
REPORT ON

Testing of the McMurdo G5/E5 Smartfind Plus 406MHz EPIRB
in accordance with RTCM Paper 77 – 2002 / SC110-STD

COMMERCIAL-IN-CONFIDENCE

Report No RM614667/04 Issue 1

September 2006



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TUV Product Service Ltd, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuvps.co.uk; www.babt.com

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September 2006

PREPARED FOR

McMurdo Limited
Silverpoint
Airport Service Road
Hilsea
PO3 5PB

PREPARED BY

K W Adsetts
Project Manager

APPROVED BY

M Jenkins
Authorised Signatory

DATED

4th September 2006



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SECTION 1

REPORT SUMMARY

Testing of the McMurdo G5/E5 Smartfind Plus 406MHz EPIRB
in accordance with RCTM Paper 77 – 2002 / SC110-STD

1.1 STATUS

Name and Address of Client	McMurdo Limited Silverpoint Airport Service Road Hilsea PO3 5PB
Model Number	G5/E5 Smartfind Plus 406MHz EPIRB
Serial Number	9D1CD34D34D74D1
Test Specification/Issue/Date	RCTM Paper 77 – 2002 / SC110-STD
Number of Items Tested	One
Security Classification of EUT	Unclassified
Incoming Release Date	Application Form 1 st February 2006
Order Number Date	PC0001813 31 st August 2005
Start of Test	16 th February 2006
Finish of Test	24 th August 2006

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out to EN 50121-3-2 is shown below.

Section	RTCM Clause	Details	Result
-	-	Table of Test Results	
2.1	A1.0	Initial Aliveness test	Pass
2.2	A3.0	Dry Heat Cycle	Pass
2.3	A4.0	Damp Heat Cycle	Pass
2.4	A5.0	Vibration Test	Pass
2.5	A6.0	Bump Test	Pass
2.6	A7.0	Salt Fog Test	Waivered
2.7A	A8.1	Drop Test (onto hard surface)	Pass
2.7B	A8.2	Drop Test (into water, 20 metres)	Pass
2.8	A9.0	Leakage and Immersion Tests	Pass
2.9	A10.0	Spurious Emissions Test	Pass
2.10	A11.0	Thermal Shock Test	Pass
2.11	A12.0	COSPAS-SARSAT TYPE APPROVAL TO T.007	Pass
2.12	A13.1	Operational Life Test	Pass
2.13	A13.2	Strobe Light Test	Pass
2.14	A 13.3	Self Test	Pass
2.15	A14.0	Automatic Release Mechanism Test	Pass
2.16	A15.0	Stability and Buoyancy	Pass
2.17	A16.0	Inadvertent Activation Test	Pass
2.18	A17.0	Auxiliary Radio-Locating Device Transmitter Test	Pass
2.19	A18.0	Humidity Test	N/A
2.20	A19.0	Orientation Test	Pass

1.3.1 Applicant Details

Contact Name	Neil Jordan	Telephone	02392 623934
Email	neiljordan@mcmurdo.co.uk	Fax	02392 623997

Contact Name	Telephone
Email	Fax

1.3 APPLICATION FORM

1.3.3 Beacon Details

Beacon Model:

Name & Location of Test Facility: BABT, Hampshire, United Kingdom

Beacon Type: ☐ Aviation ☐ Land ☒ Maritime

Operating Temperature Range: ☐ Class 1: -40°C to +55°C ☒ Class 2: -20°C to +55°C

Specified Operating Lifetime: ☐ 24 hrs ☒ 48 hrs ☐ Other [hrs]

Beacon Battery Type:

Chemistry: Lithium Manganese Dioxide
 Manufacturer & Model No: Varta CR2/3 AH
 Size & number of cells: 3 x 3 2/3AH
 Voltage: 9V nominal 6.4V end-point

Beacon Oscillator:

Type: TCXO
 Manufacturer & Model No: CMAC E3279

Ancillary Devices & Features

	No	Yes	Details
Self Test Mode:	☐	☒	See in Self Test Characteristics below
Auxiliary Radio-Locating Device:	☐	☒	Frequency: 121.5 MHz Power: 17 dBm for 48 hours Tx. Duty Cycle: Continuous
Encoded Position Data:	☐	☒	Nav. Device: Internal Type: GPS Manufacturer: EAZIX Model: EZGPM01
Long Message (144 bits):	☐	☒	
Short Message (112 bits):	☐	☐	
Automatic Activation:	☐	☒	
Strobe Light:	☐	☒	Intensity: >0.75cd Flash Rate 21 flashes per minute
Voice Communications (PTT):	☒	☐	
Other:	☒	☐	Specify:

Protocols Supported:

User Location Protocol	☐	☒
Standard Location Protocol	☐	☒
Standard Short Location Protocol	☒	☐
National Location Protocol	☐	☒
National Short Location Protocol	☒	☐

1.3 APPLICATION FORM

1.3.3 Beacon Details

Self Test Characteristics

	Yes	No
Does self-test have a separate switch positions?	[☒]	[]
Does self-test switch automatically return to normal position when released?	[☒]	[]
If not, how long until the first 'distress' message is emitted?		
Does self-test transmit a 406MHz signal?	[☒]	[]
Unmodulated signal only?	[]	[☒]
Normal data, but with inverted frame synchronisation pattern?	[☒]	[]
1 burst only?	[☒]	[]
Does self-test transmit a 121.5MHz signal?	[☒]	[]
For less than 1 second?	[]	[☒]
Continually while self-test is activated?	[]	[☒]
☒ Other period (specify): 15		
Does self-test transmit on any other frequency (e.g. 243MHz)	[]	[☒]
Result of self test is indicated by:		
Pass fail indicator light	[☒]	[]
Strobe light flash	[☒]	[]
[] Other (specify):		
Can the self-test be performed without removing the beacon from mounting bracket?	[☒]	[]
What parameters are internally tested by the self-test?		
Battery voltage	[☒]	[]
RF power at 406MHz	[☒]	[]
RF power at 121.5MHz	[☒]	[]
Approximate RF frequency	[]	[☒]
Phase locked loop	[☒]	[]
[] Other (specify):		
Number of self tests per year	[12	]
Duration of self test	[9 seconds	]
Do the above characteristics apply for all countries where beacon sold?	[☒]	[]
If No, please specify:		
Do the above characteristics apply for all production serial numbers?	[☒]	[]
If No, please specify:		

Battery Data

Battery replacement interval	[6 years	]
Battery capacity	[3.06 Ah	]
Battery self drain (i.e. when the battery is stored out of the beacon)	[1% per yr	]

1.3 APPLICATION FORM

1.3.4 Declaration of Build Status

Hardware Version: Issue C

Software Version: 1.2.186

1.3.5 Declarations

	Yes	No
Are the equipments submitted representative production models?	☒	☐
If No re the equipments pre-production models?	☐	☐
If pre-production, will final equipments be identical in ALL respects?	☒	☐
If No supply full details:		
Is the Test report to be used as part of a Cospas-Sarsat Type Approval Application?	☒	☐
If Yes, has the product, any direct engineering predecessor, or variant ever been granted Type Approval in any EEC member country?	☐	☒
If Yes, supply full details:		
Will the labeling of the equipment comply with the requirements of C/S T.007 Issue 4?	☒	☐
ITU Class of Emission: 121.5MHz = 3K20A3X 406.028MHz = 16K0G1D		

1.3.6 Applicant's Declaration

I hereby declare that I am entitled to sign on the behalf of the applicant and that the information supplied is correct and complete.

Signed: (when not emailing)
Name:


 Neil Jordan

Position Held: Electronics Engineer

Date:

1.4 MODIFICATIONS

No modifications were made to the test sample during testing.

