

Exhibit 5n-i – GNSS Receiver Operational Description

C/S T.007 Issue 5 Rev 7 June 2021 section 5.n

i-description of the GNSS receiver operation cycle and its phases, including duration of GNSS receiver ON and OFF phases when navigation signal is present or absent,

GNSS Receiver Description

Technical datasheets for the internal GNSS receiver and its antenna are included as separate exhibits:

Exhibit 5n-iii GNSS Receiver Technical Data Sheet

Exhibit 5n-iii GNSS Antenna Technical Data Sheet

The beacon uses a GNSS receiver type NEO-M8N from supplier uBlox.

The associated antenna is a Dayton Granger ELT10-903 see datacheet in Exhibit 5l Rev00 Antenna.

The GNSS receiver supports simultaneous reception of GPS, and Galileo.

GNSS Operation Cycle.



The paragraphs in *italics* are taken from T.001 Issue 4 Rev 8 June 2021 §4.5.10.4 internal GNSS timing requirements. The paragraphs in between describe how the beacon operation is compliant.

- **4.5.10.4 GNSS Update Rate (after Crash Detection)**
During a 30-minute period after a crash detection, the GNSS encoded location shall be updated before each transmitted burst, as per section 4.5.5.6. 4-19 C/S T.001 – Issue 4 – Rev. 8 June 2021

Beyond 30 minutes, the GNSS encoded location shall be updated in accordance with section 4.5.5.4

From para 4.5.5.6 ELT(DT) Navigation Device Requirements:

- *ELT(DT)s shall incorporate an internal navigation device and may incorporate an interface to an external navigation device (e.g., the aircraft avionics), which produce navigation data for encoding into the beacon message.*

The ELT(DT) incorporates an internal navigation device and have external position data coming from the ARINC 429 interface.

- *The first ELT(DT) transmission shall occur within 5 seconds of the beacon activation. If, after the ELT(DT) activation, navigation data is not available, then the ELT(DT) shall transmit its first and subsequent 406-MHz messages with the default position values specified in Annex A until such time, as navigation data becomes available from an internal GNSS receiver or, if applicable, from an external navigation device.*

The ELT(DT) transmission occurs with 5 seconds of the beacon activation. If no position is available, then default position is transmitted in the 406MHz until a valid position is obtained.

- *If navigation data is available, 406-MHz transmissions shall contain a valid encoded position that was calculated within the 2 seconds immediately prior to a 406-MHz transmission.*

If a navigation data is available, the 406MHz contains the valid encoded position that was calculated within the 2 seconds immediately prior to a 406-MHz transmission.

- *The initial position transmitted in the first burst may be obtained from either the internal navigation device or from the external navigation device input.* The transmission in the beacon message of this external source of position is only subsequently allowed if the internal GNSS receiver is not able to produce a valid encoded position less than 2 seconds before the burst. If position data is available from both sources, within 2 seconds before any subsequent burst, then the location produced by the internal GNSS receiver has priority over the external source of data.*

The internal navigation device and the internal encoded position has priority over the external position data when the 406MHz message is encoded.

- *Internal navigation device cold start shall be forced on each initial power up of the internal navigation device, but shall not occur if the ELT(DT) is subsequently activated or between ELT(DT) transmissions. Cold start refers to the absence of time dependent or position dependent data in the beacon's or in the GNSS receiver's memory, which might affect the acquisition of the GNSS position.*

When the beacon is turned from OFF mode to ARM mode, the microprocessor initiates a Cold start sequence on the internal navigation device. This sequence occurs only once, and it is not repeated further even if the microprocessor controls the ON/OFF cycles of the internal navigation device.

- *ELT(DT)s shall attempt to acquire fresh position information prior to every 406 MHz transmission and shall encode the latest position obtained within less than 2 seconds (defined as current position) prior to each burst into that transmission.*

When the internal navigation device is ON, the ELT(DT) encodes the latest position obtained within less than 2 seconds prior to each burst.

