

CHAPTER 10

OPERATIONAL LIFE AND SELF TESTS

10.1. TEST SPECIFICATIONS AND PROGRAMME

10.1.1 Operating Life Test

Following :

- Section A10.1 of RTCM Recommended Standards for 406 MHz Satellite PLBs (Version 1.1 – June 19, 2002)
- Section A2.3 of C/S T.007 Cospas/Sarsat Standard (Issue 3 – Revision 10 October 2003)
- Using a fresh battery pack, turn ON the EUT (at the ambient temperature) for a period of time equal to the extension interval gived by the constructor . (See Test Results § 10.5.1)
- Place the EUT turned OFF inside climatic chamber stabilized at - 20° C (class II) for a period of 2 hours minimum
- At the conclusion of this period the EUT is turned ON and continually monitor the following parameters until the end of the battery life :
 - Frequency (nominal carrier, short and medium term stability),
 - RF output power,
 - Homing transmitter peak envelope output power.

10.1.2 Self Test

Following :

- Section A10.2 of RTCM Recommended Standards for 406 MHz Satellite PLBs (Version 1.1 – June 19, 2002)
- Section A3.6 of C/S T.007 Cospas/Sarsat Standard (Issue 3 – Revision 10 October 2003)
- For each test temperature $-20 \pm 2^{\circ}\text{C}$, $22 \pm 2^{\circ}\text{C}$ and $55 \pm 2^{\circ}\text{C}$ place the EUT turned OFF inside climatic chamber stabilized at its temperature for a period of 2 hours minimum
- At the conclusion of this period the EUT is turned ON and monitor the following parameters :
 - 406 MHz RF output pulse duration,
 - Frame synchronzation pattern,
 - Only one burst of the 406 MHz RF signal ,.
 - 15 Hex ID of message ,
 - Audio sweeps or duration time of 121.5 MHz signal

10.2. EQUIPMENT UNDER TEST

Beacon

Beacon Unit : 1/3 & 2/3
Name : ACR / TeraFixTM 406GPS I/O PLB & TeraFixTM 406GPS I PLB
Type : PLB200 & PLB201
Number : 07 & 12
Class : II

Beacon Battery Type

Chemistry : Li-MnO₂
Manufacturer & model n° : SANYO – CR123A
Size & number of cells : 2/3 A size & 2x4 cells

10.3. TEST SITE

Toulouse Space Center (C.S.T./ ITS) - Beacon certification laboratory .

10.4. TEST EQUIPMENT

- Climatic chamber: CLIMATS F.C.H. – Type: Austral 137H60/1,5E - S/N: S4880.
- Argos - Cospas/Sarsat Test Bench

10.5. RESULTS

These tests have been performed during the COSPAS-SARSAT Type Approval tests (chapter 9)

10.5.1 Operating Life Test results

Before these tests we have verified the manufacturer calculation of the loss in battery capacity due to self-testing as well as battery pack self-discharge during the useful lifetime of battery pack (see chapter 9 : C/S Type Approval Test Report § " OPERATING LIFE TEST RESULTS ON PLB 200 N° 07 & PLB 201 N° 12 " pages : PLB200-37 & PLB201-37)

Following the "PLB-200 estimate calculations for battery drain prior to RTCM & Cospas/Sarsat Life Test" manufacturer note joint in annex the batteries packs capacity has been reduced by the Test Laboratory during 24 hours (2x12 hours) into 681 ohms load

Total AMP-HOUR burn off battery for –20° C life test : 0.249 AMP-HOURS

10.5.1.1 Test implementation

Beacon Unit : 1/3
 Name : ACR / TeraFixTM 406GPS I/O PLB
 Type : PLB200
 Number : 07

