ENVIRONMENTAL TEST REPORT OF 406 MHz EPIRB		Number of pages : 497
INTESPACE Reference E.09788.B	Client KANNAD	INTESPACE Test Division ES

Test Type(s)				
☑ RTCM	☐ ETSI	☐ IEC	☑ TP4522	☐ AS/NZS

Equipment in Test
406 MHz Emergency Position Indicating Radio Beacon **KANNAD SAFELINK**

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CHAPTER 1

ADMINISTRATION, GENERAL COMMENTS AND SUMMARY OF TESTS

1.1 GENERAL COMMENTS

This document reports the procedures and results of certification tests on 406-MHz SARSAT beacons. The tests were conducted for the United States Coast Guard (USCG) by INTESPACE (ITS)

1.2 ADMINISTRATION

1.2.1 WORK ORDER

Manufacturer : KANNAD
Address : BP 23 – ZI des cinq chemins
58520 GUIDEL – FRANCE

Represented by : Stéphane JINCHELEAU

1.2.2 INTESPACE TEST CENTER

The test operations have been conducted by :
Gérard PEYROU
François ESQUEVIN

1.2.3 SCHEDULE

Start of test : June 18th 2009
End of test : October 6th 2009

1.2.4 WORK REFERENCE

E.09788

1.2.5 EQUIPEMENT UNDER TEST

The results from this test report concern only the equipments referenced below:

Equipement Under Test (EUT)	Model	Beacon serial number	Float free system auto-release mechanism	Comments
9	SafeLink Auto/Manual+	9	SafeLink Bracket n°3	- nominal EPIRB for C/S antenna & satellite tests and complementary environmental tests
10	SafeLink Auto/Manual+	10		- nominal EPIRB for complementary environmental tests
11	SafeLink Auto/Manual+	11	SafeLink Bracket n°5	- nominal EPIRB for complementary environmental tests
12	SafeLink Auto/Manual+	12	SafeLink Bracket n°4	-Antenna disconnected - EPIRB 50 Ω fitted for C/S electrical checking and environmental main test file

1.3 TEST FACILITIES

- ARGOS – COSPAS/SARSAT Certification Test Bench
- INTESPACE Enviromental Test Equipements
- Toulouse CNES MCC

1.4 STANDARDS AND TEST PROCEDURES APPLICABLES

- **COSPAS-SARSAT standards** :

- "C/S T. 001 – Issue 3 – Revision 9 – October 2008"
- "C/S T. 007 – Issue 4 – Revision 8 – October 2008"

- **RTCM Recommended Standards** For 406 MHz Satellite Emergency Position-Indicating Radiobeacons (EPIRBs) - Version 2.1 - June 20, 2002

- **TP4522 (E) :** Performance standard for 406MHz Satellite Emergency Position Locating Radiobeacons (EPIRBs)

- INTESPACE Radiobeacon Test Procedures

1.5 TEST SEQUENCE

1.5.1 SERIES OF TESTS RUN IN ORDER WITH EUT12 :

	TEST	RTCM ITEM
1	Initial Alivness Test	(A 1.0)
2	Dry Heat Test	(A 3.0
3	Damp Heat Test	(A 4.0)
4	Vibration Test	(A 5.0)
5	Bump Test	(A 6.0)
6	Salt Fog Test	(A 7.0)
7	Drop Tests	(A 8.0)
8	Leakage and Immersion Tests	(A 9.0)
9	Spurious Emission Test	(A 10.0)
10	Thermal shock Tests	(A 11.0)
11	Cospas-Sarsat C/S T.007 Tests	(A 12.0)
12	Operational Life, Strobe Light and Self Tests	(A 13.0)

1.5.2 SERIES OF TESTS RUN ANY TIME DURING THE SEQUENCE :

TEST	RTCM ITEM
Automatic Release Mechanism & Automatic Activation Tests	(A 14.0)
Stability & Buoyancy Test	(A 15.0)
Inadvertent Activation Test	(A 16.0)
Auxiliary Radio-Locating Device Transmitter Test	(A 17.0)
Humidity Test	(A 18.0)
Orientation Test	(A 19.0)

