

Wanley Radio Technical Laboratory Report Number KS0

File Reference: KS0048
 Equipment : Locate PLB7 Homing Beacon
 Specification : ETS 300 152
 Date : 25-2-92
 Report Technician: Russel Kent-Smith

Russel Kent-Smith

Wanley Radio Technical
 10, Palace Hill
 10, Palace Hill
 10, Palace Hill

CONTENTS

Section.	Description.	Page.
1)	Details of Testing.	2
2)	General Description of Equipment.	3
3)	List of Test Equipment Used.	4
4)	Results Summary.	5
5)	Type-Testing Results.	6 - 14
6)	Environmental Tests	15 - 22
7)	Photographs of Equipment Tested.	

1. DETAILS OF TESTING.

This report details testing carried out on the Locat Man Overboard PLB7 Homing Beacon Rescue System to ensure that the unit fully complied with European Telecommunication Specification No. ETS 300 152.

2. GENERAL DESCRIPTION OF TESTED EQUIPMENT

The unit under test is the Locat Man Overboard PLB7 Homing Beacon Rescue System.

The Locat PLB7 is designed to be worn around the neck, for hands free operation.

The unit is designed to transmit on 121.500 MHz, but for the purpose of these tests the operational frequency was offset to 121.650 MHz, to prevent inadvertent operation of the search and rescue services.

Modulation: Swept tone, square wave, amplitude modulation.

Battery: Nominally +9v (Duracell)
Extremes +8v and +11v.

3. LIST OF TEST EQUIPMENT USED

	PLANT NUMBER
Tenuline 30 dB attenuator	1261
Varex 30-10 power supply	1175
Marconi 6960A power meter	104
Racal Dana 9919 frequency counter	1607
Marconi 6912 power sensor	1765
Marconi power meter	1182
HP 8566 B spectrum analyzer	1220
LeCroy storage oscilloscope	1738

4. RESULTS SUMMARY

The unit complies with ETS 300 152 with the exception of the following items:

- 4.1 ETS 300 152 paragraph 2.2 requires that initial activation of the unit shall result in the breaking of a seal. No such seal was in evidence.
- 4.2 The labelling relating to the battery replacement date (paragraph 2.3) needs to be easier to read, and to contain the following words:
"Replace on(date) "
- 4.3 The calculated value for peak envelope power (paragraph 4.6) at - 10 Deg C is 0.78 dB below the specification limit. this is within the measurement uncertainty tolerance for this measurement.
- 4.4 Operation of the unit's test facility produced an emission of 31.6 nW. Paragraph 4.7 limits the magnitude of radiation produced by the test facility to 25 nW. This level exceeds the specification limit by 1 dB, this is within the measurement uncertainty tolerance.

Note:

- 1). To facilitate the observation of certain parameters, a test fixture was supplied by the manufacturer. The results of measurements made on this complementary unit are identified by the term 'Fixture'.
- 2). The D.U.T. was operated continually for two hours.
- 3). Battery voltage checks:
-15°C = 6.6V
+55°C = 7.8V

5. TYPE TESTING RESULTS TO ETSI SPEC 300 152

CONTENTS

- 5.1. GENERAL CONDITIONS.
- 5.2. FREQUENCY ERROR.
- 5.3. CLASS OF EMISSION.
- 5.4. MODULATION CHARACTERISTIC.
- 5.5. RADIATION CHARACTERISTIC.
- 5.6. RADIATED PEAK ENVELOPE POWER.
- 5.7. RADIATION PRODUCED BY OPERATION OF TEST FACILITY.
- 5.8. SPURIOUS EMISSIONS.
- 5.9. PROTECTION OF THE TRANSMITTER.

5.2 Frequency Error.

(Para. 4.2)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

Temp (°C)	Supply voltage (V)	PLB7		Fixture		Limit (kHz)
		Freq. (MHz)	Error (Hz)	Freq. (MHz)	Error (Hz)	
T amb. +22	9.0	121.6504	+400	121.65061	+610	±3.5
	8.0	/	/	121.65025	+250	±3.5
	11.0	/	/	121.65043	+430	±3.5
T max. +55	9.0	121.6497	-300	121.65036	+360	±3.5
	8.0	/	/	121.65024	+240	±3.5
	11.0	/	/	121.65070	+700	±3.5
T min. -10	9.0	121.65160	+1600	121.65204	+2040	±3.5
	8.0	/	/	121.65186	+1860	±3.5
	11.0	/	/	121.65222	+2220	±3.5

Uncertainty of measurement $< \pm 1 \times 10^{-7}$
for a minimum confidence level of 95 %

5.4 Modulation characteristics.

(Para 4.4)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

UNIT UNDER TEST: TEST FIXTURE.

Temp. (°C)	Supply voltage (V)	Modulation depth (%)	Modulation duty cycle (%)
T amb. +22	9.0	100	50
	8.0	100	50
	11.0	100	50
T max. +55	9.0	100	50
	8.0	100	50
	11.0	100	50
T min. -10	9.0	100	50
	8.0	100	50
	11.0	100	50

Uncertainty of measurement +/- 5%
for a minimum confidence level of 95 %

5.3 Class of emission.

(Para. 4.3)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

UNIT UNDER TEST: FIXTURE.

