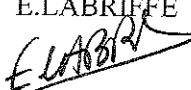
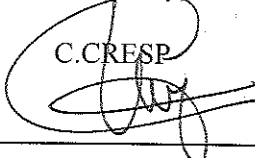
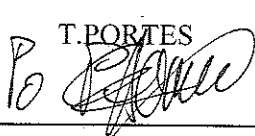


**QTP – QTR
for ELT model
ADT 406 S**

Référence : 05E63096

Révision : B

ORIGINAL EN ROUGE

<u>Rédigé par :</u> (issued by) E.LABRIFFE 	<u>Vérifié par :</u> (checked by) C.CRESP 	<u>Approuvé par :</u> (approved by) T.PORTES 	<u>Emis le :</u> 21 / 09 / 2005
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Forme 99 Q 8 0269, Rev. : C		N° archive :	Page : 1 / 36

DOCUMENT REVISION

Révision <i>Issue</i>	Nom de l'émetteur <i>Name</i>	Description de l'évolution <i>Revision description</i>	Date <i>date</i>
A	E.LABRIFFE	Creation (BPE)	31/05/05
B	E.LABRIFFE	Add type approval number (n°153) and updating antenna tests	21/09/05

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1. SUBJECT

The purpose of this document is to supply the European Aviation Safety Agency (EASA) with the relevant data needed to perform the approval process of the ELT model ADT 406 S manufactured by ELTA, F6614.

It includes Tests results performed in accordance with the EUROCAE ED-62 standard used as Qualification Tests Procedures (QTP).

Basic electrical and RF tests were performed internally at ELTA premises, Blagnac France.

COSPAS-SARSAT type approval tests and environmental tests were performed in approved laboratory :

- INTESPACE, approved COSPAS-SARSAT test laboratory located in Toulouse France for the Cospas-Sarsat aspects (operation on 406.028 MHz),
- EMITECH, located closed to Paris, for the EMI,
- ETBS, a military test laboratory located in Bourges, France, for the environmental tests,
- MECANO-ID, located in Toulouse France, for vibration & G-Switch activation level tests and 50g/11 ms Shocks.

Detailed laboratory tests reports are included in appendixes.

2. APPLICABLE DOCUMENT

- Ref. 1: C/S T.001, Specification for Cospas-Sarsat 406 MHz Distress Beacons, Issue 3 - Revision 5, with Corrigendum 1, dated October 2003,
- Ref. 2: C/S T.007, Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard, Issue 3 - Revision 11, dated October 2004,
- Ref. 3: EUROCAE ED-62, issue May 1990,
- Ref. 4: ED-14D/RTCA DO-160D issue July 1997,
- Ref. 5: ED-12B/RTCA DO-178B issue December 1992,
- Ref. 6: RTCA DO-183, Issue May 1983, for information only,
- Ref. 7: RTCA DO-204, issue September 1989 for information only.

Note: EUROCAE ED-62 refers to (includes) C/S T001 and RTCA DO-160C applicable specification issued in 1990. For this qualification process we apply the latest available issue for these documents see Ref. here above.

3. APPLICABILITY

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This equipment is designed for installation in any aircraft including commercial/General aviation aircraft and helicopters.

It is an **E**mergency **L**ocator **T**ransmitter (ELT)

This ELT meets the latest ICAO requirements (July 2002) i.e. operation on COSPAS-SARSAT 406 MHz .

This ELT model will be produced at ELTA premises located 14 Place Marcel Dassault 31702 Blagnac Cedex France (F6614).

PART 21 G agreement N° FR.21G.029 is granted to ELTA company and permanent audits are performed by GSAC (quality department of French Airworthiness in charge with PART 21 G Survey). The POE/MOE (Production Organisation Exposition) document reference is 00Q80937 (x).

3.1. MINIMUM PERFORMANCE STANDARD

The ELT model ADT 406 S is a three (3) frequencies distress transmitter.

It meets both the requirements of:

- ETSO-2C91a, 121.5 & 243 MHz ELT (EUROCAE ED-62)
- ETSO-2C126, 406 MHz COSPAS-SARSAT ELT (EUROCAE ED-62)

Basically this ELT is a class 2 (-20°C +55°C) Survival type and has been tested following this class.

3.2. ENVIRONMENTAL STANDARD

The reference document is the ED-14/RTCA DO-160 included in the EUROCAE ED-62.

We will apply the latest issue "D" of this document. For information the issue called by ED-62 is "C".

Note:

Some of the tests are ruggurised from ED-14D/DO-160D and are described as special.

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3.3. ENVIRONMENTAL QUALIFICATION FORM AS PER ED-14D/DO-160D

DO-160D Env. Cat. : *X*A*[F1C1]A[RW]XXSZXXXZWMXXXX

* Special per ED-62 or DO-183 or DO-204

QUALIFICATION TEST DESIGNATION	ED-14D DO-160D SECTION	ED-14D / DO-160D CATEGORY	REPORT document. METHOD (S)imilarity (T)est
Temperature & altitude	4	Special Eurocae ED 62, tested to 50,000 feet	05E63096 (T)
In Flight Loss of Cooling	4.5.4	Equipment identified to category X no test required	N/A
Temperature variation	5	Special Eurocae ED 62	05E63096 (T)
Humidity	6	Equipment tested to category A	05E63096 (T)
Operational shocks and crash safety	7	Special : equipment tested to 50g / 11 ms	05E63096 (T)
Vibrations	8	Equipment tested to category F/F1 C/C1	05E63096 (T)
Explosion proofness	9	Equipment tested to category A	93E60001 (S)
Water-proofness	10	Equipment tested to category RW	05E63096 (T)
Fluid susceptibility	11	Equipment identified to category X no test required	N/A
Sand & Dust	12	Equipment identified to category X no test required	N/A
Fungus resistance	13	Equipment identified to category X no test required	N/A
Salt spray	14	Equipment tested to category S	05E63096 (T)
Magnetic effects	15	Equipment tested to category Z	02E66255 (S)
Power input	16	Equipment identified to category X no test required	N/A
Voltage spike	17	Equipment identified to category X no test required	N/A
Audio frequency conducted susceptibility-power inputs	18	Equipment identified to category X no test required	N/A
Induced signal susceptibility	19	Sect. 19.3.1, equipment tested to category Z	05E63096 (T)
Radio frequency susceptibility (radiated & conducted)	20	Sect. 20.5, equipment tested to category W	05E63096 (T)
Emission of radio frequency energy	21	Sect. 21.4, equipment tested to category M in "ARMED" mode (normal stand-by mode), and in transmission.	05E63096 (T)
Lightening induced transient susceptibility	22	Equipment identified to category X no test required	N/A
Lightening direct effects	23	Equipment identified to category X no test required	N/A
Icing Test	24	Equipment identified to category X no test required	N/A
Electrostatic Discharge Test	25	Equipment identified to category X no test required	N/A
Flame	None	Special Eurocae ED 62, 20s	02E66255 (S)
Autonomy	None	Special Eurocae ED 62, 24 hours (406.028 MHz) & 60 hours (121.5-243 MHz)	05E63096 (T)

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4. QUALIFICATION TESTS REPORT (QTR)

4.1. QUALIFICATION ELT'S PRODUCT

The ELT model ADT 406 S (see figure 1) is a three frequency 121.5-243-406.028 MHz .
It meets the latest ICAO recommendation and operates the new required Cospas-Sarsat channel.

It is a Class 2 ELT (-20° +55°)

It is a Survival type (S)

It incorporates a water sensor that activate automatically the ELT when the ELT operates in a float free condition (ELT secured to the survival or to a life raft).

Automatic activation (water sensor) is located in the Activation/Identification module. This Activation/Identification module incorporates the Cospas-Sarsat identification storage.

Please refer to user's handbook for detailed presentation.

