

Toulouse, 28 Feb 2002

INTESPACE reference : M3433

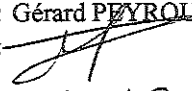
TEST REPORT OF 406 MHz DISTRESS BEACON

MANUFACTURER : ELTA SA

BEACON MODEL : ADT406 AF/AP

Written : 28 Feb 2002

By : Gérard PEYROU

Visa : 

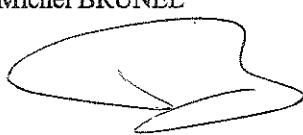
Approved : 5/03/02

By : Alain SERDANE

Visa : 

Quality Control : 05.03.02

By : Michel BRUNEL

Visa : 

Distribution :

- Mr	Claude CRESP	ELTA SA	(1 copy)
- Mr	S. MIKAILOV	COSPAS/SARSAT Sec	(1 copy)
- Mr	C. GAL	CNES - DSO/RC//AS	(1 copy)
- INTESPACE		ITS/AP/ET	(1 copy)

This document may not be reproduced other than in full .
It includes 111 pages and 1 annex . A part of reproduction
must be submitted at the laboratory authorization .

*The COFRAC Test section accreditation proves the technical hability of
the laboratory for tests or analysis under the authority of the accreditation*



Accréditation
N° 1-0743
Scope
given
on request



ELTA SA

Monsieur Claude CRESP

14 Place Marcel Dassault

31702 BLAGNAC

Toulouse, 21 June 2002

N/Réf. : M3433-C_S-2/Elta/GP/3

TRANSMITTAL SHEET N° M3433-C_S-2/AP/ET/3

NUMBER	TITLE	COMMENTS
1	Set of revised pages from M3433 C/S T.A. Test Report on ELTA ADT406 AF/AP ELT Ref. : M 3433 Rev1	
1	Results of Additional Beacon Coding Software Test on ELTA ADT406 AF/AP ELT (Self Test Message) Ref : M3433 Self Test Messages	
1	Results of Complementary Antenna Test on ELTA ADT406 AF/AP ELT Ref : M3433 circular ant test	



Gérard PEYROU

Technological Test Department

**Revised pages from M3433 C/S T.A. Test Report of
ELTA ADT406 AF/AP ELT**

Page 4 : Application For a C/S 406 MHz Beacon Type Approval Certificate

Page 11 : Part of Table C2

Page 44 : 406 MHz Self Test Characteristics

Pages 73 to 76, 78 and 79 : Satellite Qualitative Test Results

Pages 80 to 88 and 90 : Antenna Test Results

Pages 1 and 2 of antenna measurements data

Pages Annex : OCXO Sorep Doc

1 - ADMINISTRATION

1.1. WORK ORDER

Manufacturer : ELTA SA

Address : 14 Place Marcel Dassault - 31702 BLAGNAC FRANCE

Represented by : Mr Claude CRESP

1.2. INTESPACE TEST CENTER

The test operations have been conducted by : Mr G. PEYROU

1.3. SCHEDULE

Start of test: 23 October 2001

End of test : 19 December 2001 - (GPS 20 february 2002)

1.4. WORK REFERENCE : **M3433**

1.5. EQUIPMENT UNDER TEST

The results from this test report concern only the equipment here after referenced :

- Commercial designation : ADT 406
- Model : ADT406 AF/AP
- Sérial number: PROTO 009.2001

2 - TEST FACILITIES

- ARGOS - COSPAS/SARSAT Certification Test Bench.
- Anechoic chamber for antenna test .
- Toulouse CNES MCC .