All beacons electronic are identical

1.6 RESULTS

See following pages Summary of Test results and following chapters Test Result Reports (data and graphs)

SUMMARY OF TESTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (-30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (+ 70 to + 55 °C)	
1. INITIAL ALIVENESS TEST (A2.0)						*Results in Chapter 2*
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 933		Compliant
* Power Output	35 - 39	dBm		35.88		Compliant
* Data Message	must be correct	√		√		Compliant
2. DRY HEAT CYCLE (A3.0)						*Results in Chapter 3*
• Aliveness Test (during 2 hour period)						
* Carrier Frequency	406.037 ± 0.001	MHz			406.036 947	Compliant
* Power Output	35 - 39	dBm			35.92	Compliant
* Data Message	must be correct	√			√	Compliant
• Aliveness Test (at end of 2 hour period)						
* Carrier Frequency	406.037 ± 0.001	MHz			406.036 887	Compliant
* Power Output	35 - 39	dBm			35.93	Compliant
* Data Message	must be correct	√			√	Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS		COMMENTS
			T min. (± 3 °C) (-30 to -20 °C)	T max. (± 3 °C) (+40 °C)	
3. DAMP HEAT CYCLE (A4.0)					*Results in Chapter 4*
• Aliveness Test (during 2 hour period)					
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 942	Compliant
* Power Output	35 - 39	dBm		36.19	Compliant
* Data Message	must be correct	√		√	Compliant
• Aliveness Test (end of 2 hour period)					
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 947	Compliant
* Power Output	35 - 39	dBm		36.2	Compliant
* Data Message	must be correct	√		√	Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (__ °C)	T amb. (± 3 °C) (22°C)	T max. (± 3 °C) (+40 °C)	
4. VIBRATION TEST (A5.0)						*Results in Chapter 5*
• Exterior Mechanical Inspection	No damage	√		√		
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 926		Compliant
* Power Output	35 - 39	dBm		36.51		Compliant
* Data Message	must be correct	√		√		Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (_____ °C)	T amb. (± 3 °C) (22°)	T max. (± 3 °C) (_____ °C)	
5. BUMP TEST (A6.0)						*Results in Chapter 5*
• Exterior Mechanical Inspection	No damage	√		√		Compliant
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 926		Compliant
* Power Output	35 - 39	dBm		36.51		Compliant
* Data Message	must be correct	√		√		Compliant
6. SALT FOG TEST (A7.0)				**T amb. (± 3 °C) (35°)**		*Results in Chapter 6*
• UUT6 Aliveness Test						
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 022		Compliant
* Power Output	35 - 39	dBm		36.41		Compliant
* Data Message	must be correct	√		√		Compliant
• Exterior Mechanical Inspection	No damage	√		√		Compliant
• Self Test	must be correct	√		√		Compliant