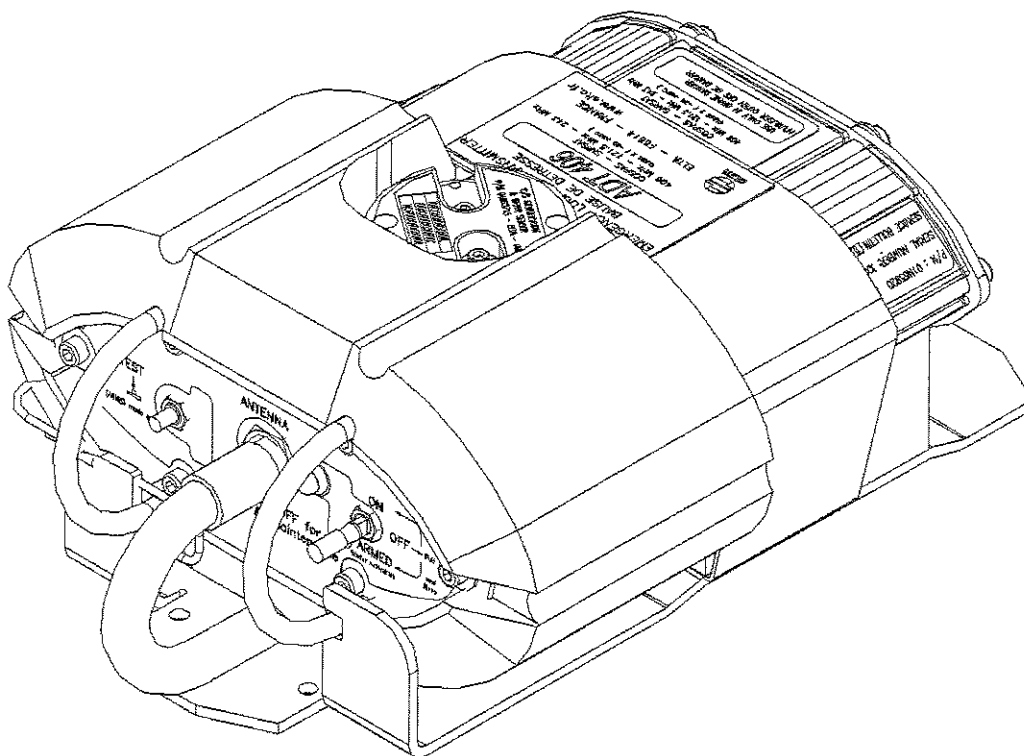


Figure 1

Local manual activation is performed via the three positions toggle switch on the ELT front panel.

The three frequency whip antenna meets COSPAS-SARSAT and EUROCAE requirements.

The push button activates the beacon self test.

Part Number of the ELT product in production will be **01N6592(x) (x)**.

This P/N incorporates all the changes detected and solved on the prototypes during the qualification process.

Where the first (x) starts at **0** and revision index (second (x)) starts at **B**. **ORIGINAL EN ROUGE**
The first (x) will be used for family range (same function).

Revision index will trace up minor change to design that still keep Fit Form & Function capability of the ELT and is covered by minor Aeronautical Equipment Change Order (AECO) approval.

The following ELT prototypes P/N 01N65920 rev A, representative of the future ELT production were used for the qualification process:

- Proto 04-0001,
- Proto 04-0002,
- And some of the pre-production ELT products in conformance to P/N 01N65920 Rev. B definition :
- 04.0005 to 04.0014

The configuration tested was set up as follow:

- One ELT transmitter P/N 01N65920, with his whip antenna 04N62718 per ELTA specification 04E60733 (OEM CHELTON P/N 1364-44 tested with this prototype).
- One Bracket P/N : 04N64250, when necessary.
- One transparent protective cover P/N : 04N64265, when necessary.

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5. CERTIFICATION TEST BENCH

Internally ELTA operates a COSPAS-SARSAT certification test bench for the production of its ELT.

This test bench was used to verify the RF performance of the ADT under test before and after the environmental tests in order to verify failure or performances degradation due to the test.

It use commercial measurements instruments controlled by a computer.

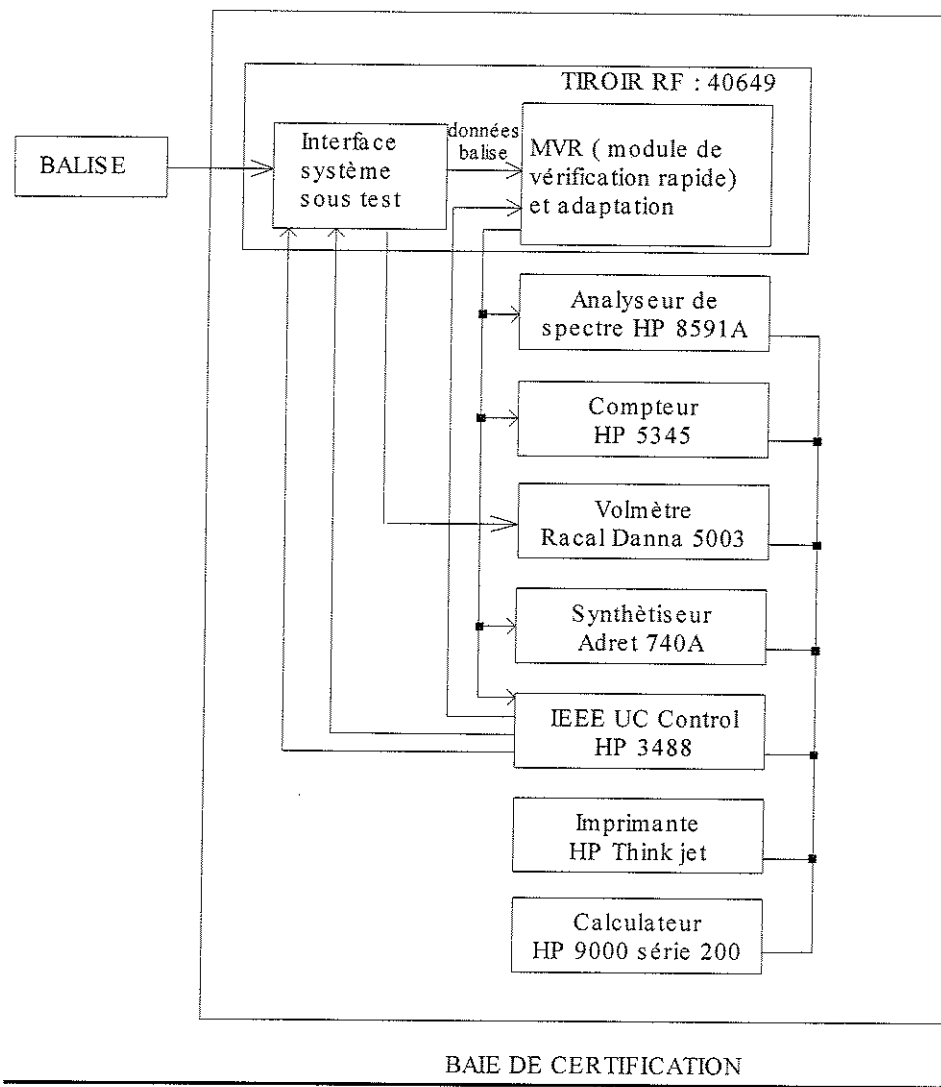
The software used is "CS_ADT_V1.1" or "CS_ADT_V1.2" .

This software issue automatically a test report sheet with all the COSPAS-SARSAT and associated homing signals RF & timing.

An example of this sheet is given at the end of the Appendix 2.

This bench is designed to measures the ELT operating on 406.028 MHz so the frequency measurement (value) issued for the ADT 406 is correct by out the specification indicated on the test report sheet and the output power (406 MHz) is reduced of about 1dB (RF filters).

The certification test bench bloc diagram is presented here under:



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User's Handbook of this "Certification Test Bench" is presented in Appendix 2.

Note. A similar test bench is used by INTESPACE laboratory when they perform the COSPAS-SARSAT type approval process.

This Test Bench is used in the final acceptance test of any ELT from our production range (PART 21 G).

It was used in the past for the initial qualification process on the actual ELT production models.

6. TEST PLAN

The Qualification process is made of two main parts.

- First one is the “COSPAS-SARSAT” type Approval process. It is defined by Ref. 2.

Tests results are presented in appendix 4. A type Approval is n°153 with this organisation, see Appendix 3.

These tests were performed at INTESPACE a Cospas-Sarsat type approval approved laboratory.

- Second one is the “EUROCAE ED-62” technical standard. It is defined by Ref. 3.

Environmental tests were performed in specialised laboratories.

These tests are summarised in the compliant matrix presented here under:

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7. COMPLIANCE MATRIX VERSUS ED-62 (EUROCAE) & CST 007 (COSPAS-SARSAT)

Test Designation		ED-62 §	Defined as	Test Performed & location		Test Result	Comments
	Airworthiness	2.1	Mandatory	N/A	N/A	Compliant	
	IUT	2.2	Mandatory	N/A	N/A	Compliant	
	Fire Protection	2.3	Mandatory	N/A	N/A	Metallic case, Compliant	
	ELT Controls & Monitors (S)	2.5.2	Mandatory	YES, ELTA	Compliant	OFF/ON/ARMED, toggle switch and TEST push button.	
	Monitoring	2.5.3	Mandatory	YES, ELTA	Compliant	LED and Buzzer included in the ELT	
	Self Test 406 MHz	2.6.1	Mandatory	YES, ELTA	Compliant	Self test incorporates, output power, C/S identification, Software Check sum. One C/S burst, with reverse synchronisation pattern is used.	
	Self Test 121.5 – 243 MHz	2.6.2	Optional	YES, ELTA	Compliant	Self test incorporates 5s of real transmission	
	Installation Orientation	2.7	Not Applicable			There is no G-Switch	
	Case Design & colour	2.8	Mandatory	YES, ELTA	Compliant	ELT colour is "distress Orange". No sharp edges and instructions for use label is present.	
	Power Supply	2.9	Mandatory	YES, ELTA	Compliant	ELT is stand alone. Power is made with 2 packs of 2 "D" cells of LiMNO ₂ primary, not rechargeable battery (lithium battery).	
	Temperature & Altitude ranges	2.10	-	YES, ELTA,	Compliant	Class 2 ELT (-20°C; +55°C)	

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Test Designation		ED-62 §	Defined as	Test Performed & location		Test Result	Comments
	Water-proofness	2.11	Mandatory		YES, ETBS	Compliant	Cat R,W ED-14D/DO160D section 10. See § 8.4.2 and 8.4.13
	Immersion in salt water	2.12	Mandatory		YES, ETBS	Compliant	Sealed. See § 8.4.13
	Fire Resistant	2.13	Flame, Mandatory		YES, Not test Performed	Compliant	By similarity with ADT406 AF/AP (same case and gasket is used).
	Software Control	2.15	ED-12A		YES, ELTA	Compliant	ED-12B/DO178B & level D selected.
	Additional Requirements (S)	2.16.3	Mandatory		YES, ELTA,	Compliant	ELT incorporate a red LED & buzzer, float and the antenna is permanently screwed on the beacon.