- *For ELT(DT)s using rotating field data in PDF-2, (e.g., the aircraft operator 3LD), the current position is transmitted with its full resolution (using both PDF-1 and PDF-2) according to the transmission scheme described in section 2.2.1.*

For ELT(DT)s using rotating field data in PDF-2, the current position is transmitted with its full resolution

- *If an updated position is not available within 2 seconds immediately prior to every 406 MHz transmission, then the ELT(DT) shall transmit the latest position that it has, unless this position is more than 4 hours old, in accordance with section 4.5.5.2, in which case it shall revert to transmitting the default position until such time as an updated position is available.*

If no position is available within 2 seconds prior to every 406MHz transmission, the ELT(DT) transmits the latest position available. If no new position has been acquired after 4 hours, then the default position is transmitted until updated position is available.

- *The freshness of the encoded location transmitted by the ELT(DT) shall be indicated in the ELT(DT) message as defined in Annex A.3.3.8.*

Position freshness is encoded in the 406 MHz message.



From 4.5.5.4 Internal Navigation Device Timing

- *The internal navigation device shall make an attempt to obtain an initial location for a period of at least 10 minutes after beacon activation unless a location is obtained sooner than this.*

After post-crash, the internal navigation device will be ON for 30 minutes, even if a position is obtained earlier

- *After this initial attempt to obtain a location, the internal navigation device shall make subsequent attempts to obtain an initial location, or an updated location, as applicable, at intervals of no more than 15 minutes and no less than every 4 minutes and 25 seconds, measured from the end of the last update attempt, for the remainder of the manufacturer declared minimum operating lifetime of the beacon*. Whenever an initial location or an updated location is obtained, it shall be encoded into the next available beacon message to be transmitted. If an updated location is not obtained prior to the transmission of the next beacon message then the previous location (or if there was no previous location, default position values) shall be transmitted until either a location becomes available, or 4 hours $\pm$ 5 minutes have elapsed (after which time the encoded position shall be set to the default values).*
- *Attempts at obtaining an initial location or location update shall require the navigation device to be powered up for a period of at least 90 seconds each time, unless a location is obtained sooner than this, in which case the navigation device may then be put into a sleep mode 10 seconds later (noting that if this occurs after 80 seconds, this 10-second period can be reduced accordingly to maintain the total 90 seconds navigation device 'on' time).*

Attempts at obtaining a position will occur every 15 minutes.

If a position is available, as soon as it is acquired, the internal navigation device will be switched OFF 10 seconds later.

If a no position is available, the internal navigation device will stay ON for 90 seconds.



Beacon Coding Software & Navigation System

Page: 1 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

Ultima-DT

ELT(DT)

Beacon Coding Software & Navigation system

TEST REPORT

This document is copyright © 2022 Orolia group and/or its affiliates. All rights are strictly reserved. This document and any attached materials contain proprietary and confidential information and data and is the sole property of Orolia group and/or its affiliates. The documents, any attached materials and/or information contained therein must not be used, disseminated, or distributed except for the agreed purpose. Unauthorized use, reproduction, or issue to any third party is not permitted without the prior written consent of the orolia group. This document is to be returned to the Orolia group when the agreed purpose is fulfilled.

Compiled by Frederic Laudet: firmware engineer Date: 2022.02.23 Frederic Laudet 09:28:11 +01'00'	Approved by Samuel Davenel: Senior Project manager Date: 2022.02.23 Samuel DAVENEL 18:15:01 +01'00'
---	--

Copyright © Orolia S.A.S. All rights reserved



Beacon Coding Software & Navigation System

Page: 2 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

Test facility: Orolia SAS, Z.I des 5 Chemins, CS 10028, 56520, Guidel, France

Accreditations: EN 9100:2009 AS 9100C - JISQ 9100:2009, ISO 9001 : 2008

Report on : KANNAD ULTIMA-DT-05

Prepared for: Orolia SAS

Prepared by: Frederic Laudet
Firmware engineer
Tel: +33 (0) 2 30 17 04 45
Email: frederic.laudet@orolia.com
Website: www.orolia.com

Approved by: Samuel Davenel
Senior Project Manager
Direct: +33 (0) 2 97 02 49 20
Mobile: +33 (0) 6 98 14 81 50

Email: samuel.davenel@orolia.com
Website: www.orolia.com

Date of Issue: 4th February 2022

Dates of testing:
Submitted for testing: 28th January 2022
Start of tests: 31th January 2022
End of tests: 4th February 2022