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PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (_____ °C)	
7-A. DROP TEST						*Results in Chapter 7*
On Hard Surface (A8.1)						
• Exterior Mechanical Inspection	No damage	√	√			Compliant
• Aliveness Test						
* Carrier Frequency	406.037 ± 0.001	MHz	406.036 900			Compliant
* Power Output	35 - 39	dBm	36.33			Compliant
* Data Message	must be correct	√	√			Compliant
7-B. DROP TEST						*Results in Chapter 7*
In Water (A8.2)						
• Exterior Mechanical Inspection	No damage	√		√		Compliant
• Aliveness Test						
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 879		Compliant
* Power Output	35 - 39	dBm		36.36		Compliant
* Data Message	must be correct	√		√		Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (-20 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (55°C)	
8. LEAKAGE AND IMMERSION TEST (A9.0)					+70°C	*Results in Chapter 8*
• Aliveness Test						
* Carrier Frequency	406.037 ± 0.001	MHz		406.036 914		Compliant
* Power Output	35 - 39	dBm		35.44		Compliant
* Data Message	must be correct	√		√		Compliant
• Interior Inspection	No water	√		√		Compliant
9. SPURIOUS EMISSION TEST (A10.0)						*Results in Chapter 9*
• 406 MHz	Figure 2-1	√	√	√	√	Compliant
• 121.5 MHz	Figure 2-5	√	√	√	√	Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (+70 °C)	
10. THERMAL SHOCK TEST (A11.0)			-30°C → 0.1°C		+70°C → +27°C	*Results in Chapter 10*
• Self-activation in water	≤ 5	minutes	< 0.1		< 0.1	Compliant
• Aliveness Test :						
*Carrier Frequency	406.037 ± 0.001	MHz	406.0369268		406.0369099	Compliant
* Power Output	35 - 39	dBm	36.4		35.96	Compliant
* Data Message	must be correct	√	√		√	Compliant
• Frequency Stability						
* Short term stability	≤ 0.002	parts/ million in 100 ms	≤ 1.4E-10		≤ 1.5E-10	Compliant
* Medium term stability :						
• mean slope	≤ 0.001	parts/ million /minute	≤ ± 8.3E-10		≤ ± 6.7E-10	Compliant
C/S T.001 & T.007 Stds→	≤ 0.002					
• residual frequency variation	≤ 0.003	parts/ million	≤ 8.7E-10		≤ 7.2E-10	Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 20 °C)	T min. (± 3 °C) (- 20 °C)	T max. (± 3 °C) (+55 °C)	
11. COSPAS-SARSAT TYPE APPROVAL TESTS (A12.0)	C-S Certificate (attach test report)	√	√	√	√	*Results in Chapter 11* Compliant
12. .OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS (A13.0)						Results in Chapter 12
Operational Life Results after 48 hours (A13.1)						
• Frequency						
* Nominal Carrier	406.037 ± 0.001	MHz	406.036 936			Compliant
* Short-term stability	≤ 0.002	parts/ million in 100 ms	1.02E-10			Compliant
• Medium term stability :						
* Mean slope	≤ 0.001	parts/ million /min	5.37E-13			Compliant
* Residual variation	≤ 0.003	parts/ million	1.36E-10			Compliant
• RF output power	35-39	dBm	35.38			Compliant
• Strobe flash rate	20-30	/min	22			Compliant
• Auxiliary radio-locating Peak Envelope output Power	14-20	dBm	14.7			Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 20 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (55 °C)	
13. STROBE LIGHT TEST (A13.2)						*Results in Chapter 12*
• Flash rate	20-30	/min	22	22	22	Compliant
• Effective intensity	>0.75	Cd	1.04	0.85	0.86	Compliant
• Pulse duration	10^{-6} to 1	S	0.108	0.108	0.108	Compliant
• Visibility		√	√	√	√	Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (70 °C)	
14. AUTOMATIC RELEASE MECHANISM TEST (A14.0)						*Results in Chapter 13*
• Normal mounted orientation	Release and	√	X (4.80 m)	√	√	Exceeding specification. See explanations in Chapter 13
• Rolling 90° starboard	float free before	√		√		Compliant
• Rolling 90° port	4 meters ;	√		√		Compliant
• Rolling 90° bow down	automatic	√		√		Compliant
• Rolling 90° stern down	activation	√		√		Compliant
• Upside down		√		√		Compliant
15. BUOYANCY AND STABILITY *TEST (A15.0)*						Results in Chapter 14
• Time to upright	≤ 2	s		1		Compliant
• Reserve buoyancy	≥ 5	%		27.4		Compliant
• Float upright ; Antenna base	> 4	cm		4		Compliant
16. INADVERTENT ACTIVATION TEST (A16.0)°						Results in Chapter 15
• EUT not release from bracket		√		√		Compliant
• EUT not automatically activate		√		√		Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (-40 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (55 °C)	
17. HOMING DEVICE TRANSMITTER TEST						*Results in Chapter 16*
• **Carrier frequency**	121.5 ± 0.006	MHz	121.5028	121.5017	121.5008	Compliant
• **Output Power (50 Ω)**	14-20	dBm	15.5	16.4	16.6	Compliant
• Duty Cycle	100	%	100	100	100	Compliant
• **Modulation**						
* Frequency	≥ 700 Hz within range of 300-1600 Hz	Hz	490-1330	510-1330	500-1330	Compliant
* Direction	Upward	√	√	√	√	Compliant
* Duty cycle	33-55	%	41	40	40	Compliant
*Factor	0.85-1.0	#	>0.85	>0.85	>0.85	Compliant
* Sweep repetition rate	2 - 4	Hz	2.85	2.88	2.91	Compliant
• **Antenna**						
* EIRP	14 dBm ≤ EIRP ≤ 20 dBm			14.0		Compliant
* Pattern	Omnidirectional	√		√		Compliant
* Polarization	Vertical	√		√		Compliant
* VSWR	≤ 1.5:1	√		√		Compliant