3 - STANDARS AND TEST PROCEDURES APPLICABLE

COSPAS-SARSAT standards :

- "C/S T. 001- Issue 3 - Revision 3 - October 1999 "
- "C/S T. 007- Issue 3 - Revision 7 - October 2000"

INTESPACE Radio Beacon Test Procédures :

- | | |
|---|------------------------|
| - " COSPAS-SARSAT Certification Test" | Réf. ITS : 572 AP/QA |
| - " 406 MHz Characteristic Antenna Test " | Réf. ITS : 566 AP/QA |
| - " Radio Beacon Test Report " | Réf. ITS : 579 AP/QA-f |

4 - RESULTS

See the following pages :

- application form for a COSPAS-SARSAT 406 MHz beacon Type Approval Certificate,
- summary of 406 MHz beacon test results
- test results : data and graphs
- and manufacturer technical doc and data Annex A

ITS - AP/ET M3433 Rev1

APPLICATION FOR A COSPAS - SARSAT 406 MHz BEACON TYPE APPROVAL CERTIFICATE

Beacon Manufacturer : ELTA SA

Beacon model : ADT406 AF/AP

Beacon Number : PROTO 009.2001

Name and Location of Beacon Test Facility : INTESPACE / CNES Toulouse

Beacon Type : Aviation : ☒ Land : ☐ Maritime : ☐

Antenna Model : 2624-82 CHELTON formerly RAYAN

Specified Operating Temperature Range -20 °C to 55 °C

Specified Operating Lifetime : 24 hr ☒ 48 hr ☐ Other ☐ Specify :

Beacon Battery Type(s)

Chemistry : LiMnO2

Manufacturer & model n° : FRIWO M20 HR

Size & number of cells : (D x 2) x 2

Extra Features in Beacon	No	Yes	Details
a) Auxiliary Radio-Locating Device :	☐	☒	Frequency : 121.5/243 MHz Power : 23 dBm +/- 3 dBm Tx. Duty Cycle : Cont
b) Transmits Encoded Position Data	☐	☒	Nav. Device : External Type : GPS Manufacturer : From an A/C Model : data Bus
c) Transmits Long Message (144 bits)	☒	☒	Selectable
c) Automatic Activation :	☐	☒	
d) Built-in Strobe light :	☒	☐	Intensity : Flash rate :
e) Self-test mode	☐	☒	
f) Other	☐	☒	Specify : G-Switch

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 COSPAS-SARSAT Specification (C/ST T.001) as demonstrated in the attached report.

Dated : 28 Feb 2002 revised on 5 Jun 2002

Signed :

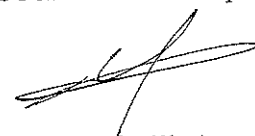

(for test facility)

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. -20°C (±3)	T amb. 20°C (±3)	T max. 55°C (±3)	
1 - POWER OUTPUT	35 - 39	dBm	37,4	37,3	37,2	Graphs p. 20, 23 and 26 Graphs pages 14 to 16
	< 5	ms	0,07	0,05	0,05	
	must be < -10 dBm	✓ *	✓	✓	✓	
2 - DIGITAL MESSAGE	Bits number					Data and graphs pages 17 to 26
	1-15	✓	✓	✓	✓	
	16-24	✓	✓	✓	✓	
	25	✓	1	1	1	
	26	✓	1	1	1	
	27-85	✓	✓	✓	✓	
	86-106	✓	✓	✓	✓	
	107-112	data bits	001111	001111	001111	
	113-144	✓	✓	✓	✓	
	< 5	km	Default	Default	Default	

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMETRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. -20°C (+3)	T amb. 20°C (+3)	T max. 55°C (+3)	
3 - DIGITAL MESSAGE GENERATOR						
o repetition rate *** :						Data and graphs pages 17 to 26
	minimum T_R =	47,5				
o bit rate	maximum T_R =	seconds	50,0	50,0	50,0	
	minimum f_b =	seconds	52,0	52,0	52,0	
o total transmission time :	maximum f_b =	bits/sec.	400,73	400,74	400,74	
	short message =	bits/sec.	400,78	400,77	400,79	
o CW preamble	long message (optional) =	ms				
	minimum T_1 =	ms	519,54	519,02	518,80	
o first burst delay	maximum T_1 =	ms	160,02	159,48	159,28	
		ms	160,04	159,95	159,30	
		seconds	49,5	51,0	50,5	