Date	Hour	Operations	Results
July 13 th , 2004	13:00	The beacon, in the ready condition, is thermally soaked at - 20° C in the temperature-controlled oven .	
July 13 th , 2004	15:30	The beacon in the oven at -20° C and connected into 50 Ohm load Argos Cospas Sarsat Test Bench is manually activated . Simultaneously an Automatic Operational Life Test begin.	OK
July 15 th , 2004	04:00	End of Automatic Operational Life Test.	
July 15 th , 2004	10:30	Analysis of Operating Life Test Results :	Correct during ≈ 34.5 hours

Beacon Unit : 2/3
 Name : ACR / TeraFixTM 406GPS I PLB
 Type : PLB201
 Number : 12

Date	Hour	Operations	Results
July 9 th , 2004	18:00	The beacon, in the ready condition, is thermally soaked at - 20° C in the temperature-controlled oven .	
July 10 th , 2004	06:30	The beacon in the oven at -20° C and connected into 50 Ohm load Argos Cospas Sarsat Test Bench is manually activated . Simultaneously an Automatic Operational Life Test begin.	OK
July 11 th , 2004	18:00	End of Automatic Operational Life Test.	
July 12 th , 2004	08:30	Analysis of Operating Life Test Results :	Correct during ≈ 34.2 hours

10.5.1.2 Electrical results of Operating Life Tests

Beacon Unit : 1/3
 Name : ACR / TeraFixTM 406GPS I/O PLB
 Type : PLB200
 Number : 07
 Date of test : July 13th to July 15th, 2004

Burst N°	Δ Frequency (Hz) (F _{beacon} – 405978000 Hz)	Temp. (°C)	P406 (dBm)	P121.5 (dBm)
1	49859,81	-19,6	38,0	19,1
2	49862,41	-19,9	38,0	19,2
3	49864,16	-20,0	38,0	19,2
4	49865,86	-20,1	38,0	19,2
5	49866,98	-20,1	38,0	19,2
6	49867,40	-20,1	38,0	19,2
7	49868,28	-20,1	38,0	19,2
8	49868,75	-20,1	38,0	19,2
9	49869,37	-20,1	38,0	19,2
10	49869,50	-20,1	38,0	19,2
11	49869,95	-20,2	38,0	19,2
12	49870,21	-20,1	38,0	19,2
13	49870,37	-20,1	38,0	19,2
14	49870,95	-20,1	38,0	19,2
15	49870,88	-20,1	38,0	19,2
16	49871,13	-20,1	38,0	19,2
17	49870,52	-20,1	38,0	19,2
18	49870,59	-20,1	38,0	19,2

Note : Meas = Burst number + 18

Meas N°	Temp. (°C)	Slope	Sigma	406 MHz Pw (dBm)	Short term	121.5 MHz Power (dBm)
1	-20,1	1,2E-9	2,7E-09	38,0	2,2E-10	19,2
18	-20,0	1,4E-10	7,1E-10	38,0	2,4E-10	19,2
31	-20,0	1,7E-11	6,6E-10	38,0	1,8E-10	19,2
61	-20,0	-1,7E-11	6,4E-10	38,0	3,0E-10	19,2
91	-20,0	9,6E-11	4,9E-10	38,0	1,3E-10	19,2
121	-20,1	-3,0E-11	7,1E-10	38,0	2,9E-10	19,2
151	-20,1	-1,1E-11	6,0E-10	38,0	2,3E-10	19,2
181	-20,0	5,4E-11	7,0E-10	38,0	2,5E-10	19,2
211	-20,1	-3,7E-11	4,3E-10	38,0	2,6E-10	19,2
241	-20,1	-3,5E-11	6,3E-10	38,0	3,0E-10	19,2
271	-20,1	7,0E-11	5,0E-10	38,0	1,8E-10	19,2
301	-20,1	4,7E-11	5,5E-10	38,0	1,9E-10	19,2
331	-20,1	-2,6E-12	6,6E-10	38,0	2,3E-10	19,2
361	-20,1	4,4E-11	7,4E-10	38,0	2,5E-10	19,2
391	-20,1	2,8E-11	4,4E-10	38,0	2,2E-10	19,2
421	-20,1	2,3E-11	6,9E-10	38,0	1,8E-10	19,2
451	-20,1	-3,6E-11	8,7E-10	38,0	2,2E-10	19,2
481	-20,1	-3,5E-11	6,3E-10	38,0	2,1E-10	19,2
511	-20,1	6,2E-11	7,9E-10	38,0	2,6E-10	19,2
541	-20,1	-4,1E-11	4,5E-10	38,0	2,6E-10	19,2
571	-20,1	1,4E-11	5,7E-10	38,0	2,4E-10	19,2
601	-20,1	-3,6E-11	5,1E-10	38,0	2,5E-10	19,2
631	-20,1	1,5E-10	4,7E-10	38,0	2,7E-10	19,2
661	-20,1	3,3E-12	5,4E-10	38,0	2,8E-10	19,2
691	-20,1	-2,4E-11	7,5E-10	38,0	1,6E-10	19,2
721	-20,1	6,5E-11	7,1E-10	38,0	2,0E-10	19,2
751	-20,1	-1,5E-11	5,3E-10	38,0	2,3E-10	19,2
781	-20,1	2,7E-12	6,4E-10	38,0	3,2E-10	19,2
811	-20,1	-2,7E-11	5,1E-10	38,0	3,3E-10	19,2
841	-20,1	2,4E-11	6,4E-10	38,0	2,1E-10	19,2