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121.5 – 243 MHz TRANSMITTER

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Operating Frequencies (homing)	3.1.1	Mandatory	YES, ELTA,	Compliant	121.5 & 243MHz. See § 8.1.1 for detail
Modulation Characteristics	3.1.2	Mandatory	YES, ELTA,	Compliant	AM, Mod. Factor 99% (121.5) & (243), Sweep Downward from 1470 to 489 Hz, Sweep Duty Cycle 35.2 % See § 8.1.2 for detail
Emission Characteristics	3.1.3	Mandatory	YES, ELTA,	Compliant	Mod. Type A3X (compatible with A3A), continuous carrier, side bands clearly defined, power within 30 Hz 50% (121.5) and within 60 Hz 43 %(243), See § 8.1.3 for detail
Antenna Radiation Characteristics	3.1.4	Mandatory	YES, INTESPACE,	Compliant	Omni-directional See § 8.1.4 for detail
EIRP	3.1.5	Mandatory	YES, INTESPACE,	Compliant	21.08 dBm See § 8.1.5 for detail
Endurance	3.1.6	Mandatory	YES, INTESPACE,	Compliant	> 60 hours with ULTRALIFE or SAFT batteries. See § 8.1.6 for detail
RF Inter-modulation	3.1.7	Not Applicable to Survival			There is no external antenna
RF Susceptibility	3.1.8	Not Applicable to Survival			There is no external antenna
Transmitter Turn ON	3.1.9	Mandatory	YES, INTESPACE,	Compliant	Lower than one millisecond. See § 8.1.9 for detail

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406 MHz TRANSMITTER

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Operating Frequency 406 MHz	3.2.1	Mandatory	YES, INTESPACE	Compliant	406.028 $\pm$ 1 KHz. See INTESPACE TEST reports in appendix 4. Note: Deviation from ED-62 but mandatory for Cospas-Sarsat
Digital Message Generator	3.2.2	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
Modulation characteristics	3.2.3	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
Data Encoding	3.2.4	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
EIRP	3.2.5	Mandatory	YES, INTESPACE	Compliant	See § 8.2.5.
Antenna Radiation characteristics	3.2.6	Mandatory	YES, INTESPACE	Compliant	See § 8.2.6 and INTESPACE TEST reports in appendix 4.
Abnormal Transmitter Load	3.2.7	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
Maximum Continuous Transmission	3.2.8	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
Spurious Emission & Carrier Harmonics	3.2.9	Mandatory	YES, INTESPACE	Compliant	See INTESPACE TEST reports in appendix 4.
RF Susceptibility	3.2.10	Not Applicable for Survival			
Warm up time	3.2.11	Mandatory	YES, INTESPACE	Compliant	Lower than 50s. See INTESPACE TEST reports in appendix 4.
Endurance	3.2.12	Mandatory	YES, INTESPACE	Compliant	24 Hours. See INTESPACE TEST reports in appendix 4.

GROUP A TESTS

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Low temperature activation (-55°)	4.4.1.1	Mandatory	YES, ETBS	Compliant	Same as Altitude. See § 8.3.1 for detail.
High temperature activation (+85°)	4.4.1.2	Mandatory	YES, ELTA	Compliant	Normal activation.
Altitude	4.4.1.3	Mandatory	YES, ETBS	Compliant	50,000 feet. See § 8.3.3
Decompression	4.4.2	Mandatory	YES, ETBS	Compliant	To 1 psi in 25s. See § 8.3.4
Overpressure	4.4.3	Mandatory	YES, ETBS	Compliant	170Kpa for 10'. See § 8.3.5.
Vibration	4.4.4	Mandatory	YES, MECANO ID	Compliant	ED-14D/DO-160D Section 8 cat F/F1 C/C1 See § 8.3.6
Magnetic influence	4.4.5	Mandatory	YES, EMITECH (Per similarity)	Compliant	Cat. Z (17 cm for 1° deviation), ED-14D/DO160D section 15. See § 8.3.7
Power input normal operation	4.4.6	Not applicable for survival	N/A	-	No external power
Power input abnormal operation	4.4.7	Not applicable for survival	N/A	-	No external power
Audio frequency conducted susceptibility	4.4.8	Not applicable for survival	N/A	-	No external power
Induced signal susceptibility	4.4.9	Mandatory	YES, EMITECH	Compliant	ED-14D/DO-160D Section 19 cat Z, See § 8.3.11
RF susceptibility	4.4.10	Mandatory	YES, EMITECH ELTA	Compliant	ED-14D/DO-160D Section 20.5 cat W and See § 8.3.12
Lightning induced transient susceptibility	4.4.11	Not applicable for survival	N/A	-	
Lightning susceptibility	4.4.12	Not applicable for survival	N/A	-	
Emission of RF energy	4.4.13	Mandatory	YES, EMITECH	Compliant	Cat. M, ED-14D Section 21. See § 8.3.15
Explosion	4.4.14	If Required	N/A	-	Sealed. Considered as qualified per similarity. See § 8.3.16

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GROUP B TESTS

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Humidity	4.5.1	Mandatory	YES, ETBS,	Compliant	Cat. A, ED-14D Section 6. See § 8.4.1
Water-proofness	4.5.2	Mandatory	YES, ETBS,	Compliant	Cat W, ED-14 Section 10. See 8.4.2
Fluid immersion	4.5.3	If Required	N/A	-	
Sand & Dust	4.5.4	If Required	N/A	-	
Fungus resistance	4.5.5	If Required	N/A	-	
Salt fog	4.5.6	Mandatory	YES, ETBS	Compliant	Cat S, ED-14 Section 14. See §8.4.6
Operational shocks	4.5.7.1	Not applicable for survival	N/A		No G-Switch on this beacon
Crash shocks	4.5.7.2	Mandatory	YES, MECANO ID	Compliant	50g/11ms. See § 8.4.7.2
Penetration	4.5.8	Mandatory	YES, ETBS	Compliant	See § 8.4.8
Impact	4.5.9	Not applicable for Survival	-		
Crush	4.5.10	Mandatory	YES, ETBS	Compliant	See § 8.4.10
Flame	4.5.11	Mandatory	YES, ETBS (Per similarity)	Compliant	See § 8.4.11
Fire	4.5.12	Not applicable for Survival	N/A	-	
Post Crash Immersion	4.5.13	Mandatory	YES, ETBS	Compliant	See § 8.4.13

ORIGINAL EN ROUGE

GROUP C TESTS

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Operation at low temperature (-20°C)	4.6.1	Mandatory	YES, INTESPACE	Compliant	See § 8.5.1
Operation at High temperature (+55°C)	4.6.2	Mandatory	YES, INTESPACE	Compliant	See § 8.5.2
Temperature variation	4.6.3	Mandatory	YES, INTESPACE	Compliant	See § 8.5.3
Thermal Shock	4.6.4	Mandatory	YES, INTESPACE	Compliant	See § 8.5.4

GROUP D TESTS

Test Designation	ED-62 §	Defined as	Test Performed & location	Test Result	Comments
Buoyancy	4.7.1	Mandatory	YES, ELTA	Compliant	See § 8.5.5
Endurance	4.7.2	Mandatory	YES, INTESPACE	Compliant	See § 8.5.6

ORIGINAL EN ROUGE

8. DETAILED RF TEST

8.1. MINIMUM PERFORMANCES 121.5 – 243 MHZ

8.1.1. Operating Frequencies

8.1.1.1. *Frequency*

F1 = 121.50206 MHz at -20°C

F1 = 121.5000 MHz at +20°C

F1 = 121.49843 MHz at +55°C

ELTA measurement.