Beacon Coding Software & Navigation System

Page: 3 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

Date	Version	Modifications
4/2/2022	A	Initial Document



Beacon Coding Software & Navigation System

Page: 4 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

TABLE OF CONTENTS

1	Scope.....	6
2	Reference Documents	6
3	Details of Test Samples.....	6
4	Setting ELT-DT protocols.....	8
4.1.1	List of protocols	9
5	Test Results Summary Table	10
5.1	Position Data Encoding	11
5.1.1	Test conditions	11
5.1.2	Test setup with internal GNSS source	12
5.1.3	Test setup with external source (ARINC).....	13
5.1.4	Beacon Coding Software, location message.....	16
5.1.5	Test Method	17
5.1.6	Messages as per Appendix D to Annex F	17
5.1.7	Table F-D.2	17
5.1.7.1	Internal GNSS location source	18
5.1.7.2	External location source (ARINC 429).....	19
5.1.8	Conclusion.....	20
5.3	Navigation System Test.....	20
5.3.1	Test conditions	20
5.3.2	Test method	21
5.3.3	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) location test protocol	21
5.3.4	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) location test protocol	22
5.3.5	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) AOD protocol.....	23
5.3.6	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) AOD protocol.....	24
5.3.7	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) 24bits ADR protocol	25
5.3.8	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) 24bits ADR protocol, with 3LD... ..	27
5.3.9	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external (ARINC) location source – ELT(DT) 24bits ADR protocol ..	28



Beacon Coding Software & Navigation System

Page: 5 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

5.3.10	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) 24bits ADR protocol, with 3LD	29
5.3.11	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) TAC & Serial number protocol	30
5.3.12	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) TAC and Serial number protocol	31
5.3.13	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) Location Test protocol, with 3LD	32
5.3.14	Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) Location Test protocol, with 3LD	33
5.3.15	Conclusion	34
6	Photographs	35
7	Test Equipment Used	35
8	Other Technical Information	35
9	Technical data submitted by Beacon manufacturer	35



Beacon Coding Software & Navigation System

Page: 6 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

1 Scope

This test report describes the test method, equipment and set up used to demonstrate compliance of the Ultima-DT ELT(DT) beacon with the Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard T.007 section A.3.8.7 Position Data Encoding and section A.2.8 Beacon coding software requirements.

The tests were carried out in the manufacturer premises at Orolia SAS, Z.I des 5 Chemins, CS 10028, 56520, Guidel, France over the period from the 31th January 2022 to the 4th February 2022.

2 Reference Documents

C/S T.001 Issue 4 Rev 8, June 2021 Specification for Cospas-Sarsat 406 MHz Distress Beacons

C/S T.007 Issue 5 Rev 7, June 2021 Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard

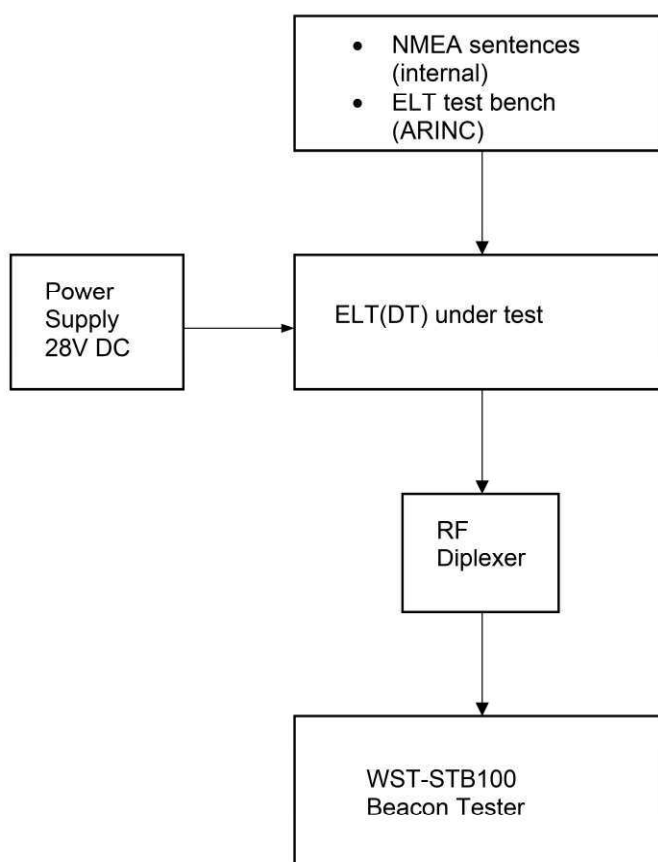
3 Details of Test Samples

The following test samples were used during the performance of this series of tests:

<u>EUT ID</u>	<u>Description</u>
EUT1	KANNAD ULTIMA-DT-05 P/N S1865501-05 Beacon Serial Number: TO0010000005 Firmware Version: A (engineering version 2.3.1)

TEST REPORT

Figure 1 - Block Diagram of Test Set Up



TEST REPORT

4 Setting ELT-DT protocols

Before executing a test, the proper protocol should be written to the ELT-DT. The protocol is coded in a 30 Hex ID, which also provides a unique identification to the beacon.
A Programming Dongle, also called an Aircraft Identifier Module (AIM), is designed to hold and write the corresponding Hex ID.



You just need to plug the Dongle to the right-side connector of the ELT-DT and start a Self-Test (ELT-DT should be in "ARM" state). At the end of the Self-test, the ELT is programmed with the 30Hex held in the Dongle.

The five ELT-DT protocols declared for the Ultima-DT are encoded into a dedicated AIM.



Beacon Coding Software & Navigation System

Page: 9 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

4.1.1 List of protocols

ELT(DT) protocol

Protocol	T.007 parameters (Annex C)	Hex-id (default position) Country code 201 -Albania
ELT(DT) location test protocol	Country code: 201 41..42: 00 43..66: 11111111111111111111	FFFE2F8C993FFFFDFE8927CF61F0FF01
ELT(DT) location protocol AOD: AAA500	Country code: 201 41..42: 01 43..66: 110001100011000111110100	FFFE2F8C99718C7D1FEFFB33E9CFE1F0FC30
ELT(DT) location protocol 24bit Adr: 11472655	Country code: 201 41..42: 00 43..66: 101011110000111100001111	FFFE2F8C992BC3C3DFE9BDFD00FE1F0FC30
ELT(DT) location protocol TAC with S/N	Country code: 201 41..42: 10 43..66: 1111100111 00000001100011 TAC:999 S/N:99	FFFE2F8C99BE7018DFE9F965B7CFE1F0FC30
ELT(DT) location test protocol with 3LD rotating field	Country code: 201 41..42: 00 43..66: 101011110000111100001111 113..117: 00000 118..132: 101011010110101 (YYY)	FFFE2F8C992BC3C3DFE9BDFD00F056B567D



Beacon Coding Software & Navigation System

Page: 11 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

5.1 Position Data Encoding

5.1.1 Test conditions

Date of test	31th-January-2022 to 4th-February-2022
Specification	C/S T.007 – section A.2.8
Beacon Model	KANNAD ULTIMA-DT-05
Serial number	EUT1
EUT Mod State	MS0
EUT system configuration during the test, including antenna, external ancillary devices and modes of their operation	The EUT and test equipment was configured as shown in Figure 1. The 28V DC was present, provided by external power supply. The antenna port of the EUT was connected via a RF Diplexer to the STB100 Beacon Tester. NMEA test data was generated using Virtual GPS software and feeds directly NMEA sentences over a serial link to the EUT.
Navigation device details (model, interface)	Virtual GPS Simulator Software
Measurement Equipment, provided by beacon manufacturer, if any	None
Performed by	Frederic Laudet
Verified by	Samuel Davenel
Environmental conditions	Ambient laboratory temperature: +19°C to +21°C Relative air humidity: 60 to 70% RH
Deviations from standard test procedures	None
Non-compliances noticed	None



Beacon Coding Software & Navigation System

Page: 10 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022

TEST REPORT

5 Test Results Summary Table

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
4th-Feb-22				
KANNAD ULTIMA-DT-05 beacon				
16. Beacon Coding Software - sample message provided for each coding option of the applicable coding types	correct	n/a	PASS	Per applicable F-D.2 table.
- sample self-test message provided for each coding option of the applicable coding types	correct	n/a		Per applicable F-D.2 table.
17. Navigation System - Position data encoding	correct	n/a	PASS	Results per Tables F-C.4, as appropriate

TEST REPORT

5.1.2 Test setup with internal GNSS source

Sarsat Receiver: Tester Model: WST STB100, S/N: 20001

Pre-requisite:

For each step of the table D.4, the navigation data should be encoded into a NMEA sentence, then sent directly to the ELT-DT micro-controller. For this purpose, Virtual GPS software (ZylSoft) is running on a PC, sending data via a USB to serial cable.