Meas	Temp.	Slope	Sigma	P406	Short term	P121.5
871	-20,1	-4,1E-11	4,5E-10	38,0	2,2E-10	19,2
901	-20,1	6,3E-11	5,7E-10	38,0	2,5E-10	19,2
931	-20,1	5,5E-11	6,4E-10	38,0	2,5E-10	19,2
961	-20,1	1,9E-11	5,9E-10	38,0	2,7E-10	19,2
991	-20,1	-2,6E-11	6,9E-10	38,0	2,9E-10	19,2
1021	-20,1	-2,2E-11	4,9E-10	38,0	2,2E-10	19,2
1051	-20,1	1,1E-10	3,6E-10	38,0	1,2E-10	19,2
1081	-20,2	2,4E-11	8,1E-10	38,0	2,1E-10	19,2
1111	-20,1	-1,8E-11	6,3E-10	38,0	2,5E-10	19,2
1141	-20,1	3,8E-11	6,4E-10	38,0	2,8E-10	19,2
1171	-20,1	8,1E-11	5,0E-10	35,9	3,0E-10	19,2
1201	-20,2	5,8E-12	7,0E-10	38,0	1,8E-10	19,2
1231	-20,1	-1,3E-11	5,4E-10	38,0	2,4E-10	19,2
1261	-20,1	-9,8E-11	6,4E-10	38,0	3,3E-10	19,2
1291	-20,1	4,5E-11	7,0E-10	38,0	3,0E-10	19,2
1321	-20,1	-5,2E-11	5,6E-10	38,0	2,2E-10	19,2
1351	-20,1	-1,2E-10	6,5E-10	38,0	2,1E-10	19,2
1381	-20,1	-3,0E-12	5,2E-10	38,0	1,9E-10	19,2
1411	-20,2	5,8E-11	4,8E-10	38,0	1,5E-10	19,2
1441	-20,1	4,7E-12	6,4E-10	38,0	2,0E-10	19,2
1471	-20,1	-3,2E-11	5,5E-10	38,0	2,3E-10	19,2
1501	-20,2	-4,0E-11	5,0E-10	38,0	3,2E-10	19,2
1531	-20,2	8,1E-11	5,3E-10	38,0	2,5E-10	19,2
1561	-20,1	3,0E-11	5,3E-10	38,0	1,5E-10	19,2
1591	-20,2	-9,7E-11	3,6E-10	38,0	2,6E-10	19,2
1621	-20,2	6,2E-11	6,4E-10	38,0	2,1E-10	19,2
1651	-20,2	2,0E-11	6,1E-10	36,3	1,6E-10	19,2
1681	-20,2	1,0E-11	4,2E-10	38,0	2,0E-10	19,2
1711	-20,2	3,3E-11	7,1E-10	38,0	2,9E-10	19,2
1741 ≈ 24 h	-20,2	1,5E-12	5,5E-10	38,0	2,3E-10	19,2
1771	-20,2	5,6E-12	6,1E-10	38,0	1,9E-10	19,2
1801	-20,2	2,3E-11	5,0E-10	38,0	2,7E-10	19,2
1831	-20,2	5,5E-11	5,7E-10	38,0	2,9E-10	19,2
1861	-20,2	3,4E-11	6,2E-10	38,0	2,0E-10	19,2
1891	-20,2	-1,2E-11	7,3E-10	38,0	2,7E-10	19,2
1921	-20,2	1,2E-12	4,3E-10	38,0	2,3E-10	19,2
1951	-20,2	-3,0E-11	6,6E-10	38,0	2,0E-10	19,2
1981	-20,2	-3,6E-11	4,0E-10	38,0	2,1E-10	19,2
2011	-20,2	1,7E-11	5,7E-10	38,0	2,6E-10	19,2
2041	-20,2	-1,3E-11	5,8E-10	38,0	1,8E-10	19,2
2071	-20,2	-1,2E-11	5,2E-10	38,0	1,7E-10	19,2
2101	-20,2	8,6E-11	5,3E-10	38,0	2,1E-10	19,2
2131	-20,2	-9,1E-11	5,1E-10	38,0	2,6E-10	19,2
2161	-20,2	3,4E-11	4,9E-10	38,0	1,2E-10	19,2
2191	-20,2	4,0E-12	6,5E-10	38,0	2,8E-10	19,2
2221	-20,2	-3,0E-11	4,4E-10	38,0	2,6E-10	19,2
2251	-20,3	2,7E-12	6,5E-10	37,9	3,0E-10	19,2
2281	-20,2	-5,6E-11	4,9E-10	37,8	3,0E-10	19,2
2311	-20,2	1,6E-11	4,4E-10	37,6	3,4E-10	19,2
2341	-20,2	-4,5E-11	5,6E-10	37,3	4,9E-10	19,2
2371	-20,3	-1,2E-11	6,0E-10	37,1	2,3E-10	19,2