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. -20°C (±3)	T amb. 20°C (±3)	T max. 55°C (±3)	
4 - MODULATION						
o biphasé-L		✓	✓	✓	✓	Data and graphs pages 17 to 26
o rise time	50 - 250	microsec.	110	130	130	
o fall time	50 - 250	microsec.	150	130	130	
o phase deviation : positive	+ (1.0 to 1.2)	radians	+ 1,08	+ 1,10	+ 1,09	
o phase deviation : negative	- (1.0 to 1.2)	radians	- 1,06	- 1,06	- 1,07	
o symmetry measurement	≤ 0.05		+ 0,004	+ 0,01	+ 0,01	
5 - 406 MHz TRANSMITTED FREQUENCY						
o nominal value	406.023 - 406.027 or 406.027 - 406.029***	MHz	406,028292	406,028288	406,028317	Data pages 18, 21 and 24
o short term stability	≤ 2 x 10 ⁻⁹	MHz	1,64E-10	1,84E-10	1,19E-10	
o medium term stability . slope	(-1 to +1) x 10 ⁻⁹	/100 ms	-1,9E-11	-1,7E-11	1,3E-11	
o residual frequency variation	≤ 3 x 10 ⁻⁹	/minute	1,39E-10	1,67E-10	2,53E-10	
6 - SPURIOUS EMISSION **** (into 50 ohms)						
o in-band (406.0 - 406.1 MHz)	see spurious emission mask in C/S T.001	✓	✓	✓	✓	See graphs pages 27 to 30

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min.} -20°C (±3)	T _{amb.} 20°C (±3)	T _{max.} 55°C (±3)	
7 - 406 MHz VSWR CHECK after open circuit, short circuit, then while VSWR is 3:1, measure :						See data and graphs pages 31 to 37
o nominal transmitted frequency	406.023 - 406.027 or 406.027 - 406.029***	MHz	406,0282913	406,0282872	406,0283169	
Modulation :						
o rise time	50 - 250	microsec.	129,7	129,7	119,8	
o fall time	50 - 250	microsec.	149,7	129,7	119,8	
o phase deviation : positive	+ (1.0 to 1.2)	radians	1,10	1,09	1,12	
o phase deviation : negative	- (1.0 to 1.2)	radians	-1,03	-1,06	-1,04	
o symmetry measurement	≤ 0.05	✓	+ 0,00	+ 0,00	+ 0,01	
o digital message	must be correct	✓	✓	✓	✓	
8 - SELF-TEST MODE (if applicable)						Data pages 42 to 44
o frame sync	9 bits (011010000)	✓	✓	✓	✓	
o format flag	1/0	bit	1	1	1	
o single radiated burst	≤ 440 / 520 (+/- 1%)	ms	519,55	519,12	518,77	
o default position data (if applicable)	must be correct	✓	✓	✓	✓	
o description provided	protection provided	✓	✓	✓	✓	Manufacturer doc. Annex A
o design data provided on protection against repetitive self-test mode transmissions		✓	✓	✓	✓	
o single burst verification	one burst	✓	✓	✓	✓	
o provides for beacon 15 Hex ID	must be correct	✓	✓	✓	✓	Data page 43

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
9 - THERMAL SHOCK (30° C change) o Soak temperature : o Measurement temperature : the following parameters are to be met within 15 minutes of beacon and maintained for 2 hours o Transmitted frequency : - nominal value - short term stability - medium term stability : . slope . residual frequency variation o Transmitted power output o Digital message		°C °C MHz /100 ms /minute dBm ✓	Tsoak = 23 TMeas = -11 406,028301 / 406,028314 2,50E-10 -5E-10 / 8E-12 2,2E-10 37,5 / 37,6 ✓	Data and graphs pages 45 to 52