1.5 REPORT MODIFICATION RECORD

Issue 1 – First Issue

SECTION 2

TEST DETAILS

Testing of the McMurdo G5/E5 Smartfind Plus 406MHz EPIRB
in accordance with RCTM Paper 77 – 2002 / SC110-STD



TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
1. INITIAL ALIVENESS TEST (A 1.0)						Section 2.1
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		37.2		
2. DRY HEAT CYCLE (A 3.0)						Section 2.2
Aliveness test (during 2 hour period)						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz			406.0281	
• Power Output	35 – 39	dBm			36.4	
Aliveness test (at end of 2 hour period)						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz			406.0281	
• Power Output	35 – 39	dBm			36.1	
3. DAMP HEAT CYCLE (A 4.0)						Section 2.3
Aliveness test (during 2 hour period)						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz			406.0281	
• Power Output	35 – 39	dBm			36.4	
Aliveness test (at end of 2 hour period)						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz			406.0281	
• Power Output	35 – 39	dBm			36.2	



TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
4. VIBRATION TEST (A 5.0)						Section 2.4
• Exterior Mechanical Inspection	No damage	✓		✓		
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		37.2		
• Activation	No activation during test	✓		✓		
5. BUMP TEST (A 6.0)						Section 2.5
• Exterior Mechanical Inspection	No damage	✓		✓		
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		37.3		
• Activation	No activation during test	✓		✓		
6. SALT FOG TEST (A 7.0)						Section 2.6
• Exterior Mechanical Inspection	No damage	✓		Waivered		See Annex A
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		N/A		
• Power Output	35 – 39	dBm		N/A		

TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
7-A. DROP TEST (A 8.1)						Section 2.7A
On Hard Surface						
• Exterior Mechanical Inspection	No damage	✓		✓		Test button cover fell off (replaced)
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0282		
• Power Output	35 – 39	dBm		37.3		
• Activation	No activation during test	✓		✓		
7-B. DROP TEST (A 8.2)						Section 2.7B
In Water						
• Exterior Mechanical Inspection	No damage	✓		✓		
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		37.2		
• Activation	No activation during test	✓		✓		
8. LEAKAGE AND IMMERSION TEST (A 9.0)						Section 2.8
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		37.2		
• Interior Inspection	No water	✓		✓		

TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
9. SPURIOUS EMISSIONS TEST (A 10.0)						Section 2.9
• 406 MHz	Figure 2-1	✓	✓	✓	✓	Attach graphs
• 121.5 MHz	Figure 2-6	✓	✓	✓	✓	Attach graphs
10. THERMAL SHOCK TEST (A 11.0)			(-30°C)		(+70°C)	Section 2.10
• Self-activation in water	5	Minutes	Fresh Water: 4.12 Salt Water: <0.1		Fresh Water: <0.1 Salt Water: <0.1	
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz	406.0279		406.0279	
• Power Output	35 – 39	dBm	35.7		36.4	
Frequency Stability						
• Short term stability	0.002	Parts/million in 100ms	7.8 ⁻¹¹		1.01 ⁻¹⁰	
Medium term stability						
• Mean slope	0.001	Parts/million/min	-2.97 ⁻¹⁰		-6.44 ⁻¹⁰	
• Residual frequency variation	0.003	Parts/million	4.78 ⁻¹⁰		1.41 ⁻⁹	
11. COSPAS-SARSAT TYPE APPROVAL (A 12.0)	C-S Certificate					Section 2.11

TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
12. OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS (A 13.0)						Section 2.12
Operational Life						
Frequency						
• Nominal Carrier	406.025± or 406.028±0.001	MHz	Max: 406.027949 Min: 406.027944			
• Short-term stability	0.002	Parts/million in 100ms	Max: 2.3525 x 10 ⁻¹⁰ Min: 5.716 x 10 ⁻¹¹			
Medium-term stability						
• Mean slope	0.001	Parts/million/min	Max: 2.469 x 10 ⁻¹⁰ Min: -2.948 x 10 ⁻¹⁰			
• Residual variation	0.003	Parts/million	Max: 1.185 x 10 ⁻⁰⁹ Min: 1.143 x 10 ⁻¹⁰			
• RF output power	35 – 39	dBm	Max: 37.43 Min: 37.19			
• Strobe flash rate	20 – 30	/min	21.2			
• Auxiliary radio-locating Peak envelope power	14 – 20	dBm	Max: 15.43 Min: 15.03			Calculated
13. STROBE LIGHT TEST (A 13.2)						Section 2.13
• Flash rate	20 – 30	/min	21.2	21.0	21.2	
• Effective intensity	0.75	Cd	1.37	1.27	1.18	
• Pulse duration	10 ⁻⁶ to 10 ⁻²	ms	10	10	10	
14. SELF TEST (A 13.3)						Section 2.14
• RF pulse duration	0.444 sec or 0.525 sec	✓	0.522	0.521	0.521	
• Frame synchronisation pattern	0 1101 0000	✓	✓	✓	✓	
• Number of RF bursts	1 – burst	✓	✓	✓	✓	

TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
15. AUTOMATIC RELEASE MECHANISM TEST (A 14.1)						Section 2.15
• Normal mounted orientation	Release and float free before 4 meters: automatic activation	✓		✓		Annex A
• Rolling 90° starboard		✓		✓		Annex A
• Rolling 90° port		✓		✓		Annex A
• Rolling 90° bow down		✓		✓		Annex A
• Rolling 90° stern down		✓		✓		Annex A
• Upside down		✓		✓		Annex A
16. STABILITY AND BUOYANCY TEST (A 15.0)						Section 2.16
• Turn upright	2	S		<2		
• Reserve Buoyancy	5	%		58.7		
• Float upright; Antenna base	>4	cm		5.5		
17. INADVERTENT ACTIVATION TEST (A 16.0)						Section 2.17
• Activation / Release	EUT should not release from bracket or automatically activate	✓		✓		

TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min} (-20°C)	T _{amb} (+23°C)	T _{max} (+55°C)	
18. AUXILIARY RADIO-LOCATING DEVICE TRANSMITTER TEST (A 17.0)						Section 2.18
• Carrier frequency	121.5 ± 0.006	MHz	121.500081	121.500000 (ref)	121.499571	
• PERP	14 – 20	dBm		Max: 15.6 Min: 15.2		
• Duty cycle	100	%	99.08	99.05	98.91	
Modulation						
• Frequency	700Hz within range of 300 – 1600 Hz	Hz	Max: 1481 Min: 339.0	Max: 1488 Min: 339.4	Max: 1486 Min: 339.6	
• Direction	Upward	✓				
• Duty cycle	33 – 55	%	39.3	42.5	42.8	
• Factor	0.85 – 1.0	#	0.961	0.968	0.963	
• Sweep repetition rate	2 – 4	Hz	3.000	3.005	3.002	
Antenna						
• Pattern	Omnidirectional	✓		✓		
• Polarization	Vertical	✓		✓		
• VSWR	1.5:1	✓		✓		
19. HUMIDITY TEST (A 18.0)						Section 2.19
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz			N/A	
• Power Output	35 – 39	dBm			N/A	



TABLE OF TEST RESULTS

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T _{min}	T _{amb}	T _{max}	
			(-20°C)	(+23°C)	(+55°C)	
20. ORIENTATION TEST (A 19.0)						Section 2.20
Vertical						
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		36.5		
Upside down						
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.0281		
• Power Output	35 – 39	dBm		36.3		
Horizontal						
Aliveness test						
• Carrier Frequency	406.025±0.002 Or 406.028±0.001	MHz		406.021		
• Power Output	35 – 39	dBm		36.5		



2.1 INITIAL ALIVENESS TEST

2.1.1 Specification Reference

RCTM Paper 77 (A 1.0)

Beacon Test Report 1D1C000002FFBFF

Organization:
Tested By:
Date: 16-Feb 2006, 1:03:44 PM
Tester Model/Serial No./File Name: BT100S/1025/Functional-5
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 28°C

☐ PASS ☐ FAIL INITIALS: _____

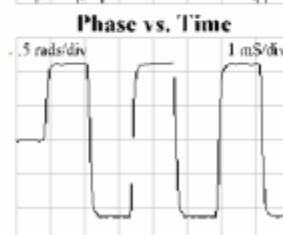
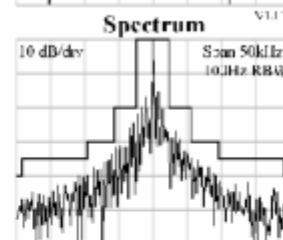
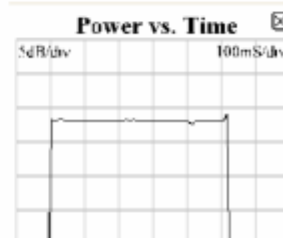
Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF
Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 232: United Kingdom
Bits 41 - 64: 1

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (5 Watt): 37.2 dBm
Power Rise Time: < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 400 bps
CW Preamble: 161.6 ms

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OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY
DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR
FAILURE OF THIS MEASUREMENT EQUIPMENT