Meas	Temp.	Slope	Sigma	P406	Short term	P121.5
2401	-20,3	-1,8E-11	6,1E-10	36,7	2,9E-10	19,2
2431	-20,3	-6,2E-11	5,2E-10	36,3	1,7E-10	19,2
2461	-20,3	1,3E-11	5,7E-10	35,8	2,4E-10	19,2
2491 ≈ 34.5 hours	-20,3	-4,9E-11	7,1E-10	35,2	2,3E-10	19,1
2521	-20,3	-2,4E-11	3,6E-10	34,3	2,2E-10	19,0
2551	-20,3	-6,7E-11	5,9E-10	33,4	3,0E-10	18,9
2581	-20,3	-2,8E-11	6,4E-10	32,1	2,3E-10	18,8
2611						
2641						

Beacon message after 24 of Operating Lifetime Test :
FFFE2F96EE3240072B80302DC5F78E0159E3

See data and graphs of results on chapter 9 "C/S Type Approval Report -Ref E5503-ACR"

- pages : PLB200-37 to PLB200-46 for EUT 1/3 (PLB200)
- pages : PLB201-37 to PLB201-46 for EUT 2/3 (PLB201)

10.5.2 Self Test results

The Self Test has been done during Cospas / Sarsat Certification Test at three temperatures .

See Chapter 9 "C/S Type Approval Report -Ref E5503-ACR"

- pages : PLB200-26 to PLB200-28 for EUT 1/3 (PLB200)
- pages : PLB201-26 to PLB201-28 for EUT 2/3 (PLB201)