These tests require that NMEA data is injected into the beacon rather than relying on any internal GNSS module. The following procedure is applied:

- Connect a USB-to-serial converter cable to the beacon TX PCBA PAD6 as follows –

USB Serial Cable	Tx PCB Test-Point	Notes
Black (GND)	any suitable 0V point	
Red (Tx)		Data transmit from GNSS module
Yellow (Rx)	NC	Do not connect this signal



- Plug the USB-to-serial cable into a USB port of the PC.
- Open Virtual GPS with the corresponding COM port at 19200 bauds.
- Set the ELT-DT to ON mode.
- Enter the location parameters corresponding to the test script of Table D.4.
- Monitor the 406 emissions continuously with the STB100 beacon tester.

TEST REPORT

5.1.3 Test setup with external source (ARINC)

The navigation data is transmitted to the ELT-DT by the ARINC 429 interface. It uses a hardware transmitter A429-USB-NT from techSAT and a software component ELT Test Bench developed by Orolia to send altitude and geographic coordinates.



techSAT A429-USB-NT ARINC transmitter

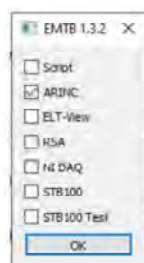
The transmitter has two TX outputs. The ELT Test bench software sends ARINC frames simultaneously to the two ARINC inputs of the ELT-DT.

To operate the ARINC location data:

Plug the transmitter to PC side via USB cable, and to beacon side via ARINC cable.

Press **Start ARINC Bus** button to connect ELT Test Bench to the transmitter. Then coordinates and altitude are sent continuously via 310, 311 and 203 labels. They could be edited on the fly in the dedicated fields, the change is effective immediately.

First select ARINC in the initial window:

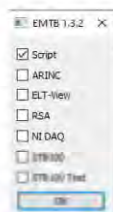


TEST REPORT

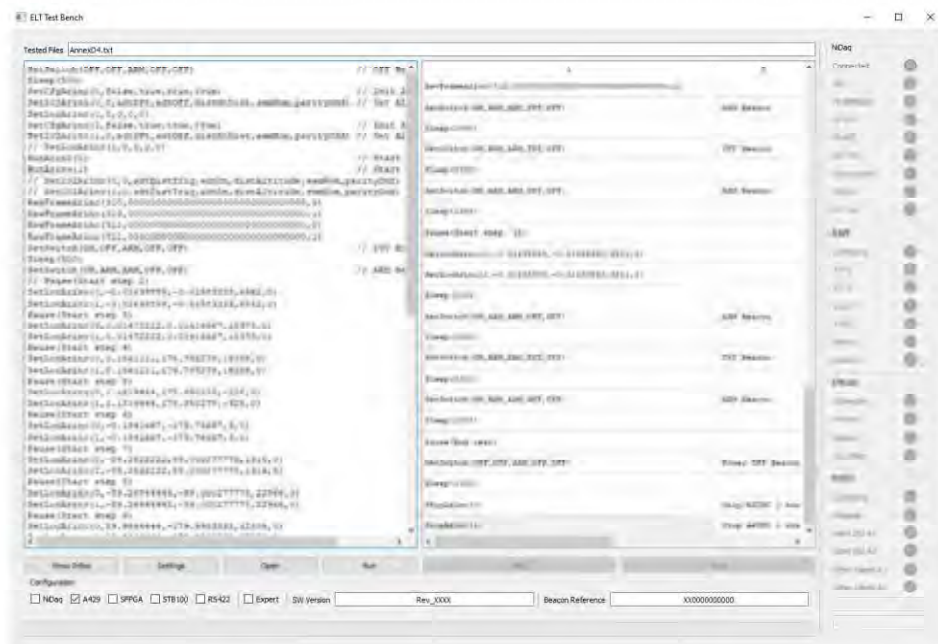


Driving GNSS source through ARINC

To simplify test progress of the Position Data Encoding section, a script could be run from the ELT-DT Test Bench software. Run "Script" in the first window, then open the "AnnexD4.txt" file. Click run to start, then press OK to skip to the next predefined location, until the script ends.