Beacon Test Report - Initial Aliveness Test

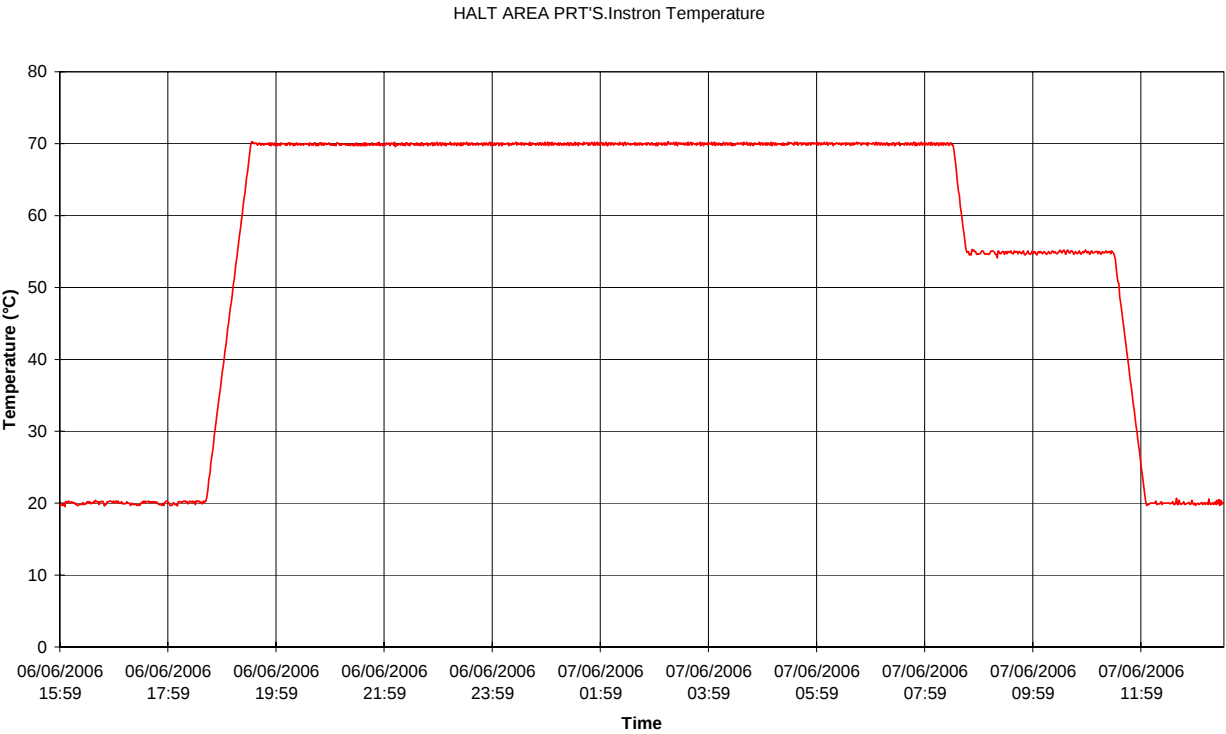


2.2 DRY HEAT CYCLE

2.2.1 Specification Reference

RCTM Paper 77 (A 3.0)

2.2.2 Temperature Plot



Plot showing temperature cycle



2.2 DRY HEAT CYCLE

2.2.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:

Tested By:

Date: 07-Jun-06 9:19:00 AM

Tester Model/Serial No./File Name: BT100S/1025/smartenv-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 24°C

☐ PASS☐ FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: *****

Longitude: *****

406 MHz Measurements

406 Frequency (INT REF): 406.0281 MHz

406 Power (5 Watt): 36.4 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.09 +1.12 radians

Modulation Rise Time: 142 uS

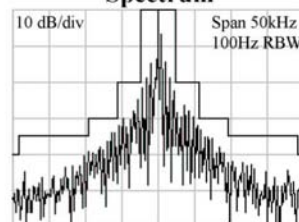
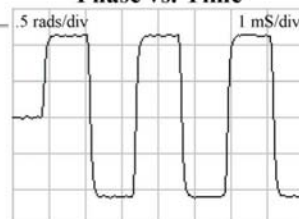
Modulation Fall Time: 153 uS

Modulation Symmetry: 0.4%

Modulation Bit Rate: 400.2 bps

CW Preamble: 161.4 ms

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Power vs. Time ☒**Spectrum****Phase vs. Time**Beacon Test Report at 55°C



2.2 DRY HEAT CYCLE

2.2.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:
Tested By:
Date: 07-Jun-06 11:18:49 AM
Tester Model/Serial No./File Name: BT100S/1025/smartenv-2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

☐ **PASS**
☐ **FAIL**
INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF
Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 232: United Kingdom
Bits 41 - 64: 1

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * * * * *
Longitude: * * * * *

406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (5 Watt): 36.1 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.09 +1.13 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 400.2 bps
CW Preamble: 161.6 ms

Power vs. Time ☒

Spectrum ☒

Phase vs. Time

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

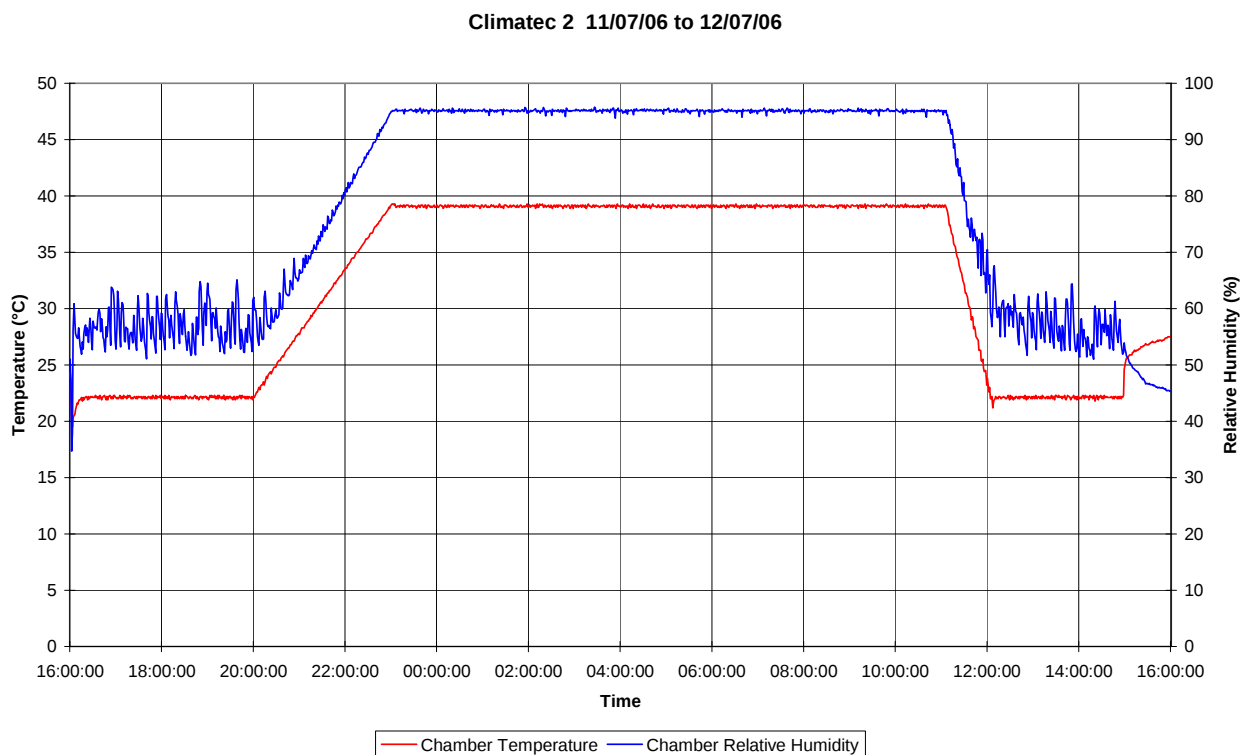
Beacon Test Report after 2 hours at 55°C

2.3 DAMP HEAT CYCLE

2.3.1 Specification Reference

RCTM Paper 77 (A 4.0)

2.3.2 Temperature/Humidity Plot



Plot showing temperature and humidity cycle



2.3 DAMP HEAT CYCLE

2.3.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:

Tested By:

Date: 12-Jul-06 10:45:40 AM

Tester Model/Serial No./File Name: BT100S/1025/smartfind-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 20°C