Temp. (°C)	Supply voltage (V)	Modulation freq. (Hz)		Sweep repetition rate (Hz)
		Min	Max	
T amb. +22	9.0	454	1445	2.5
	8.0	456	1445	2.5
	11.0	450	1436	2.5
T max. +55	9.0	505	1538	2.5
	8.0	505	1547	2.5
	11.0	487	1538	2.5
T min. -10	9.0	458	1449	2.5
	8.0	457	1453	2.5
	11.0	456	1436	2.5

Uncertainty of measurement +/- 10 Hz
for a minimum confidence level of 95%

5.5 Radiation Characteristics.

(Para 5.4)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

As the antenna orientation on this unit depends largely upon the attitude of the wearer, no characterisation of the radiation pattern has been attempted.

5.6 Radiated Peak Envelope Power.

(Para 4.6)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

Temp. (°C)	Supply voltage (V)	Fixture		PLB 7
		Output power (dBm)	Output rel to normal (dB)	Radiated Peak Envelope Power (mW)
T. amb. +22	9.0	+ 21.0	/	37.15
T. max. +55	9.0	+ 21.9	+ 0.1	38.02
T. min. -10	9.0	+ 18.7	- 2.3	21.88

Uncertainty of measurement +/- 4 dB
for a minimum confidence level of 95 %

REMARKS:

The calculated value for peak envelope power at - 10 Deg C is 0.78 dB below the specification limit. This is within the measurement uncertainty tolerance for this measurement.

Note:

- 1). All radiated power measurement were made on the alternative indoor test site as described in Annex A Para A.1.4 of ETS 300 152..
- 2). For the purpose of measuring power under extreme conditions a test fixture was used. Any resultant change in output power was applied to the value for radiated peak envelope power obtained on the test site.
- 3). The orientation of the unit and it's associated antenna altered the value of radiated power obtained. All measurements were made with the antenna as if worn around neck.

5.7 Radiation produced by operation of the test facility (Para 4.7)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

Frequency of Emission. (MHz)	Level. (nW)	Limit. (nW)
121.65	31.6	25

Uncertainty of measurement +/- 4 dB
for a minimum confidence level of 95 %

REMARKS:

This level exceeds the specification limit by 1dB,
this is within the measurement uncertainty tolerance.

Note:

All radiated power measurement were made on the
alternative indoor test site as described in Annex A
Para A.1.4 of etsi 300 152..

5.8 Spurious emissions.

(Para 4.8)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

D.U.T.	Frequency (MHz)	Level	
		dBm	W
PLB7	81.10000	-0.7	851 μ W
PLB7	162.20128	-42.9	51.3nW
PLB7	202.75156	-38.3	147.9nW
PLB7	243.30184	-4.2	380 μ W
PLB7	283.85300	-51.1	7.7nW
PLB7	324.40240	-47.9	16.2nW
PLB7	364.95400	-42.8	52.5nW
PLB7	446.05300	-68.3	147pW
PLB7	486.60480	-62.4	575pW
PLB7	567.70460	-55.7	2.7nW
PLB7	770.45700	-55.5	2.8nW

Uncertainty of measurement +/- 4 dB
for a minimum confidence level of 95 %

Note:

Spurious emission measurements were made on the
alternative indoor test site as described in Annex A
Para A.1.4. of ETSI 300 152.

6.0 ENVIRONMENTAL TESTS.

(Para 3.8)

Details of Environmental Program.

6.1 CEPT Rec T/R 34-01 Annex VI. Para 4. Vibration.

6.2 " " " " " . Para 5. Dry Heat Cycle.

" " " " " . Para 6. Damp Heat Cycle.

" " " " " . Para 7. Low Temp. Cycle.

6.3 ETS 300 152. Para 3.8. Immersion Test.

6.4 ETS 300 152. Para 3.8.1. Drop Test.

6.1 Vibration.

(Para 3.8)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

Environmental Program: CEPT Rec T/R 34-01
Para 4.

Description of measurement:

The EPIRB's power and frequency were measured before and after vibration. No physical damage or performance degradation was noted as a result of the vibration tests.

Simultaneous vibration and measurement of power and frequency were not possible due to RF interference to the vibration controller from the D.U.T.

These tests were carried out on a fully operational device rather than the test fixture supplied, the use of which would be inappropriate for a test on how the EPIRB's performance is affected by vibration, drop and sealing and immersion tests.

5.1 General requirements

(Para 2)

Complies Yes/No

- | | | | |
|-----|-------------------------------------|-----|----------------------------------|
| 2.1 | Construction | Yes | |
| 2.2 | Controls | No | (no initial activation seal) |
| 2.3 | Labelling | No | (inadequate battery information) |
| 2.4 | Requirements for conformity testing | Yes | |
| 2.5 | Battery | No | (Battery expiry date not shown) |

6.2 Class of emission with environmental test applied.
(Para 4.3)

DEVICE UNDER TEST: FIXTURE.