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T min. (± 3 °C) (- 30 °C)	T amb. (± 3 °C) (22 °C)	T max. (± 3 °C) (40 °C)	
18. HUMIDITY TEST (A18.0)						Results in Chapter 17
• Aliveness Test :						
* Carrier frequency	406.037 ± 0.001	MHz		406.036 865		Compliant
* Power Output	35-39	dBm		35.97		Compliant
19. ORIENTATION TEST (A19.0)						*Results in Chapter 18*
VERTICAL						
• Aliveness Test :						
* Carrier frequency	406.037 ± 0.001	MHz		406.036 903		Compliant
* Power Output	35-39	dBm		36.7		Compliant
UPSIDE DOWN						
• Aliveness Test :						
* Carrier frequency	406.037 ± 0.001	MHz		406.036 902 8		Compliant
* Power Output	35-39	dBm		36.7		Compliant
HORIZONTAL						
• Aliveness Test :						
* Carrier frequency	406.037 ± 0.001	MHz		406.036 902 9		Compliant
* Power Output	35-39	dBm		36.7		Compliant

1.7 LABORATORY UNCERTAINTIES

UNCERTAINTY	Unit	Requirement +/-	Estimated +/-
REPETITION PERIOD	s	0,01	2.4E-03
CW PREAMBLE	ms	1,0	1.0E-02
TOTAL TRANSMISSION TIME	ms	1,0	1.0E-02
SPURIOUS POWER LEVEL	dB	2	1.6
BIT RATE	bits/s	0.6	0.01
NOMINAL FREQUENCY AT 406MHz	Hz	100	0.1
NOMINAL FREQUENCY AT 121,5MHz	Hz	100	10.8
FREQUENCY STABILITY (short term)	F0	1E-10	4.0E-11
FREQUENCY STABILITY (slope)	F0	1E-10	1.1E-11
TRANSMITTED POWER	dB	0.5	4.1E-01
POWER 1MS BEFORE 10% OF MAX	dB	n/a	3.3
CARRIER RISE TIME	ms	0.5	0.10
MODULATION RISE TIME	µs	25	12
PHASE MODULATION	rad	0.04	0.001
AMPLITUDE SYMMETRY	%	n/a	0.1
MODULATION SYMMETRY	%	1	0.7
CURRENT CONSUMPTION	%	n/a	5
TEMPERATURE NEAR BEACON	°C	2	1.7
CONTROL OF ENVIRONMENT TEMPERATURE	°C	n/a	0.9
ELECTROSTATIC DISCHARGE	kV	0.3	0.26
RF SUSCEPTIBILITY	dB	n/a	1.8
COMPASS SECURITY DISTANCE	cm	n/a	17
ANTENNA MEASUREMENT (406MHz)	dB	3	2
ANTENNA MEASUREMENT (121,5MHz)	dB	3	2.3
VSWR	n/a	n/a	0.2
SALT FOG	%NaCl	1	0.3
CONTROL OF ENVIRONMENT HUMIDITY	%HR	n/a	3.8
RELATIVE HUMIDITY NEAR BEACON	%HR	3	2.9
DROP TEST ON HARD SURFACE	cm	1	0.95
DROP TEST IN WATER	m	1	0.1
PRESSURE	hPa	20	10.1
SALT FOG pH	pH	n/a	0.2
HOSE STREAM	L/min	n/a	25
LEAKAGE DEEPNESS	cm	n/a	14
BUOYANCY	%	n/a	8
SOLAR RADIATION	W/m²	112	82
STROBE LIGHT INTENSITY	%	n/a	4.3

All uncertainties are provided with a coverage factor k = 2 (95%)