**PASS****FAIL****INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (INT REF): 406.0281 MHz

406 Power (5 Watt): 36.4 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.1 +1.15 radians

Modulation Rise Time: 153 uS

Modulation Fall Time: 153 uS

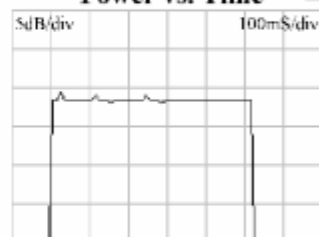
Modulation Symmetry: 0%

Modulation Bit Rate: 400.2 bps

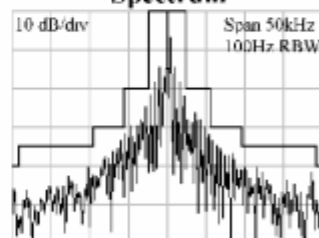
CW Preamble: 161.7 ms

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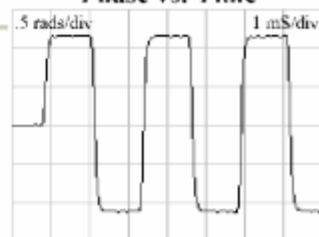
Power vs. Time ☒



Spectrum



Phase vs. Time



Beacon Test Report during 2 hour period

2.3 DAMP HEAT CYCLE

2.3.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:
 Tested By:
 Date: 12-Jul-06 11:02:19 AM
 Tester Model/Serial No./File Name: BT100S/1025/smartfind-2
 Tester Cal Due Date: Nov 10, 2006
 Tester Temperature: 23°C

☐ PASS

☐ FAIL

INITIALS: _____

Notes: Add text comments here.

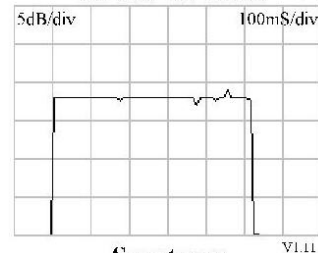
15 Hex ID: 1D1C000002FFBFF
 Full Hex: FFFE2F8E8E000017FDFFB94D53783E0F66C
 Burst Mode: Normal Mode (Long)
 Protocol: Standard Test Protocol
 Country 232: United Kingdom
 Bits 41 - 64: 1

Position Source: Internal GPS
 Auxiliary Radio: 121.5 MHz
 Bits 107-110: Default
 Latitude: * * * * *
 Longitude: * * * * *

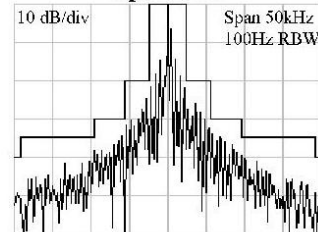
406 MHz Measurements
 406 Frequency (INT REF): 406.0281 MHz
 406 Power (5 Watt): 36.2 dBm
 Power Rise Time: < 5 ms
 Phase Deviation: -1.11 +1.15 radians
 Modulation Rise Time: 142 uS
 Modulation Fall Time: 142 uS
 Modulation Symmetry: 0.4%
 Modulation Bit Rate: 400 bps
 CW Preamble: 161.4 ms

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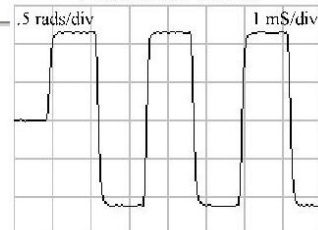
Power vs. Time ☒



Spectrum



Phase vs. Time



Beacon Test Report at end of 2 hour period



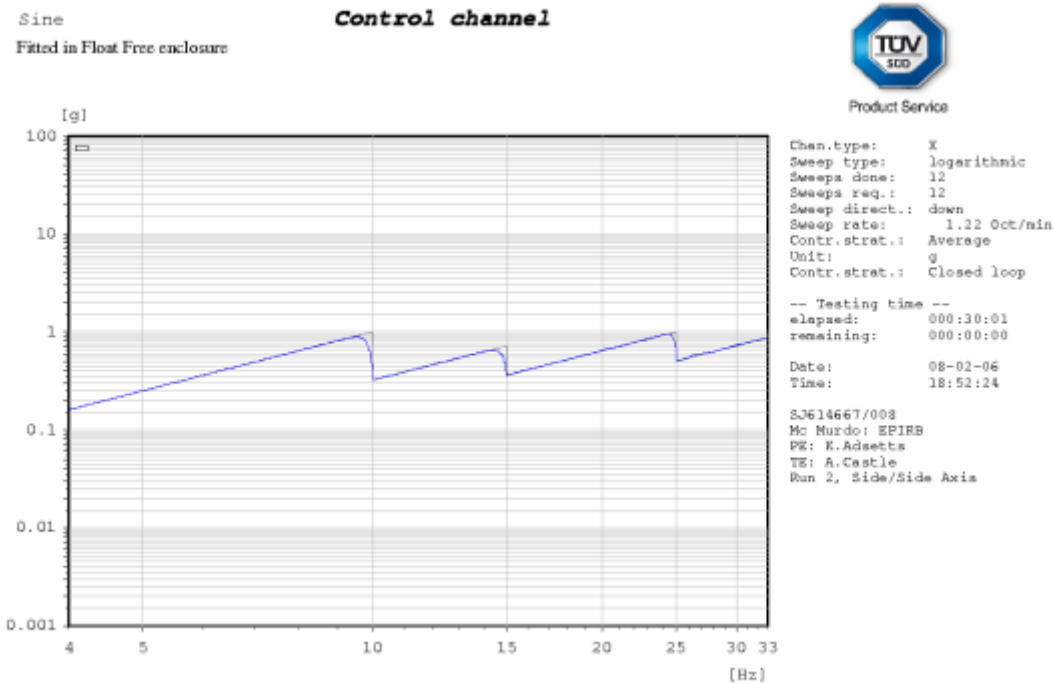
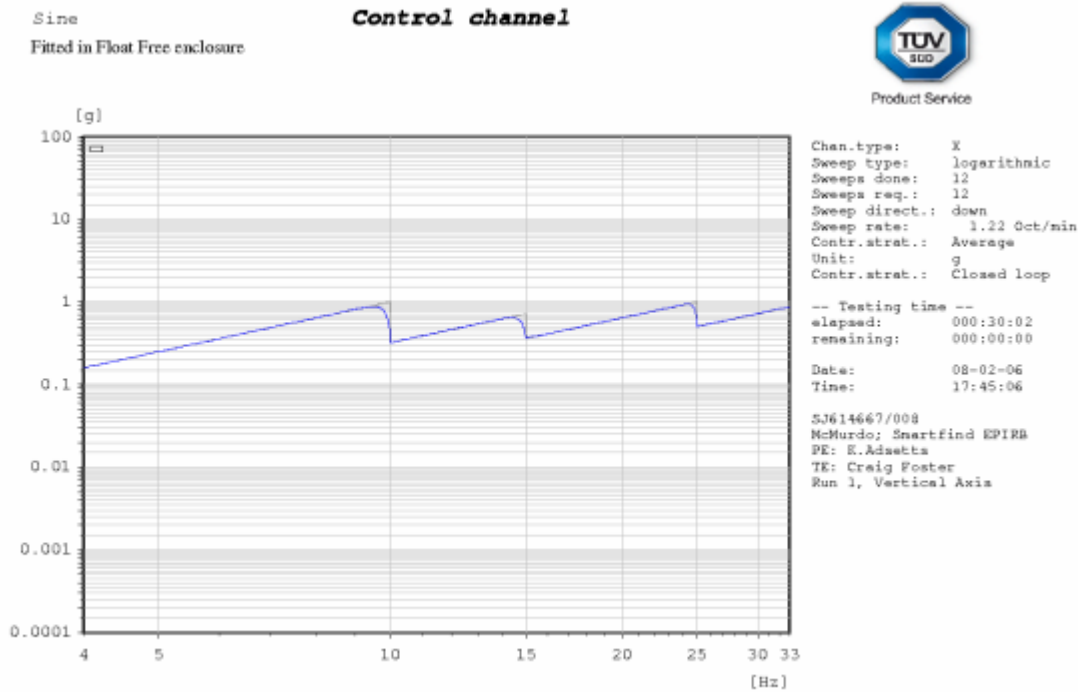
Product Service