- **Average frequency 121.50016 MHz, within the limit 121.5 MHz ± 6 KHz , compliant.**

F2 = 243.00375 MHz at -20°C

F2 = 243.00023 MHz at +20°C

F2 = 242.99663 MHz at +55°C

- **Average frequency 243.00020 MHz, within the limit 243 MHz ± 12 KHz , compliant.**

8.1.1.2. *Frequency stability*

In the ELT model ADT 406 S we are using the same transmitter chain schematics than for the model ADT406 AF/AP already approved. So we qualify this transmitter per similarity for that characteristic. **Compliant.**

8.1.2. Modulation characteristics

8.1.2.1. *Modulation type*

Modulation type is AM on 121.5 & 243 MHz homing signal.

Modulation factor m is given from

$$m = \frac{10^{\frac{dB}{20}} - 1}{10^{\frac{dB}{20}} + 1}$$

Where “dB” is the difference in dB between P max and P min measured with the spectrum Analyser.

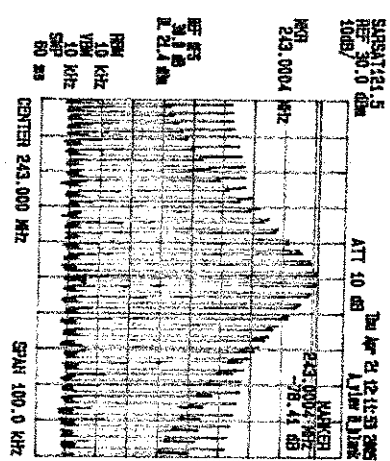
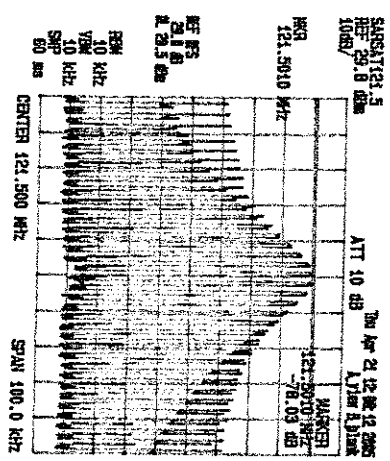
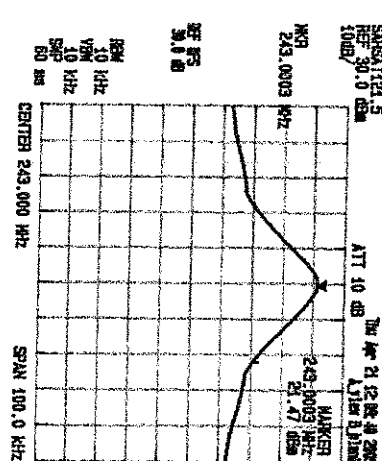
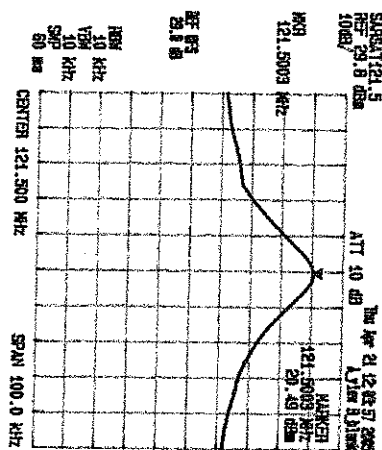
For 121.5 MHz dB = 78,03 so m = 0,99 > 0.85 and < 1, **Compliant,**

For 243 MHz dB = 78,4 so m = 0,99 > 0.85 and < 1, **Compliant.**

ORIGINAL EN ROUGE

ADT 406 S (S/N = 04.00012)

20/04/05



Modulation characteristics

8.1.2.2. Modulation sweep excursion

AM modulation is made by software.

Upper limit is set 1470 Hz, lower limit is set to 480 Hz.

See Appendix 10 where measurements on ADT 406 S (Pre-Production ELT products) issued from our certification test bench are presented.

Modulation direction is downward.

Compliant.

ORIGINAL EN ROUGE

SARSAT121.5
REF 39.6 dBm
10dB/

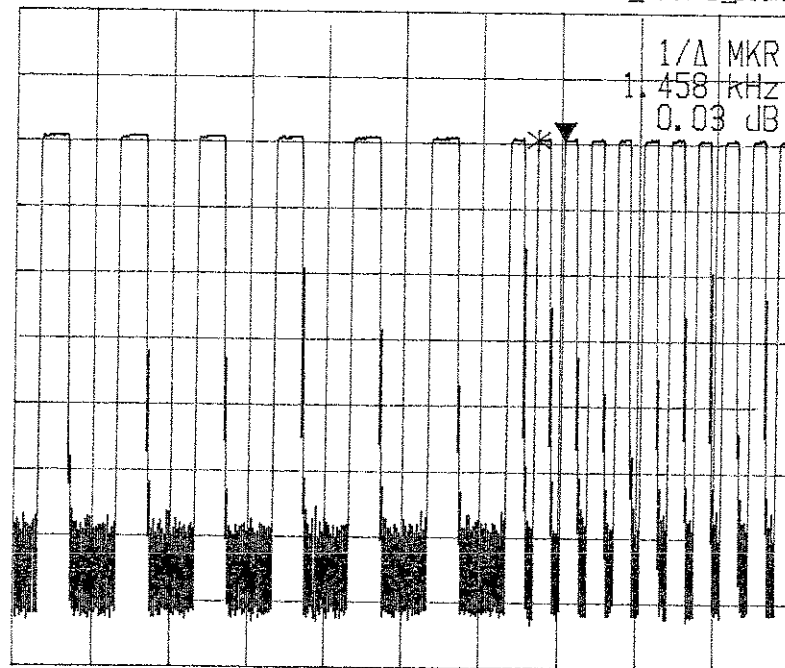
Fri Apr 22 09:52:02 2005
ATT 20 dB
A_view B_blank

Δ MKR
685.7 μ s

1/ Δ MKR
1.458 kHz
0.03 dB

REF OFS
29.6 dB

RBW
1 MHz
VBW
1 MHz
SWP
20 ms



CENTER 121.501428 MHz

SPAN 0 Hz

SARSAT121.5
REF 39.6 dBm
10dB/

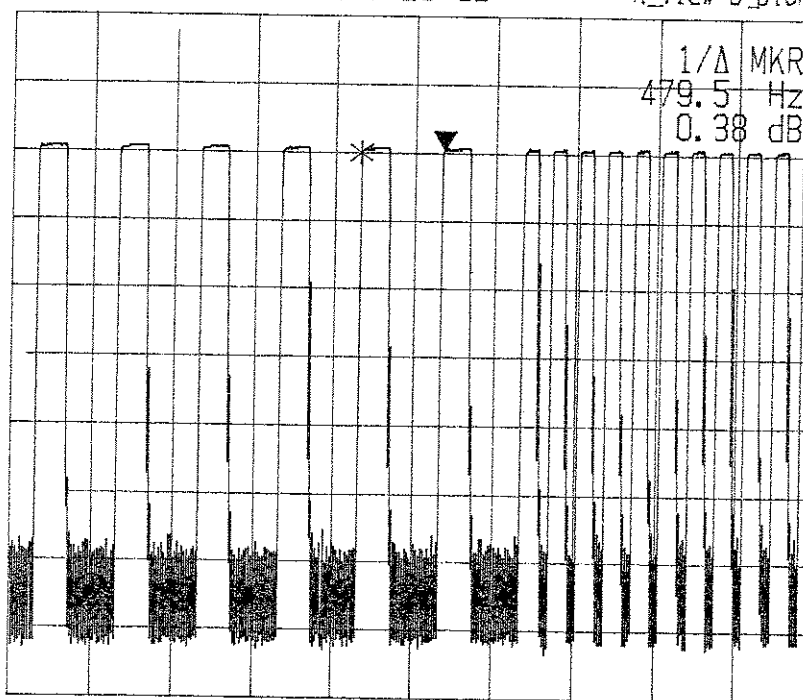
Fri Apr 22 09:48:36 2005
ATT 20 dB
A_view B_blank