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
10 - OPERATING LIFETIME AT MINIMUM TEMPERATURE **** o Duration o Transmitted frequency : - nominal value - short term stability - medium term stability . slope . residual frequency variation o Transmitted power output o Digital message	> 24 406.023 - 406.027 or 406.027 - 406.029*** $\leq 2 \times 10^{-9}$ $(-1 \text{ to } +1) \times 10^{-9}$ $\leq 3 \times 10^{-9}$ 35 - 39 must be correct	hours MHz MHz / 100 ms /minute dBm ✓	24 hours at Tmin = -20 °C 406,02826 / 406,02828 3,1E-10 -4E-10 / 6E-11 3E-10 37,4 / 37,4 ✓	Data and graphs pages 53 to 61
11 - TEMPERATURE GRADIENT **** (5° C/hr) o Transmitted frequency : - nominal value - short term stability - medium term stability . slope . residual frequency variation o Transmitted power output o Digital message	406.023 - 406.027 or 406.027 - 406.029*** $\leq 2 \times 10^{-9}$ $(-1 \text{ to } +1) \times 10^{-9}$ $\leq 3 \times 10^{-9}$ 35 - 39 must be correct	MHz /100 ms /minute dBm ✓	406,028275 / 406,028325 2,3E-10 -3E-10 / 2.5E-10 4,4E-10 37,2 / 37,4 ✓	Data and graphs pages 62 to 71
12 - LONG TERM FREQUENCY STABILITY o Data provided	406.023 - 406.027 or 406.027 - 406.029***	MHz ✓	✓	Constructor explanations in Annex A

Table C2 - SUMMARY OF 406 MHz BEACON TEST RESULTS

Ref: M3... Rev1

PARAMÈTRES TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
13 - PROTECTION AGAINST CONTINUOUS TRANSMISSION o Description provided	≤ 45	seconds √		Constructor explanations in Annex A
14 - SATELLITE QUALITATIVE TESTS **** o Results provided	successfully located by satellites / LUT	√		Data and graphs pages 72 to 79
15 - ANTENNA CHARACTERISTICS o Polarization	linear or RHCP	√	?	Antenna test report pages 80 to 90
o VSWR	≤ 1.5	-	?	
o ERP _{max} EOL	≤ 20	Watts	17,3	
o ERP _{min} EOL	≥ 1.6	Watts	4,0	
o azimuth gain variation at 40° elevation angle	≤ 3	dB	3,7	Too high
16 - BEACON CODING SOFTWARE o sample message provided for each coding option of the applicable coding protocol types	must be correct (attach to report)	√	√	See manufacturer doc. Annex A
o sample messages provided, if applicable, with encoded positions at least 5 km apart	must be correct (attach to report)	√	√	See data page 106
o sample self-test message provided for each coding option of the applicable coding protocol types	must be correct (attach to report)	√	√	See Additional Testing Annex A : M3433 Self Test Messages

Table C2 : SUMMARY OF 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
17. NAVIGATION SYSTEM **** (as applicable)				
o position data default values	must be correct	✓	✓	
o position acquisition time	< 30	minutes	50 s (at the first burst)	See data page 103 to 111
o encoded position data update interval	> 20	minutes	N/A	
o position data input update interval (as applicable)	20 / 1	minutes	at the first burst only	
o delta offset :				
- positive direction	must be correct	✓	✓	
- negative direction	must be correct	✓	✓	
- overrange to 2 times coarse res.	must be correct	✓	✓	
o last valid position :				
- retained after nav signal lost	4	hours	4:00	
- cleared when beacon received	must be correct	✓	defaulted	
o design data provided on protection against beacon degradation due to navigation device, interface or signal failure or malfunction	no degradation	✓	✓	Annex A

* The ticks mark ✓ can be used where indicated to record that the requirement is met (no value needs to be shown).

** If $(T_{R \max} - T_{R \min}) \leq 1$ second, the manufacturer must provide a technical explanation, as describes in section A3.1.1.

*** From 1 January 2000 new 406MHz beacon models submitted for type approval can be set to transmit at $406.028 \text{ MHz} \pm 1 \text{ kHz}$. The transmitted frequency shall not vary more than $+ 2 \text{ kHz} / - 5 \text{ kHz}$ from 406.028 MHz in 5 years. It shall not vary more than 2 parts in 10^6 in 100 ms. After 1 January 2002, all new beacon models submitted for the type approval must be set at the frequency $406.028 \text{ MHz} \pm 1 \text{ kHz}$ and satisfy the above stability requirements.

**** attach graphs of test results for test number 6, 9, 10 and 11 and a summary table of results for test number 14, and, if applicable, test number 17.