5	
Modulation phase deviation: positive	(maximum)	+ (1.0 to 1.2)	radians	1.084	1.073	1.077	
	(minimum)	+ (1.0 to 1.2)	radians	1.048	1.042	1.048	
Modulation phase deviation: negative	(maximum)	- (1.0 to 1.2)	radians	-1.083	-1.097	-1.109	
	(minimum)	- (1.0 to 1.2)	radians	-1.05	-1.069	-1.076	
Modulation symmetry measurement		≤ 0.05		0.03338	0.03962	0.0384	
Digital Message		correct	P / F	P	P	P	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-40°C)	(+21°C)	(+55°C)	
Model: KANNAD ULTIMA-DT-05, S/N: TO0010000002, TUV Ref: TSR1 and Modification State 0, Protocol: ELT DT Location Protocol							
Nominal Value	(maximum)	C/S T.001	MHz	406.0310716	406.0310211	406.0309709	
	(minimum)			406.0310702	406.0310205	406.0309707	
Modulation rise time	(maximum)	50-150	µs	109.1	115.4	114.8	
	(minimum)	50-150	µs	106.3	112.2	111.5	
Modulation fall time	(maximum)	50-150	µs	107.9	112.7	111.9	
	(minimum)	50-150	µs	105.2	109.9	108.8	
Modulation phase deviation: positive	(maximum)	+ (1.0 to 1.2)	radians	1.082	1.077	1.077	
	(minimum)	+ (1.0 to 1.2)	radians	1.05	1.046	1.048	
Modulation phase deviation: negative	(maximum)	- (1.0 to 1.2)	radians	-1.085	-1.097	-1.109	
	(minimum)	- (1.0 to 1.2)	radians	-1.053	-1.066	-1.077	
Modulation symmetry measurement		≤ 0.05		0.03394	0.03765	0.03919	
Digital Message		correct	P / F	P	P	P	