ENVIRONMENTAL CLASS: X

TEST ENVIRONMENT	SUPPLY VOLTAGE (V)	MODULATION FREQ. (Hz)		SWEEP RATE (Hz)
		MIN	MAX	
DRY HEAT CYCLE (Para 4.)	9.0	490	1562	2.5
	8.0	490	1562	2.5
	11.0	490	1543	2.5
DAMP HEAT CYCLE (Para 5.)	9.0	467	1497	2.5
	8.0	485	1497	2.5
	11.0	480	1488	2.5
LOW TEMP. CYCLE (Para 6.)	9.0	460	1543	2.5
	8.0	460	1453	2.5
	11.0	460	1436	2.5

Uncertainty of measurement $< \pm 10$ Hz
For a minimum confidence level of 95%

REMARKS:

6.2 Modulation characteristic with environmental test applied.
(Para 4.4)

DEVICE UNDER TEST: FIXTURE.

ENVIRONMENTAL CLASS: X

TEST ENVIRONMENT	SUPPLY VOLTAGE (V)	MODULATION DEPTH (%)	MODULATION DUTY CYCLE (%)
DRY HEAT CYCLE (Para 4.)	9.0	100	50
	8.0	100	50
	11.0	100	50
DAMP HEAT CYCLE (Para 5.)	9.0	100	50
	8.0	100	50
	11.0	100	50
LOW TEMP. CYCLE (Para 6.)	9.0	100	50
	8.0	100	50
	11.0	100	50

Uncertainty of measurement $< \pm 5\%$
For a minimum confidence level of 95%

REMARKS:

6.3 Modulation characteristic with environmental test applied.
(Para 4.7)

DEVICE UNDER TEST: FIXTURE.

ENVIRONMENTAL CLASS: X

TEST ENVIRONMENT	SUPPLY VOLTAGE (V)	OUTPUT RELATIVE TO PRE-ENVIRONMENTAL TEST LEVEL. (dB)
DRY HEAT CYCLE (Para 4.)	9.0	+ 0.2
	8.0	+ 0.2
	11.0	+ 0.1
DAMP HEAT CYCLE (Para 5.)	9.0	- 0.1
	8.0	- 0.2
	11.0	- 0.2
LOW TEMP. CYCLE (Para 6.)	9.0	0.0
	8.0	- 0.4
	11.0	- 0.1

Uncertainty of measurement $< \pm 4$ dB
For a minimum confidence level of 95%

REMARKS:

6.2 Frequency error with environmental test applied.
(Para 4.2)

Ambient temperature (Tn) 23 Deg C

Humidity 50 % rh

ENVIRONMENTAL CLASS: X

TEST ENVIRONMENT	D.U.T	SUPPLY VOLTAGE (V)	FREQUENCY ERROR. (Hz)	LIMIT (KHz)
DRY HEAT CYCLE (Para 4.)	PLB 7	9.0	-250	+/- 3.5
	FIXTURE	9.0	+230	
	FIXTURE	8.0	+ 60	
	FIXTURE	11.0	+520	
DAMP HEAT CYCLE (Para 5.)	PLB 7	9.0	+200	
	FIXTURE	9.0	+490	
	FIXTURE	8.0	+400	
	FIXTURE	11.0	+550	
LOW TEMP. CYCLE (Para 6.)	PLB 7	9.0	+2200	
	FIXTURE	9.0	+1720	
	FIXTURE	8.0	+1610	
	FIXTURE	11.0	+2020	

Uncertainty of measurement $< +/- 1 \times 10^{-7}$
For a minimum confidence level of 95%

REMARKS:

6.3 Immersion Test.

DEVICE UNDER TEST: PLB 7

FREQUENCY ERROR.

FREQUENCY ERROR BEFORE IMMERSION (Hz)	FREQUENCY ERROR AFTER IMMERSION (Hz)
- 250	- 250

OUTPUT POWER.

OUTPUT POWER BEFORE IMMERSION (dBm)	OUTPUT POWER AFTER IMMERSION (dBm)
8.7	8.9

REMARKS:

After the immersion test the frequency and power output remained unchanged.

6.3 DROP TEST

DEVICE UNDER TEST: PLB 7

FREQUENCY ERROR.

FREQUENCY ERROR BEFORE DROP TEST (Hz)	FREQUENCY ERROR AFTER DROP TEST (Hz)
+ 230	+ 520

OUTPUT POWER.

OUTPUT POWER BEFORE DROP TEST (dBm)	OUTPUT POWER AFTER DROP TEST (dBm)
8.9	8.9

REMARKS:

The measured frequency and power output were unaffected by the drop test.

7. PHOTOGRAPHS OF EQUIPMENT AS TESTED.

7.1 External View of EPIRB.

PHOTOGRAPHS OF EQUIPMENT AS TESTED (continued)

7.2 External View of EPIRB.

PHOTOGRAPHS OF EQUIPMENT AS TESTED (continued)

7.3 External View of EPIRB.