2.4 VIBRATION TEST

2.4.1 Specification Reference

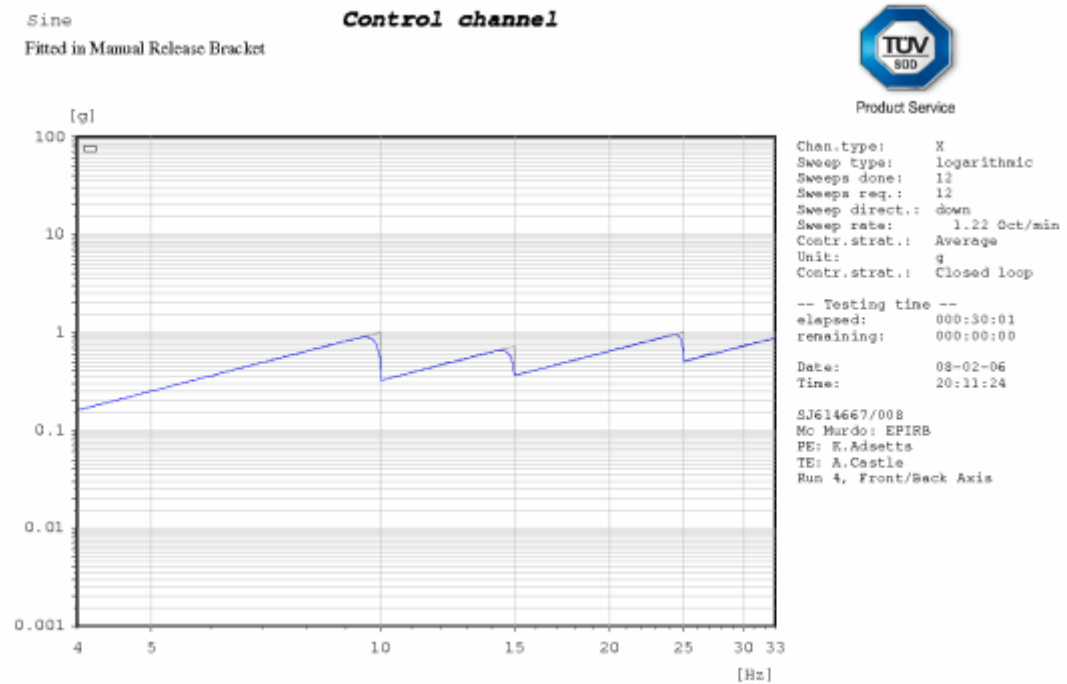
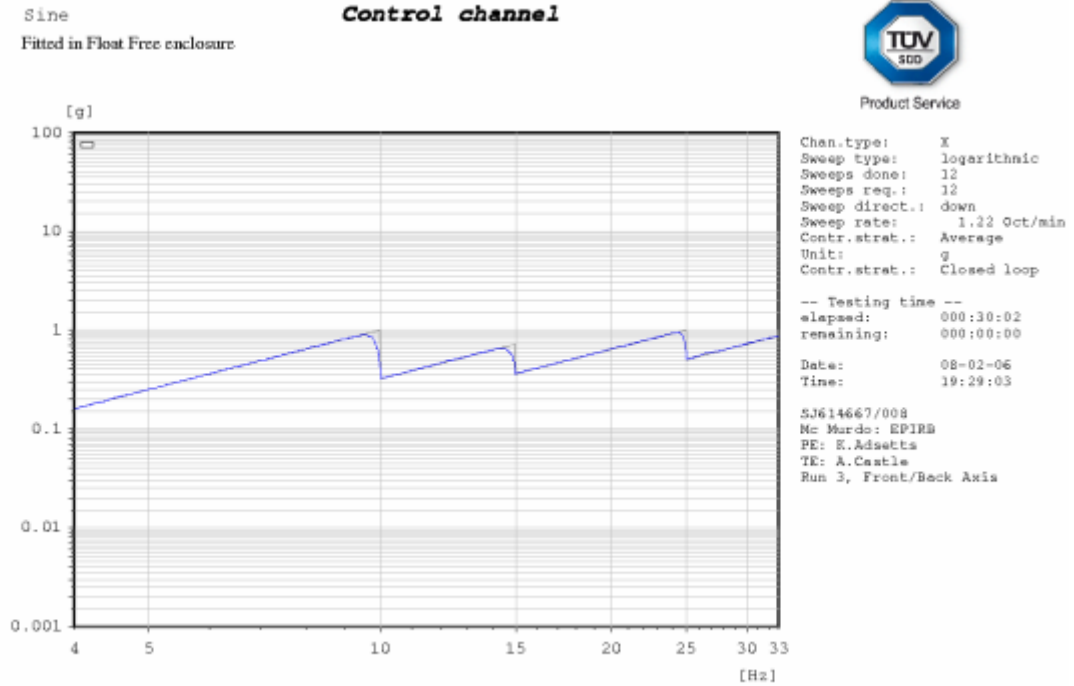
RCTM Paper 77 (A 5.0)