Δ MKR
2.086 ms

1/ Δ MKR
479.5 Hz
0.38 dB

REF OFS
29.6 dB

RBW
1 MHz
VBW
1 MHz
SWP
20 ms



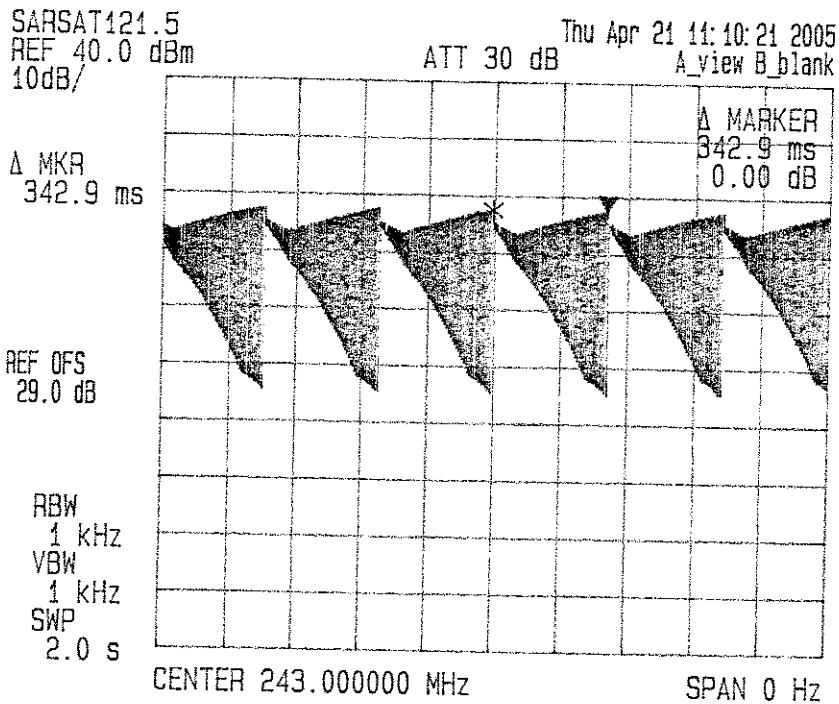
CENTER 121.501428 MHz

SPAN 0 Hz

ORIGINAL EN ROUGE

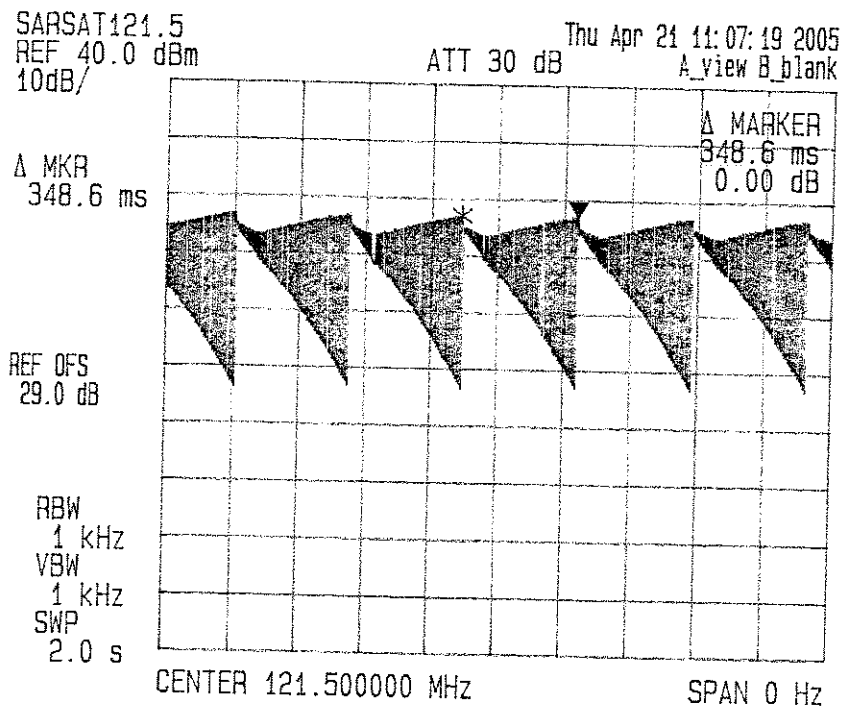
ADT 406 S (S/N : 04.0012)

20/04/05



ADT 406 S (S/N : 04.0012)

20/04/05



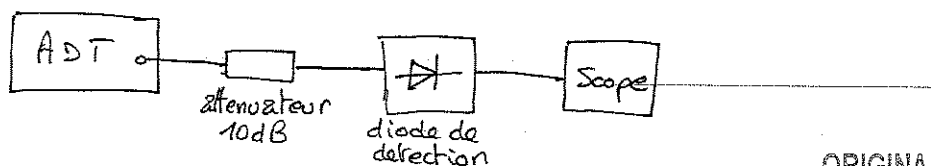
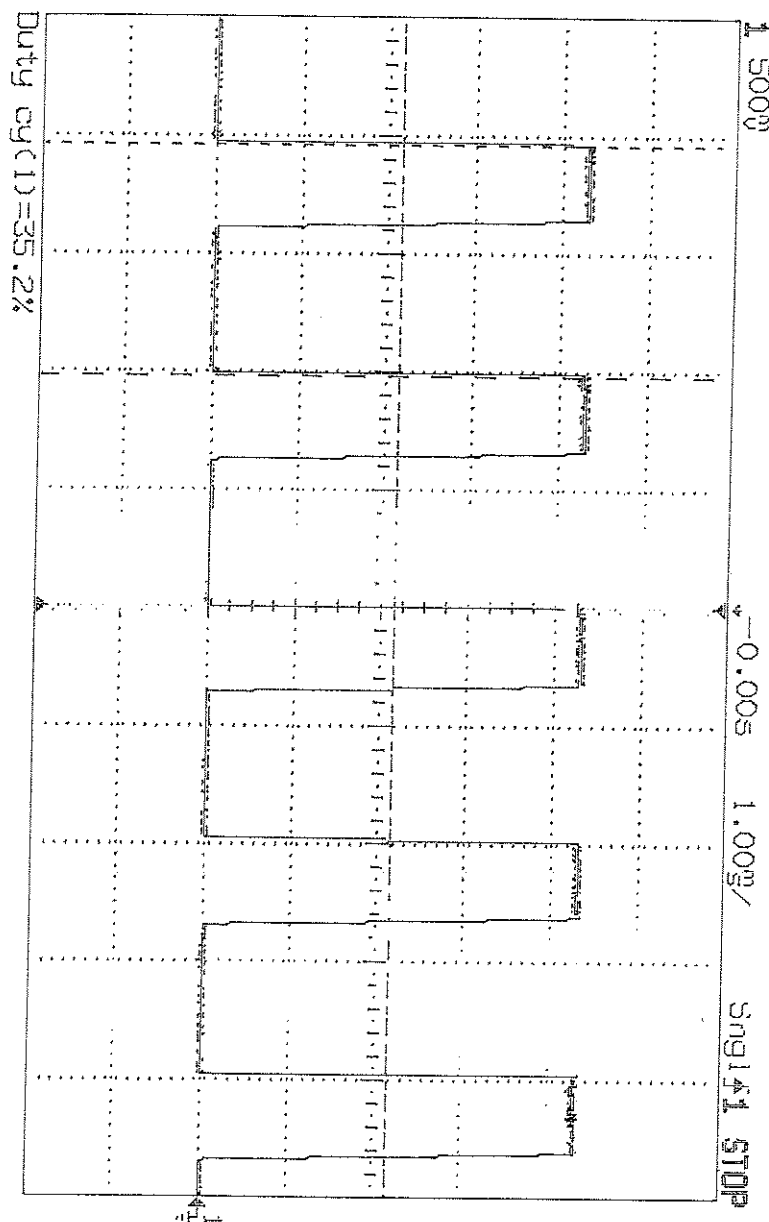
ORIGINAL EN ROUGE

8.1.2.3. Modulation duty cycle

Modulation is performed by software so the duty cycle is fixed and independent from the temperature.

Duty cycle measurement is 35.2 % > 33%, **Compliant**.

~~ADT 406 S (S/N 04 00 12) 20/04/05~~



ORIGINAL EN ROUGE

8.1.3. Emission characteristics

8.1.3.1. Type of emission

Emission on 121.5 & 243 MHz are A3X (audiosweep) compatible with A3A, **Compliant**.