TEST REPORT



Coordinates are input and sent through ARINC using Degrees 'dot' decimal degrees format. The C/S-T.007 Table D.4 scripts are written using a Degree, Minutes, Seconds format.

To run the scripts with ELT Test Bench, coordinates have been converted to the following values:

Latitude, Longitude for Table D.4 scripts

	Latitude	Longitude
Script 1	N/A	N/A
Script 2	-0.0163889	-0.015833
Script 3	0.0147222	0.0141666
Script 4	0.1861111	179.78527777
Script 5	1.1819444	178.85027
Script 6	-0.1841667	-179.7666
Script 7	-89.2522222	89.0002777777
Script 8	-89.2694444	-89.00027777
Script 9	89.9844444	-179.998333
Script 10	89.9663889	179.98999
Script 11	-36.5	-138.499722
Script 12	N/A	N/A
Script 13	-0.0163889	-0.01583333

Altitude is given in meters in C/S-T007, while ARINC supports altitude in feet, without decimal. The following table shows altitude's values for each script in feet. Altitude in meter is multiplied by 3.28084, then rounded to the unit.

TEST REPORT

	Altitude (m)	Altitude (feet)
Script 1	N/A	N/A
Script 2	2000	6562
Script 3	5600.4	18373
Script 4	5599.6	18369
Script 5	-100	-328
Script 6	1	3
Script 7	401	1316
Script 8	7000	22966
Script 9	9999	32805
Script 10	10001	32812
Script 11	15240	50000
Script 12	N/A	N/A
Script 13	1000	3281

5.1.4 Beacon Coding Software, location message

The ELT-DT is switched on from test point A to test point B. Test point A refers to the location for GNSS test



Map Location A, Location B 1

	Latitude	Longitude
Location A	47.8	-3.46667
Location B	47.7	-3.36667

TEST REPORT

5.1.5 Test Method

1. Ensure to have the ELT-DT beacon configured for the required protocol test.
2. Connect the NMEA USB serial output to the Tx board as described in [5.1.2 Test setup](#).
(Ensure to remove the connection for each protocol or beacon configuration programming with beacon configurator).
3. Ensure the beacon is connected to a 406 MHz beacon decoder.
4. For each protocol,
 - Using Beacon Configurator, program the awaited hex-id of the beacon
 - Run ON mode, initiate Virtual GPS with the first position:
 - Confirm that, the awaited hex-id and first position is received.
 - Stop Virtual GPS, change the position to the second position, and run it again
 - Confirm that, the awaited hex-id and second position is received
 - Stop the beacon and Virtual GPS, launch a short self-test and note the received message content
 - initiate Virtual GPS software with the first position
 - Ensure that the GNSS self-test limit is not reached. If reached, reset the counter with the beacon configurator
 - Stop the beacon and run GNSS self-test mode:
 - Confirm that, the awaited hex-id and first position is received.
5. Fill in the results for each mode: Live position A and Live position B, Self-test, GNSS self-test (using position A)

5.1.6 Messages as per Appendix D to Annex F

Hereafter the Appendix D to Annex F shows the table F-D.2 for each input, filled with the operational and self-test messages used for the validation.

5.1.7 Table F-D.2



Beacon Coding Software
&
Navigation System

Page: 18 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022



TEST REPORT

5.1.7.1 Internal GNSS location source

Protocol	Operational Message (in hexadecimal including bit and frame synchronization bits)		Self-Test Message (in hexadecimal including bit and frame synchronization bits)	GNSS Self-Test Message (if applicable, in hexadecimal, including bit and frame synchronization bits)
	Location "A"	Location "B"		
ELT(DT) Location (24-bit Address)	FFFE2F8C992BC3CC103BB04200D8020FE0	FFFE2F8C992BC3C3CBF0385980C0F8080001	FFFE2F8C992BC3C3DFFFBDFD00FE1F0FC30	FFFE2F8C992BC3C3CC103BB04200D8020FE0
ELT(DT) Location (Aircraft Operator Designator)	FFFE2F8C99718C7D0C103B5C7BC0D8020FE0	FFFE2F8C99718C7D0BF038B5B960F8080001	FFFE2F8C99718C7D1FE1FB33E9CFE1F0FC30	FFFE2F8C99718C7D0C103B5C7BC0D8020FE0
ELT(DT) Location (Serial Number)	FFFE2F8C99BE7018CC10390A25C0D8020FE0	FFFE2F8C99BE7018CBF03AE3E7A0F8080001	FFFE2F8C99BE7018DFFFB65B7CFE1F0FC30	FFFE2F8C99BE7018CC10390A25C0D8020FE0
ELT(DT) Location Test	FFFE2F8C99000000C103E018900D8020FE0	FFFE2F8C99000000BF03DE84BC0F8080001	FFFE2F8C990000001FE1FB6F61F0FF01	FFFE2F8C99000000C103E018900D8020FE0
ELT(DT) with Rotating POF-2 = Location POF-2 = 3LD	FFFE2F8C993FFFFFCC103EE6B5C0D8020FE0	FFFE2F8C993FFFFFCCBF03D0F77A0F8080001	FFFE2F8C993FFFFFCC1FE1FB65B7CFE1F0FC30	FFFE2F8C993FFFFFCC103EE6B5C0D8020FE0