2.4.2 Vibration Plots



2.4 VIBRATION TEST

2.4.2 Vibration Plots

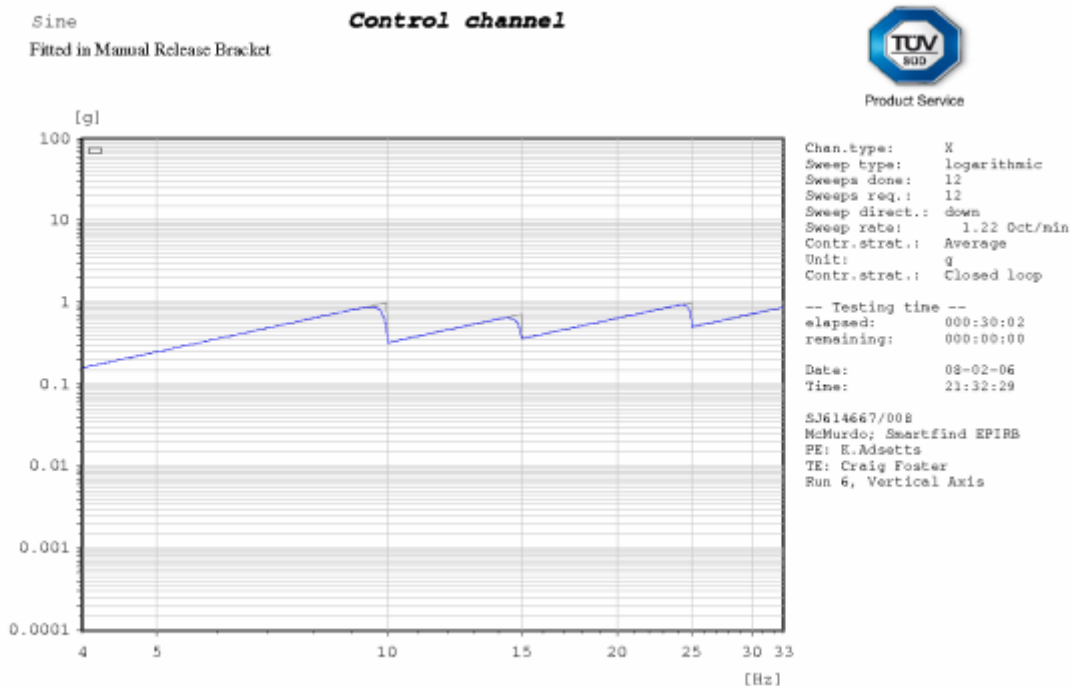




Product Service

2.4 VIBRATION TEST

2.4.2 Vibration Plots



2.4 VIBRATION TEST

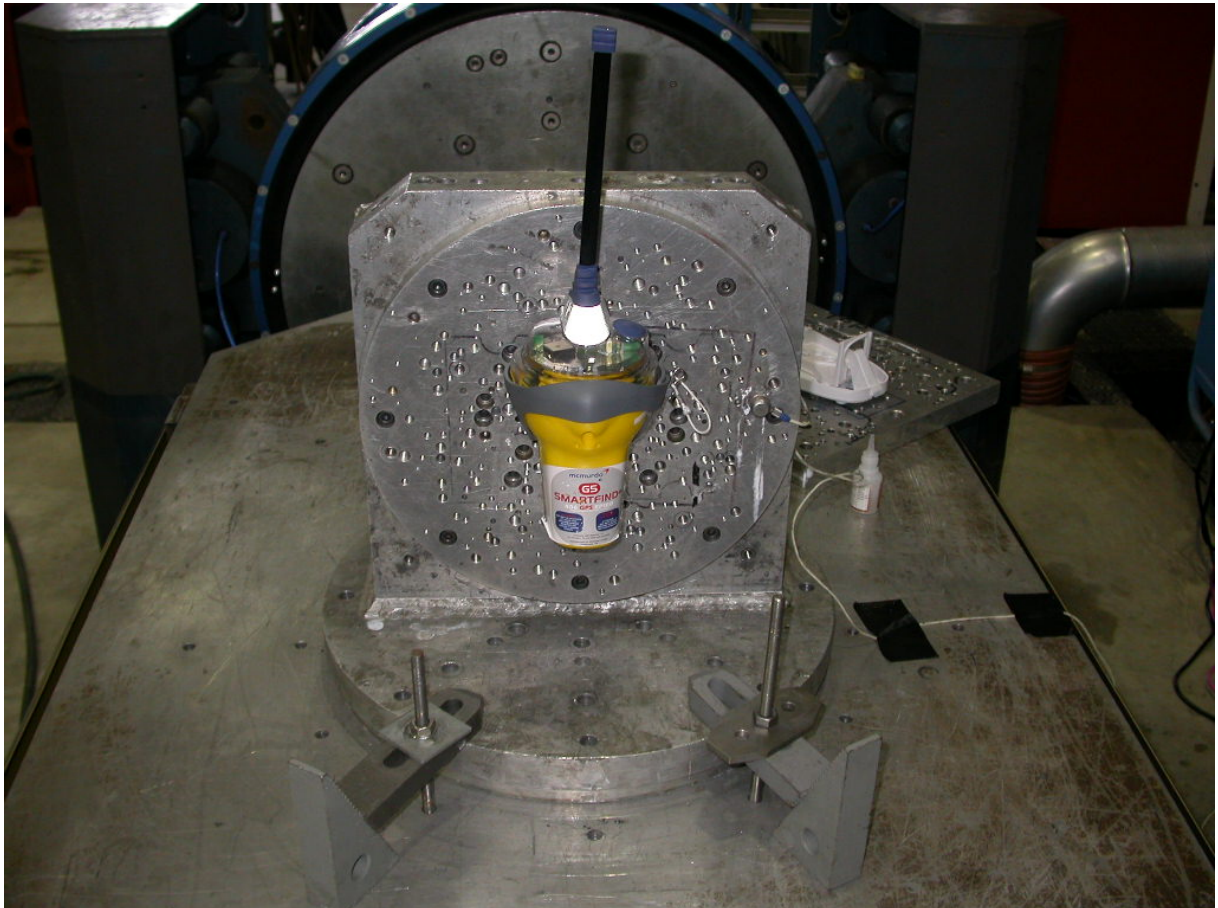
2.4.3 Set-up Photographs



Photograph showing Vibration Test Set-up in Float Free Enclosure

2.4 VIBRATION TEST

2.4.3 Set-up Photographs



Photograph showing Vibration Test Set-up in Manual Release Bracket



2.4 VIBRATION TEST

2.4.4 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:

Tested By:

Date: 03-Aug-06 9:40:11 AM

Tester Model/Serial No./File Name: BT100S/1025/mcmurdo-rtcm-1

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 24°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (INT REF): 406.0281 MHz

406 Power (5 Watt): 37.2 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.11 +1.11 radians

Modulation Rise Time: 153 uS

Modulation Fall Time: 165 uS

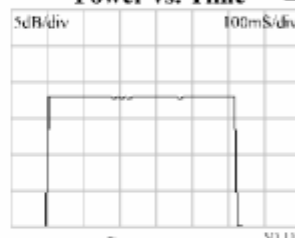
Modulation Symmetry: 0%

Modulation Bit Rate: 400 bps

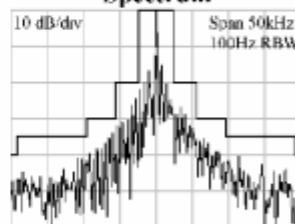
CW Preamble: 161.7 ms

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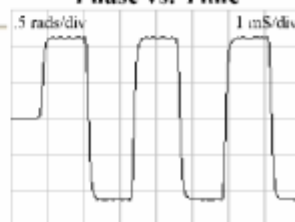
Power vs. Time



Spectrum



Phase vs. Time



Beacon Test Report following Vibration Tests

2.5 BUMP TEST

2.5.1 Specification Reference

RCTM Paper 77 (A 6.0)

2.5.2 Set-up Photographs



Photograph showing Ruggedness Test Set-up in Float Free Enclosure

2.5 BUMP TEST

2.5.2 Set-up Photographs



Photograph showing Ruggedness Test Set-up in Manual Release Bracket



2.5 BUMP TEST

2.5.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:

Tested By:

Date: 03-Aug-06 9:41:51 AM

Tester Model/Serial No./File Name: BT100S/1025/mcmurdo-rtcm-3

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 26°C



PASS



FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (INT REF): 406.0281 MHz

406 Power (5 Watt): 37.3 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.1 +1.11 radians

Modulation Rise Time: 142 uS

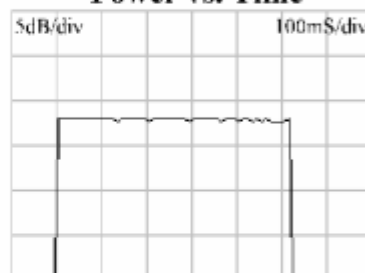
Modulation Fall Time: 153 uS

Modulation Symmetry: 0%

Modulation Bit Rate: 400 bps

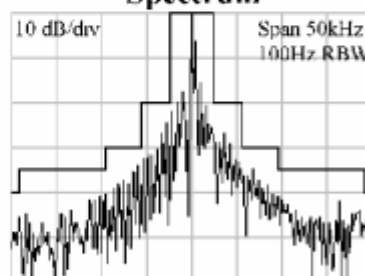
CW Preamble: 161.4 ms

Power vs. Time

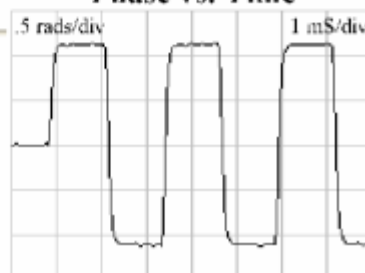


Spectrum

VI.11



Phase vs. Time



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2.6 SALT FOG TEST

2.6.1 Specification Reference

RCTM Paper 77 (A 7.0)

Waivered – refer to Smartfind E5 & G5 EPIRB Materials Declaration: Annex A



Product Service

2.7A DROP TEST (On Hard Surface)**2.7A.1 Specification Reference**

RCTM Paper 77 (A 8.1)

2.7A.2 Test Results**Beacon Test Report**

1D1C000002FFBFF

Organization: Tahoma

Tested By:

Date: 18-Aug-06 1:58:34 PM

Tester Model/Serial No./File Name: BT100S/1025/smartfind drop-2

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 26°C

**PASS****FAIL****INITIALS:** _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (INT REF): 406.0282 MHz

406 Power (5 Watt): 37.3 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.09 +1.08 radians

Modulation Rise Time: 142 uS

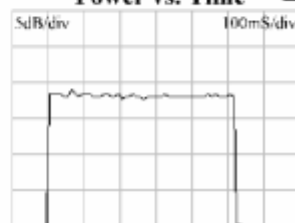
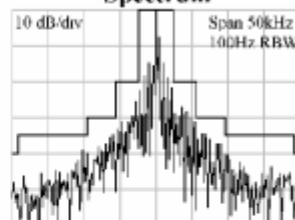
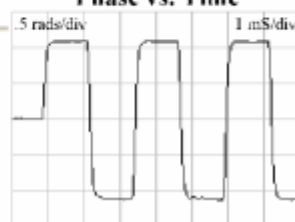
Modulation Fall Time: 142 uS

Modulation Symmetry: 0.3%

Modulation Bit Rate: 400 bps

CW Preamble: 161.5 ms

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Power vs. Time ☒**Spectrum****Phase vs. Time**Beacon Test Report following Drop test on to hard surface

2.7B DROP TEST (In Water)

2.7B.1 Specification Reference

RCTM Paper 77 (A 8.2)

2.7B.2 Test Photographs



2.7B DROP TEST (In Water)

2.7B.2 Test Photographs





2.7B DROP TEST (In Water)

2.7B.3 Test Results

Beacon Test Report

1D1C000002FFBFF

Organization:

Tested By:

Date: 22-Nov-05 2:01:42 PM

Tester Model/Serial No./File Name: BT100S/1025/Functional-5

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 28°C

☐ PASS☐ FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF

Full Hex: FFFE2F8E8E0000017FDFFB94D53783E0F66C

Burst Mode: Normal Mode (Long)