8.1.3.2. Side bands

At 121.5 MHz carrier is permanent, **Compliant**,

Side bands are well defined and symmetrical, **Compliant**,

The power energy distribution is computed by using the following formula:

$$\text{Power Repartition within 30 Hz} = \frac{P_4}{\sum_{n=1}^7 P_n} = 50\% > 30\%, \text{ **Compliant**.}$$

Spectrum analyser setting:

- RBW = 30 Hz
- VBW = 10 KHz
- SPAN = 10 KHz
- Center Frequency 121.5 MHz
- SWEEP 30 s

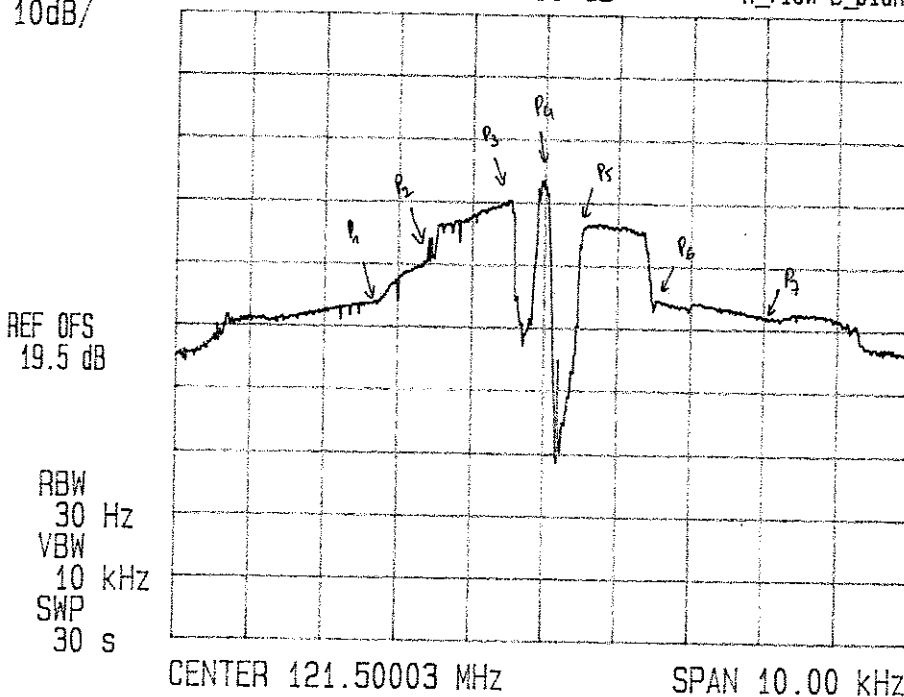
see figure here under for detail .

ADT 406 S (S/N 04.0012)

20/04/05

SARSAT121.5
REF 30.0 dBm
10dB/

Thu Apr 21 11:28:03 2005
ATT 30 dB
A_view B_blank



$$P_4 = 2,38 \text{ dBm} = 1,73 \text{ mW}$$

$$P_1 = -45,28 \text{ dBm} = 0,03 \text{ mW}$$

$$P_2 = -8,28 \text{ dBm} = 0,13 \text{ mW}$$

$$P_3 = 0,34 \text{ dBm} = 1,08 \text{ mW}$$

$$P_5 = -3,44 \text{ dBm} = 0,45 \text{ mW}$$

$$P_6 = -15,91 \text{ dBm} = 0,025 \text{ mW}$$

$$P_7 = -18,34 \text{ dBm} = 0,014 \text{ mW}$$

$$\frac{P_4}{\sum P_n} = 50\%$$

ORIGINAL EN ROUGE

At 243 MHz carrier is permanent, **Compliant**,

Side bands are well defined and symmetrical , **Compliant**,

The power energy distribution is computed by using the following formula:

$$\text{Power Repartition within } \pm 60 \text{ Hz} = \frac{P_4}{\sum_1^7 P_n} = 43\% > 30\%, \text{ **Compliant**.}$$

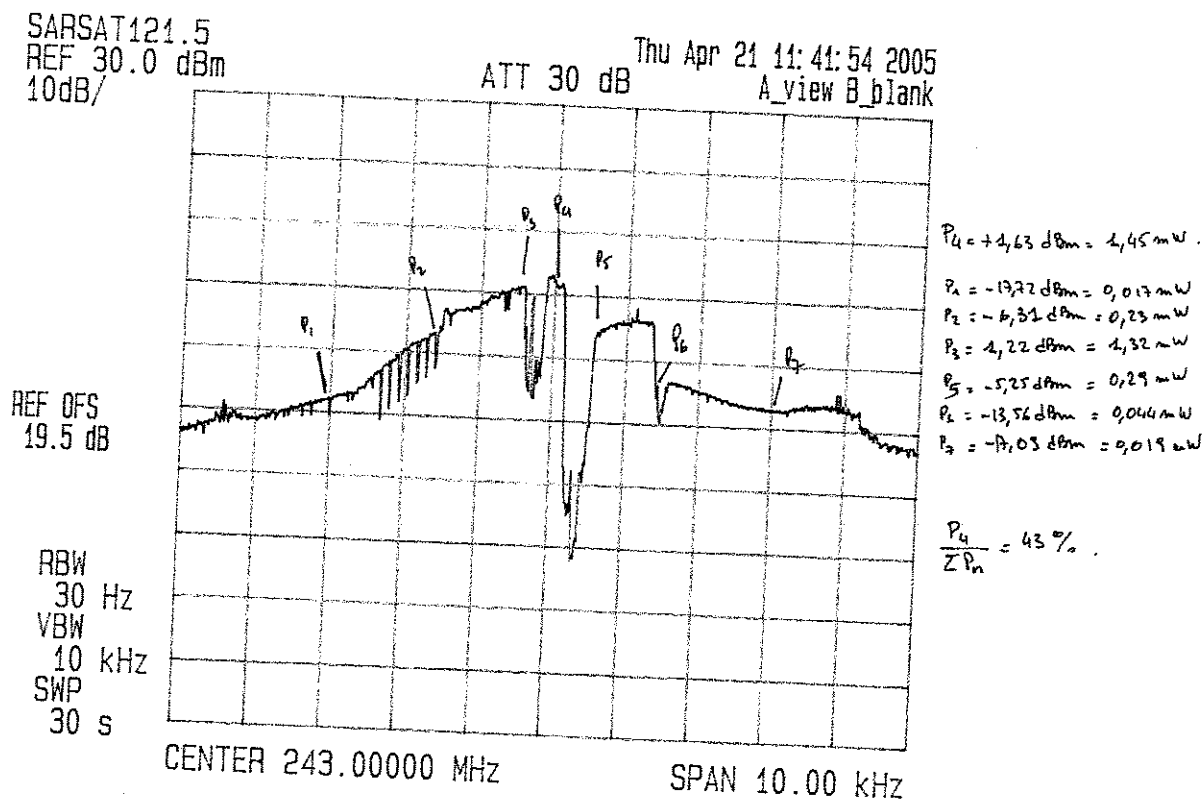
Spectrum analyser setting:

- RBW = 30 Hz
- VBW = 10 KHz
- SPAN = 10 KHz
- Center Frequency 243 MHz
- SWEEP 30 s

see figure here under for detail .

ADT 406 S (SIN : 04.0012)

20/04/05



8.1.3.3. Unmodulated CW

Not applicable to this ELT model ADT 406.

8.1.3.4. Voice modulation

Not applicable to this ELT model ADT 406.

ORIGINAL EN ROUGE

8.1.3.5. Morse code Identification

Not applicable to this ELT model ADT 406S.

8.1.4. Antenna Radiation Characteristics

The whip antenna 04N62718 (per ELTA specification 04N62718) is omni-directional in the horizontal plane. And radiation is vertically polarised, **Compliant**.

8.1.5. EIRP

Note: The measurement is made in the Intespace Anechoic chamber.

0.89 dBi < Ga < 1.54 dBi

121.5 MHz BEACON ANTENNA TEST RESULTS

Table C1 : EFFECTIVE RADIATED POWER (dBm) / ANTENNA GAIN (dBi)

AZIMUTH (degrees)	ELEVATION ANGLE (degree)							
	5		10		15		20	
	E.P.R. dBm	GAIN dBi	E.P.R. dBm	GAIN dBi	E.P.R. dBm	GAIN dBi	E.P.R. dBm	GAIN dBi
0	N.A.	#####	21,24	1,24	21,75	1,75	21,03	1,03
30	N.A.	#####	21,24	1,24	21,75	1,75	21,03	1,03
60	N.A.	#####	21,14	1,14	21,65	1,65	21,03	1,03
90	N.A.	#####	21,14	1,14	21,55	1,55	20,93	0,93
120	N.A.	#####	21,14	1,14	21,45	1,45	20,93	0,93
150	N.A.	#####	21,04	1,04	21,45	1,45	20,83	0,83
180	N.A.	#####	20,94	0,94	21,35	1,35	20,63	0,63
210	N.A.	#####	20,84	0,84	21,35	1,35	20,63	0,63
240	N.A.	#####	21,04	1,04	21,45	1,45	20,83	0,83
270	N.A.	#####	21,04	1,04	21,55	1,55	20,83	0,83
300	N.A.	#####	21,04	1,04	21,55	1,55	20,93	0,93
330	N.A.	#####	21,14	1,14	21,65	1,65	21,03	1,03
AVERAGE	0,00	#####	21,08	1,08	21,54	1,54	20,89	0,89
Overall Gain	0,00		0,40		0,40		0,40	
Variation	dB		dB		dB		dB	

EIRPmax = 21.08 < to 26 dBm limit, **Compliant**.

EIRPmin= 20.89 > 20 dBm limit, **Compliant**.

8.1.6. Endurance

See appendix 4, page 50, for ULTRALIFE and page 62 for SAFT batteries tests. With Ultralife or Saft batteries the endurance is about 67 hours, taking into account a weekly self test, battery servicing interval set to 5 years and battery packs self discharge for 5 years.

67 hours > 48 hours, **Compliant**.

8.1.7. Radio Frequency intermodulation

Not applicable for Survival ELT.