Copyright © Orolia S.A.S. All rights reserved



**Beacon Coding Software
&
Navigation System**

Page: 19 of 35
Ref: DRD22033
Issue: A
Date: 4th Feb 2022



TEST REPORT

5.1.7.2 External location source (ARINC 429)

ELT(DT) Location (24-bit Address)	FFFE2F8C992BC3C3C103BB04200D8020FE0	FFFE2F8C992BC3C3CBF0385980C0F8080061	FFFE2F8C992BC3C3DFFFBDBFD00FE1F0FC30	FFFE2F8C992BC3C3DFFFBDBFD00FE1F0FF01
ELT(DT) Location (Aircraft Operator Designator)	FFFE2F8C99718C7D0C103B5C7BC0D8020FE0	FFFE2F8C99718C7D0B0F0385B900F8080061	FFFE2F8C99718C7D1FEFFB33E9CFE1F0FC30	FFFE2F8C99718C7D1FEFFB33E9CF61F0FF01
ELT(DT) Location (Serial Number)	FFFE2F8C994BE7018CC10390A23C0D8020FE0	FFFE2F8C994BE7018CBF03AE3E700F8080061	FFFE2F8C994BE7018DFFEF965B7CFE1F0FC30	FFFE2F8C994BE7018DFFEF965B7CF61F0FF01
ELT(DT) Location Test	FFFE2F8C990000000C103E01800D8020FE0	FFFE2F8C990000000BF03DES4BC0F8080061	FFFE2F8C9900000001FEFF6E1B0F61F0FF01	FFFE2F8C9900000001FEFF6E1B0F61F0FF01
ELT(DT) with Rotating PDF-2 Field PDF-2 = Location PDF-2 = 3LD	FFFE2F8C9903FFFFFCC103EE6B5C0D8020FE0 FFFE2F8C9903FFFFFCC103EE6B5C0056B5C31	FFFE2F8C993FFFFFCBF03D0F7700F8080061 FFFE2F8C993FFFFFCBF03D0F7700056B5C31		FFFE2F8C993FFFFFDFEF8927CF61F0FF01

Copyright © Orolia S.A.S. All rights reserved

TEST REPORT

5.1.8 Conclusion

- For internal GNSS, the results are OK.
- For external location (ARINC), results are OK.

5.3 Navigation System Test

5.3.1 Test conditions

Date of test	3rd-February-2022
Specification	C/S T.007 – section A.3.8.7
Beacon Model	KANNAD ULTIMA-DT-05
Serial number	EUT1
EUT Mod State	MS0
EUT system configuration during the test, including antenna, external ancillary devices and modes of their operation	The EUT and test equipment was configured as shown in Figure 1. The 28V DC was present, provided by external power supply. The antenna port of the EUT was connected via a RF diplexer to the STB100 Beacon Tester. NMEA test data was generated and input directly over a serial link to the EUT using Virtual GPS software.
Navigation device details (model, interface)	NMEA TX Simulator Software
Measurement Equipment, provided by beacon manufacturer, if any	None
Performed by	Frederic Laudet
Verified by	Samuel Davenel
Environmental conditions	Ambient laboratory temperature: +18°C to +21°C Relative air humidity: 60 to 70% RH
Deviations from standard test procedures	None
Non-compliances noticed	None