Protocol: Standard Test Protocol

Country 232: United Kingdom

Bits 41 - 64: 1

Position Source: Internal GPS

Auxiliary Radio: 121.5 MHz

Bits 107-110: Default

Latitude: * * * * *

Longitude: * * * * *

406 MHz Measurements

406 Frequency (INT REF): 406.0281 MHz

406 Power (5 Watt): 37.2 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.11 +1.11 radians

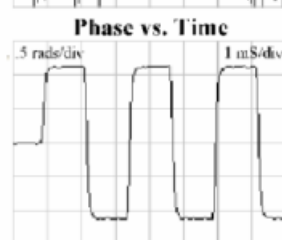
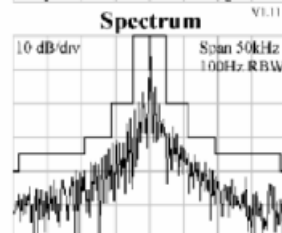
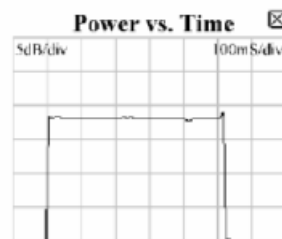
Modulation Rise Time: 153 uS

Modulation Fall Time: 153 uS

Modulation Symmetry: 0%

Modulation Bit Rate: 400 bps

CW Preamble: 161.6 ms



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DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR
FAILURE OF THIS MEASUREMENT

Beacon Test Report following 20 m Drop into Water



2.8 LEAKAGE AND IMMERSION TEST

2.8.1 Specification Reference

RCTM Paper 77: A7.0

2.8.2 Test Results

The EUT was installed into chamber at 65°C for minimum of 1 hour, EUT removed from the chamber at +65°C and immediately immersed into water at approx +20°C. After a period of 63 hours the EUT was submerged under water in a pressure vessel and subjected to simulated pressure of 10 metres (15psig) for a period of 5 minutes.

After the test it was observed that the red and green lights were ON. The cover was removed - no water ingress was observed. It was thought that the battery might be flat, due to 63 hour immersion. The batteries were replaced and correct function observed.

Beacon Test Report

1D1C000002FFBFF

Organization:
 Tested By:
 Date: 09-Dec-05 12:19:55 AM
 Tester Model/Serial No./File Name: BT100S/1025/Functional-6
 Tester Cal Due Date: Nov 10, 2006
 Tester Temperature: 27°C

☐ PASS ☐ FAIL INITIALS: _____

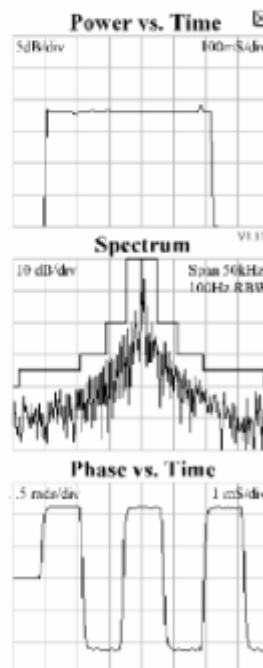
Notes: Add text comments here.

15 Hex ID: 1D1C000002FFBFF
 Full Hex: FFFE2F8E8E000017FDFFB94D53783E0F66C
 Burst Mode: Normal Mode (Long)
 Protocol: Standard Test Protocol
 Country 232: United Kingdom
 Bits 41 - 64: 1

Position Source: Internal GPS
 Auxiliary Radio: 121.5 MHz
 Bits 107-110: Default
 Latitude: *****
 Longitude: *****

406 MHz Measurements
 406 Frequency (INT REF): 406.0281 MHz
 406 Power (5 Watt): 37.2 dBm
 Power Rise Time: < 5 ms
 Phase Deviation: -1.11 +1.11 radians
 Modulation Rise Time: 142 uS
 Modulation Fall Time: 153 uS
 Modulation Symmetry: 0.3%
 Modulation Bit Rate: 400 bps
 CW Preamble: 161.3 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT



Beacon Test Report following Leakage and Immersion Test

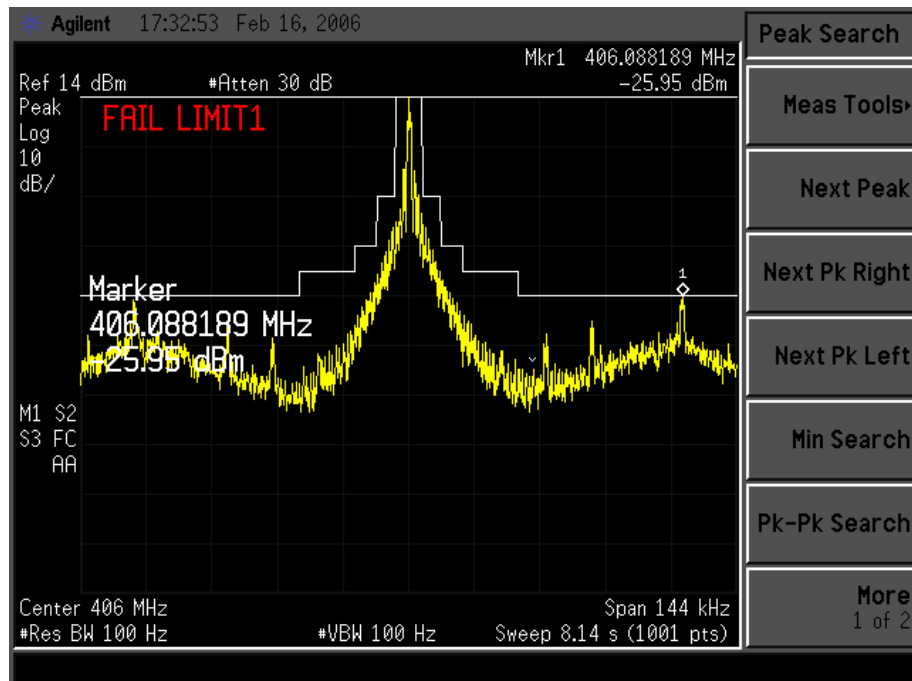


2.9 SPURIOUS EMISSIONS TEST

2.9.1 Specification Reference

RCTM Paper 77 (A 10.0)