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8.1.8. Radio Frequency Susceptibility

Not applicable for Survival ELT. Survival beacon don't have external antenna.

8.1.9. Transmitter Turn ON

121.5 & 243 MHz transmitters are solid state with transistors so there is no heat up delay. Output power is set to its maximum in less than one millisecond. (value not measured as not relevant and far from 5'). **Compliant.**

Note for information the turn on time for the 406 MHz transmitter (5W) is 40 μ s at -20°C . See Appendix 4 page 5.

8.2. MINIMUM PERFORMANCES 406 MHZ

See Appendix 4 for detail.

8.2.1. Operating Frequencies

8.2.1.1.Frequency offset

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.1.2.Frequency variation over 5 Years

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.1.3.Frequency variation over 100 ms

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.1.4.Frequency stability

8.2.1.4.1.Mean Slope

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.1.4.2.Rms deviation

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2. Digital Message Generator

8.2.2.1.Repetition Rate

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.2.Total transmission rate

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.3.CW Preamble

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.4.Digital message

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.5.Bit Synchronisation

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.6.Frame Synchronisation

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153. ORIGINAL EN ROUGE

8.2.2.7.Format Flag

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.2.8.Message Structure

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.3. Modulation characteristics

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.3.1.Modulation type

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.3.2.Rise & fall time of modulation waveform

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.3.3.Modulation symmetry

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.4. Data Encoding

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.5. EIRP

8.2.5.1.EIRP of transmitted pulse

ADT 406 S Cospas-Sarsat type approval so meet the ERP specification of COSPAS-SARSAT.

$$EIRP = P_T - L + G_A$$

$$P_T = 37,2 \text{ dBm}$$

$$G_A = \text{see appendix 4 page 100.}$$

$P_T * G_A$ is issued from measurements in appendix 4 page 98.

$$EIRP_{\min} = 32.13 \text{ dBm}$$

$$EIRP_{\max} = 40.17 \text{ dBm}$$

Compliant EIRP is comprised between 32 dBm (2W) and 40 dBm (10 W)

Note: Limits allowed by COSPAS-SARSAT are 1.6 W to 20 W.

8.2.5.2.Transmitter output power rise time

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

Rise time is 40 μ s. See Appendix 4 page 5.

8.2.6. Antenna Radiation characteristics

8.2.6.1.Radiation Pattern

Antenna is omni directional. 93 % of the measurement are within the specification (min 90% required). See Appendix 4 page 100.

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8.2.6.2. Polarisation

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.
Antenna is vertically polarized.
See appendix 4 page 97.

8.2.7. Abnormal Transmitter Load

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.8. Maximum Continuous Transmission

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.9. Spurious Emission & Carrier Harmonics

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.10. RF Susceptibility

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.11. Warm up time

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

8.2.12. Endurance

ADT 406 S Cospas-Sarsat type approved. Granted Type Approval number is 153.

ORIGINAL EN ROUGE

8.3. ENVIRONMENTAL TESTS – GROUP A

8.3.1. Low temperature activation (-55°)

This test was made with Altitude test (same results).

Controls from the ELT are satisfactory: ON / TEST / RESET. Self test result is positive. See § 8.3.3.

ELT conform to ED-62 § 4.4.1.1

8.3.2. High temperature activation (+85°)

Test Performed at ELTA. Controls from the ELT are satisfactory: ON / TEST / RESET. Self test result is positive.

ELT conform to ED-62 § 4.4.1.2

8.3.3. Altitude

ELT in “ARMED” mode.

No False activation to 50,000 feet and -55°C condition.

Controls from the ELT are satisfactory after the test : ON / TEST / RESET. Self test result is positive. See ETBS test report in appendix 6, page 7.

ELT conform to ED-62 § 4.4.1.3

8.3.4. Decompression

ELT in “ARMED” and “OFF” mode.

No False activation during rapid decompression (to 1 psi in 25s).

Controls from the ELT are satisfactory after the test: ON / TEST / RESET. Self test result is positive. See ETBS test report in appendix 6, page 8.

ELT conform to ED-62 § 4.4.2

8.3.5. Overpressure

ELT in “ARMED” mode.

No False activation at 170 Kpa pressure for 10’.

Controls from the ELT are satisfactory after the test: ON / TEST / RESET. Self test result is positive. See ETBS test report in appendix 6, page 7.

ELT conform to ED-62 § 4.4.3

8.3.6. Vibration

Vibration tests were performed at MECANO ID laboratory.

Vibration test performed were in “random mode”.

Two vibration spectrums were merged during the same run: One for Helicopter application (C/C1, low frequencies) the second for jet and turboprops (F/F1 up to 2000Hz).

Test duration was selected to 4 hours per axis (30’ at performance level, then 3 hours at endurance level and 30’ at performance level in accordance with ED-14D/DO-160D. Section 8 (robust Vibration)

See MECANO ID test report in appendix 9. Related § are referenced as ” Endurance; Performance, Resonance search” for each axis. Three axis X Y Z were tested.

No False activation occurs during these tests (ELT in “ARMED” mode).

There is no significant degradation on Resonance search (before/after test).

After test RF data sheet measurement is given here under. ELT remain conform to the specification

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Note : repetition period is set to “quick : 9.49s” in order to speed-up RF tests verifications.

Certification après essais de vibration C, L et F, F₁

ELTA Picto 04.0002 CS_ADT_V1.1

E. LABRINT DPP/PBA

ELT C/S IDENT : TSTANT1
Serial Number : 40002 Track N° 0

21 Jul 2004 00:44:26
Temperature : 21.5 °C

-RECEIVED MESSAGE-

FFFE2F4E3F0E90F1342E89876A50
CRC OK RCV CRC :001100001110110101001 Checked CRC :0011000011101101001
Message type SHORT
Country Code :227 FRANCE
Protocol : USER TEST TSTANT1
Homing 121.5MHz
Elapse Time =0 Activation AUTOMATIQUE
Simplified IDENTIFICATION = (227/7/TSTANT1/1)

-FREQUENCY 406.028 MHz-	SPECIFICATIONS	MEASURES
Unmodulated Carrier	150ms +-1.6ms	159.89 ms
Total Transmission Time	440ms +-4.4ms	439.71 ms
Repetition Period	50S +-2.5S	9.492 S (*) → <i>CV mode rapide.</i>
Power output	37dBm+-2dB	37.1 dBm
Transmitted Frequency	406.028MHz+-1KHz	406.027448 MHz
Short term Stability	<=2.E-9	2.1E-10
Bit rate	400Hz+-4Hz	400.7 Hz
Positive phase shift	1.1rd+-1.1rd	1.08 rd
Negative phase shift	1.1rd+-1.1rd	1.09 rd
Total phase shift	<=2.4rd	2.17 rd
-FREQUENCY 121.5 MHz-		
Frequency	121.50MHz+-6KHz	121.49996 MHz
Peak Power (***)	19 to 24dBm	22.7 dBm
Modulation Index (AM)	85%<TM<100%	100 %
-FREQUENCY 243.0 MHz-		
Frequency	243.00MHz+-12KHz	243.00003 MHz
Peak Power (***)	19 to 24dBm	20.8 dBm
Modulation Index (AM)	85%<TM<100%	99 %
-MODULATION VHF-		
Sweep Frequency	2Hz to 4Hz	3.2895 Hz
Maximum Frequency (Audio)	<=1600Hz	1470 Hz
Minimum Frequency (Audio)	>=300Hz	480 Hz
Total Sweep	>=700Hz	990 Hz
-POWER SUPPLY- (**)		
Supply Voltage	11 to 27Volts	10.07 Volts
Current Consumption 121.5MHz	<=110mA	-0.0101 mA
Current Consumption 406.028MHz	<=1.5A	-0.00105 A

(*) Non Applicable, ELT in short repetition period
(**) Non Applicable, ELT is powered by battery.
(***) 19dBm<Std power AF/AP<22.5dBm 22dBm<Hi power AF/AP<24dBm
(***) 20.2dBm<For AP & S<22.7dBm

BEACON ACCEPTED ☒ REJECTED ☐ INSPECTION VISA ☐

The ELT is qualified "cat C1/F1 (robust vibration), section 8 of the ED-14D/DO-160D" for installation on all type of A/C including Helicopters.

8.3.7. Magnetic influence

Qualified per similarity with Adt406 AF/AP Beacon.

1° deviation on the compass is obtained in ARMED mode at a distance of 17 cm, 2° at a distance of 10.5 cm. See extract from EMITECH TEST REPORT in Appendix 11.

The ELT is qualified per similarity to “cat Z, section 15 of the ED-14D/DO-160D”

8.3.8. Power input normal operation

Not Applicable, Stand alone ELT

8.3.9. Power input abnormal operation

Not Applicable, Stand alone ELT

8.3.10. Audio frequency conducted susceptibility

Not Applicable, stand alone ELT.