TEST REPORT

5.3.2 Test method

- Connect the NMEA transmit simulator output to the TX board as described in 5.2.2 Test setup with internal GNSS source
- Ensure the beacon is connected to a 406 MHz beacon decoder.
- ELT(DT) location protocol
 - Program the beacon with the following Hex-ID to set the beacon in ELT(DT) Protocol:
 - Ensure that, for each of the step of TABLE D.4, the "ELT(DT) and RLS Location Protocol" is decoded by the beacon decoder.
 - Then Follow the instruction for each row and first column in the TABLE D.4 from C/S-T.007 and Fill in the results in Tables F-C.4 from the beacon decoder output
 - Ensure to fill the third column in Tables F-C.4 by verifying that the second column results are equal to the required value or time in the last column from TABLE D.4
 - Fill in the Test Result

5.3.3 Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – internal GNSS source – ELT(DT) location test protocol

Table F-C.4 of C/S T.007 Issue 5 Rev 7, June 2021
Position Data Encoding Results ELT(DT) Location Protocol

Script Reference (See Table D.4)	Value of Encoded Location Bits Transmitted by Beacon	Confirmation that BCH Correct (✓)
1	Bits 67-85= 011111111 011111111 = 3FDFF Bits 115-132= 100001111 100001111 = 21F0F Bits 109-112= 1111 = F	✓
2	Bits 67-85= 100000000 100000000 = 40200 Bits 115-132= 100010000 100001110 = 2210E Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 1 second Bits 109-112= 0100 = 4	✓
3	Bits 67-85= 000000000 000000000 = 0 Bits 115-132= 100001101 100001101 = 21B0D Bits 109-112= 1001 = A	✓
4	Bits 67-85= 000000000 0101101000 = 168 Bits 115-132= 110110011 011001101 = 366CD Bits 109-112= 1001 = 9	✓
5	Bits 67-85= 000000010 0101100110 = 00966 Bits 115-132= 110101110 010010000 = 35C90 Bits 109-112= 0000 = 0	✓

TEST REPORT

6	Bits 67-85= 100000000 1101101000 = 40368 Bits 115-132= 110110001 011100000 = 362E0 Bits 109-112= 0000 = 0	✓
7	Bits 67-85= 110110011 0010110010 = 6CCB2 Bits 115-132= 011101101 100000000 = 1DB00 Bits 109-112= 0001 = 1	✓
8	Bits 67-85= 110110011 1010110010 = 6CEB2 Bits 115-132= 011011100 100000000 = 1B900 Bits 109-112= 1011 = B	✓
9	Bits 67-85= 010110100 1101101000 = 2D368 Bits 115-132= 000001110 000000001 = 01C01 Bits 109-112= 1101 = D	✓
10	Bits 67-85= 010110100 0101101000 = 2D168 Bits 115-132= 000100000 000001001 = 04009 Bits 109-112= 1110 = E	✓
11	Bits 67-85= 101001001 1100010101 = 52715 Bits 115-132= 100000000 100000000 = 20100 Bits 109-112= 1110 = E	✓
12	Bits 67-85= 111111111 0111111111 = 3FDFF Bits 115-132= 100001111 100001111 = 21F0F Bits 109-112= 1111 = F	✓
13	Bits 67-85= 011111111 0111111111 = 3FDFF Bits 115-132= 100001111 100001111 = 21F0F Bits 109-112= 1111 = F	✓

5.3.4 Position Data Encoding – Appendix C to Annex F: NAVIGATION SYSTEM TEST RESULTS - Table F-C.4 – external ARINC source – ELT(DT) location test protocol

**Table F-C.4 of C/S T.007 Issue 5 Rev 7, June 2021
Position Data Encoding Results ELT(DT) Location Protocol**

Script Reference (See Table D.4)	Value of Encoded Location Bits Transmitted by Beacon	Confirmation that BCH Correct (✓)
47.81	Bits 67-85= 011111111 0111111111 = 3FDFF Bits 115-132= 100001111 100001111 = 21F0F Bits 109-112= 1111 = F	✓
2	Bits 67-85= 100000000 1000000000 = 40200 Bits 115-132= 100010000 100001110 = 2210E Number of seconds after providing navigation data that beacon transmitted the above encoded location information: 1 second Bits 109-112= 0100 = 4	✓
3	Bits 67-85= 000000000 0000000000 = 0 Bits 115-132= 100001101 100001101 = 21B0D Bits 109-112= 1001 = A	✓