8.3.11. Induced signal susceptibility

See EMITECH TEST REPORT in appendix 5 page 5 and 36.

The ELT is qualified to “cat Z, section 19 of the ED-14D/DO-160D”

8.3.12. RF susceptibility

Refers to § 8.1.8 of this document and EMITECH TEST REPORTS in Appendix 5 page 5 and 23.

The ELT is qualified to “cat W, section 20 of the ED-14D/DO-160D”

8.3.13. Lightning induced transient susceptibility

Not Applicable (stated as “if required” in EUROCAE ED-62). There is no connection possible to the ELT.

8.3.14. Lightning susceptibility

Not Applicable (stated as “if required” in EUROCAE ED-62).

8.3.15. Emission of RF energy

See EMITECH TEST REPORT in appendix 5 page 6.

In “ARMED” mode there is no spurious above the limits.

In “ON” mode transmission carrier at 121.5 & 243 & 406 MHz are above specification but are the normal operational frequency of this transmitter.

The ELT is qualified to “cat M, section 21 of the ED-14D/DO-160D”

8.3.16. Explosion

The ELT is sealed. It is a small equipment (1 litre) and there is few space inside the case.

We are using similar way for sealing the ELT (close to our model A06 explosion-proof).

We qualify this ELT “explosion proof” per similarity with previous ELT model A06.

8.4. ENVIRONMENTAL TESTS – GROUP B

8.4.1. Humidity

ELT in “ARMED” mode.

No False activation during the test.

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Self test result is positive.

See ETBS test report in appendix 6, page 8 (damp heat).

The ELT is qualified to “cat A, section 6 of the ED-14D/DO-160D”. Note DO-160C is equivalent to DO-160 D for this section.

8.4.2. Water proofness

ELT in “OFF” mode (water sensor inactive).

No False activation (distress transmission) during the test.

Self test result is positive.

ELT is qualified to “cat W, section 10 of the ED-14D/DO-160D”.

Note DO-160C is equivalent to DO-160 D for this section.

See ETBS test report appendix 6 page 9 (watertightness).

8.4.3. Fluid immersion

Not Applicable (stated as “if required” in EUROCAE ED-62).

8.4.4. Sand & Dust

Not Applicable (stated as “if required” in EUROCAE ED-62).

ELT is inside the A/C not subjected to sand & dust

8.4.5. Fungus resistance

Not Applicable (stated as “if required” in EUROCAE ED-62).

8.4.6. Salt fog

There is no corrosion on the ELT case neither on the labels.

ELT is qualified to “cat S, section 14 of the ED-14D/DO-160D”.

Note DO-160C is equivalent to DO-160 D for this section.

See ETBS test report appendix 6 page 9 (salt mist).

8.4.7. Shocks

8.4.7.1. Operational shocks

Not Applicable, because there is no activation by “G-Switch” in this ELT.

8.4.7.2. Crash safety

We applied the level required by ED-62 for survival ELT: 50g / 11 ms on each direction (6 shocks).

These tests were performed several time at MECANO-ID laboratory.

See MECANO-ID test report in appendix 8.

The ELT is qualified to 50g/10ms shocks per § 4.5.7 of the ED-62,

8.4.8. Penetration

The ELT N° 04.0002 was subjected to this test at ETBS laboratory.

No False activation during the test.

Self test result is positive.

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See ETBS test report in appendix 6, page 11 (Punching).

The ELT is qualified to Penetration test per § 4.5.8 of the ED-62,

8.4.9. Impact

Not Applicable for Survival (S) ELT.

8.4.10. Crush

The ELT N° 04.0002 was subjected to this test at ETBS laboratory.

No False activation during the test.

Self test result is positive.

See ETBS test report in appendix 6, page 10 (Static Crushing).

The ELT is qualified to Crush Test per § 4.5.10 of the ED-62,

8.4.11. Flame

Qualified per similarity with the ELT ADT406 AF/AP, using the same case, the same batteries, the same internal design :

The ELT was subjected to this test for 20 s with 20 litres of AVGAS at ETBS laboratory.

No False activation during the test. Plastic cover of the Back up antenna was damaged.

After the test Controls from the ELT are satisfactory: ON / OFF/ ARMED and automatic activation (manual shock) is operational.

Self test result is positive.

Internal battery temperature remain under 60°C.

See extract from ETBS test report in appendix 7.

The ELT is qualified per similarity to flame test per § 4.5.11 of the ED-62,

Note : the foam float element meets FAR25.853 requirement.

8.4.12. Fire

Not Applicable for survival ELT.

8.4.13. Post crash immersion

ELT in "OFF" mode (water sensor inactive).

The ELT N° 04-0002 was subjected to this test at ETBS laboratory.

See ETBS test report in appendix 6 page 10 (Immersion in salt water).

No False activation during the test.

Self test results are positive.

The ELT is qualified "Sealed" (watertight) per § 4.5.10 of the ED-62,

8.5. ENVIRONMENTAL TESTS – GROUP C

8.5.1. Operation at low temperature (-20°)

This test is part of the COSPAS-SARSAT type approval process.

The ELT N° 04.0001 was subjected to this test at INTESPACE laboratory.

See INTESPACE test report in appendix 4, page 18

The ELT is qualified to -20° C per § 4.6.1 of the ED-62,

8.5.2. Operation at high temperature (+55°)

This test is part of the COSPAS-SARSAT type approval process.

The ELT N° 04.0001 was subjected to this test at INTESPACE laboratory.

See INTESPACE test report in appendix 4, page 24

The ELT is qualified to +55° C per § 4.6.2 of the ED-62,

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8.5.3. Temperature variation

This test is part of the COSPAS-SARSAT type approval process.

The ELT N° 04.0001 was subjected to this test at INTESPACE laboratory.

See INTESPACE test report in appendix 4, page 74

The ELT is qualified to Temperature variation per § 4.6.3 of the ED-62,

8.5.4. Thermal Shock

This test is part of the COSPAS-SARSAT type approval process.

The ELT N° 04.0001 was subjected to this test at INTESPACE laboratory.

See INTESPACE test report in appendix 4, page 42

The ELT is qualified to Thermal Shock per § 4.6.4 of the ED-62,

8.5.5. Buoyancy

This test is made by ELTA.

See ELTA test report in appendix 12.

The ELT is qualified to Buoyancy per § 2.16.3.1 of the ED-62,

8.5.6. Endurance

This test is part of the COSPAS-SARSAT type approval process.

The ELT N° 02.0001 was subjected to this test at INTESPACE laboratory, with ULTRALIFE and SAFT batteries.

See INTESPACE test report in appendix 4, pages 50 (Ultralife) and page 62 (Saft)

The ELT is qualified to 24 hours at -20°C for 406 MHz and 67 hours at -20°C for 121.5-243 MHz with ULTRALIFE and SAFT battery packs per § 4.7.2 of the ED-62,

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9. SUMMARY OF THE EVOLUTIONS APPLIED DURING TEST QUALIFICATION PROCESS

There was no "Non Conformity" sheets (FNC) issued during the qualification process.

10. CONCLUSION

Designed ELT conforms with EUROCAE ED-62 standard.

Upon completion of all these qualification tests a global Modification Request (Engineering Change Order) DM N°04/0077 was issued by our design Office in order to get the final Definition file for the production (Applicable definition).

This engineering change order (ELT qualification prototypes to ELT production model) include all the evolution discovered during the design process. These evolutions were indicated in red in the prototype definition file in accordance with ELTA quality rules (the qualification prototypes incorporate all these evolutions)

The production product is the ELT model ADT406 S P/N 01N65920 rev. B (see Appendix 1).

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11. APPENDIX LIST

- APPENDIX 1: CONFIGURATION FILE, P/N 04P63463 REV. A
- APPENDIX 2: CERTIFICATION TEST BENCH (DESCRIPTION)
- APPENDIX 3: COSPAS-SARSAT TYPE APPROVAL N°153.
- APPENDIX 4: COSPAS-SARSAT TEST REPORT REF. E5699
- APPENDIX 5: EMITECH TEST REPORT REF. RM-04-10584 (EMC)
- APPENDIX 6: ETBS TEST REPORT REF. N°796 (ENVIRONMENTAL)
- APPENDIX 7: ETBS TEST REPORT REF. N°1 (FLAME) – PER SIMILARITY
- APPENDIX 8 : MECANO-ID TEST REPORT REF. MID-ELT-408-PVE-005 (SHOCKS)
- APPENDIX 9: MECANO-ID TEST REPORT REF. MID-ELT-408-PVE-004 (VIBRATIONS)
- APPENDIX 10: EXEMPLE OF TEST SHEET ON PRE-PRODUCTION ADT
- APPENDIX 11: EXTRACT FROM EMITECH REPORT RM-01-10448 (MAGNETIC EFFECT) – PER SIMILARITY
- APPENDIX 12: ELTA REPORT FROM BUOYANCY P/N 05E63862

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