2.9.2 Test Results (406MHz)

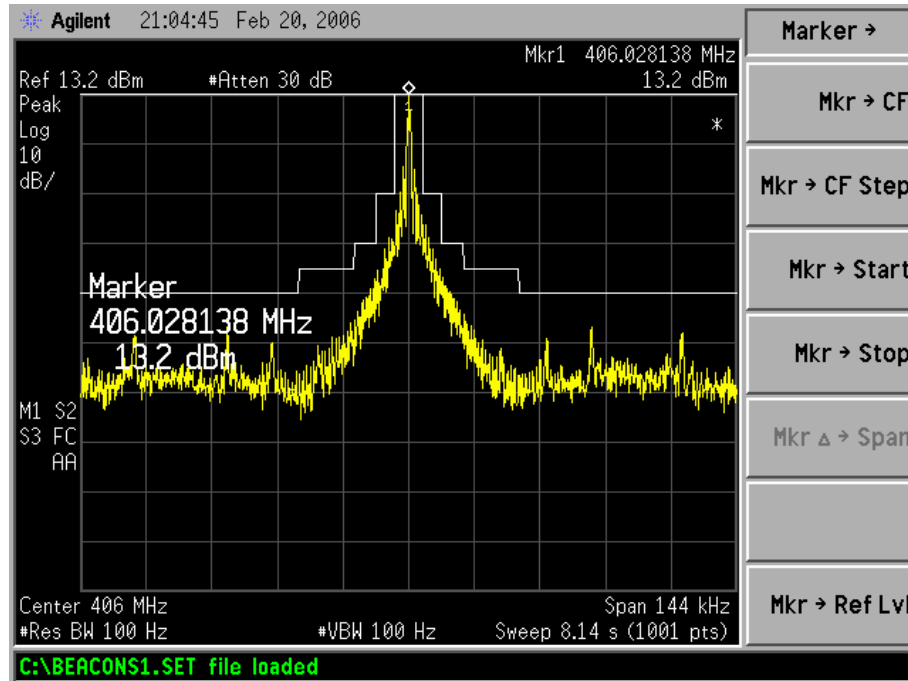


Plot showing 406MHz Spurious Emissions at Ambient Temperature

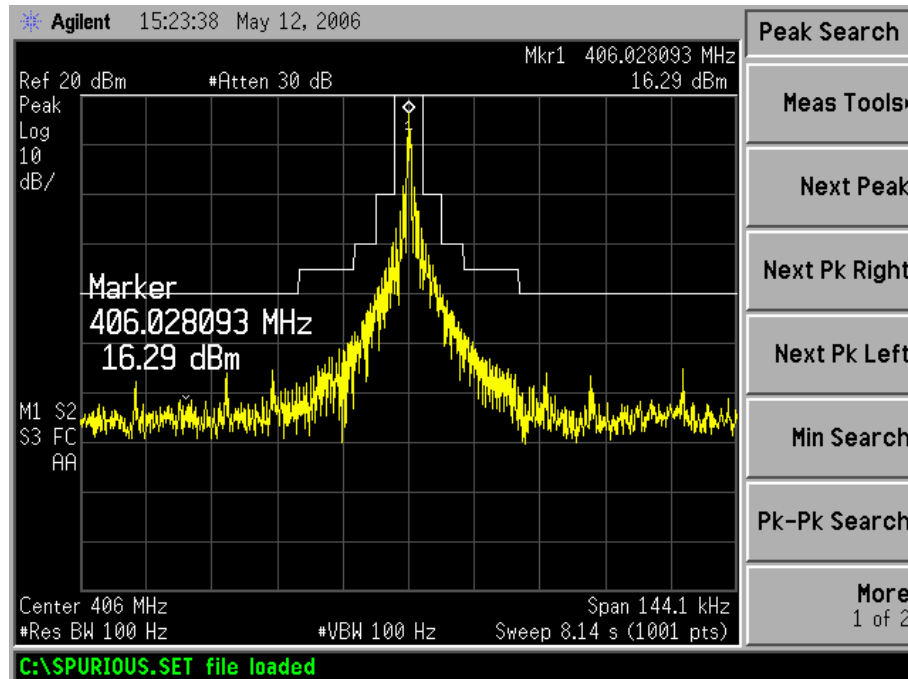
Note: From the reference level (peak power) of +14.00 dBm, the relative limit of -40.00 dBc occurring at 406.088189 MHz gives an equivalent limit of -26.00 dBm, the recorded level of -25.95 is a pass within measurement uncertainty

2.9 SPURIOUS EMISSIONS TEST

2.9.2 Test Results (406MHz)



Plot showing 406MHz Spurious Emissions at High Temperature (+55°C)

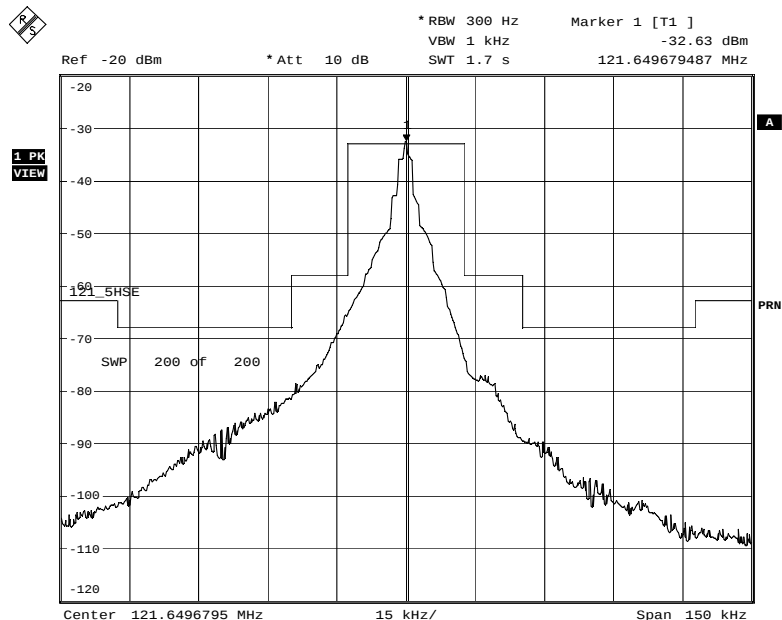


Plot showing 406MHz Spurious Emissions at Low Temperature (-20°C)



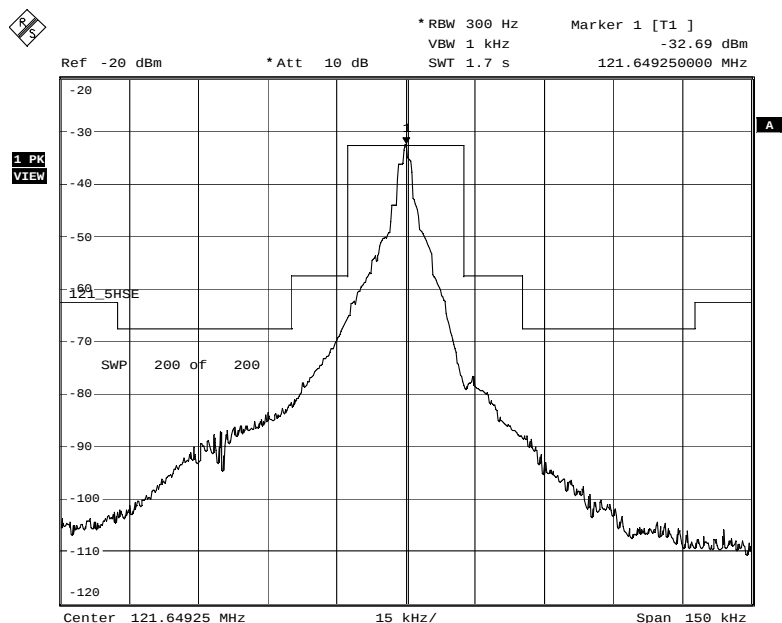
2.9 SPURIOUS EMISSIONS TEST

2.9.3 Test Results (121.5MHz)



Date: 10.MAY.2006 12:40:04

Plot showing 121.5MHz Spurious Emissions at Ambient Temperature



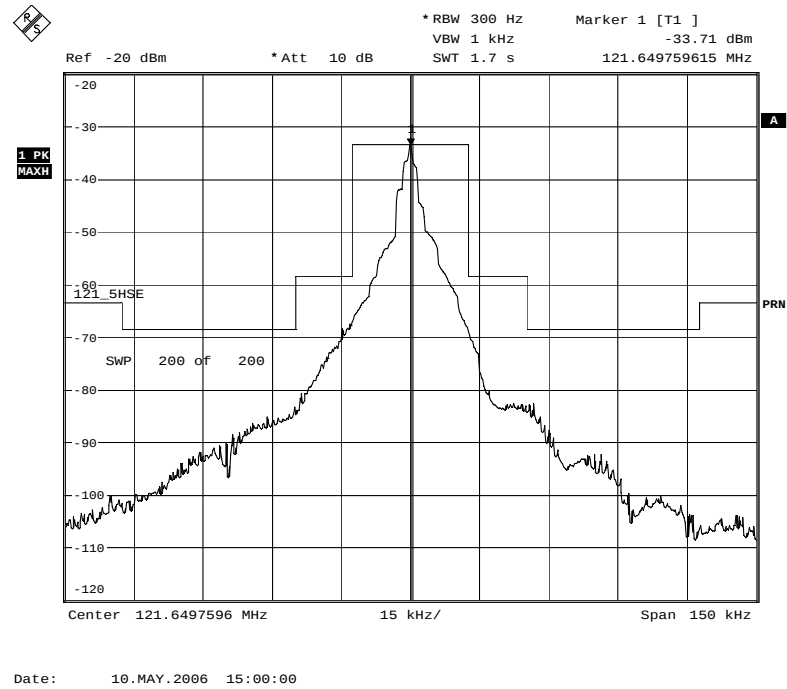
Date: 10.MAY.2006 17:14:21

Plot showing 121.5MHz Spurious Emissions at High Temperature (+55°C)



2.10 SPURIOUS EMISSIONS TEST

2.10.3 Test Results (121.5MHz)



Plot showing 121.5MHz Spurious Emissions at Low Temperature (-20°C)



2.10 THERMAL SHOCK TEST

2.10.1 Specification Reference

RCTM Paper 77 (A 11.0)

2.10.1 Test Results

Beacon Test Report

993D40018C00F9D

Organization: Tahoma

Tested By:

Date: 23-Aug-06 2:25:38 PM

Tester Model/Serial No./File Name: BT100S/1025/tshock23aug-2

Tester Cal Due Date: Nov 10, 2006

Tester Temperature: 31°C

☐ PASS

☐ FAIL

INITIALS: _____

Notes: Add text comments here.

15 Hex ID: 993D40018C00F9D

Full Hex: FFFE2F4C9EA000C6007CECEA1B50

Burst Mode: Normal Mode (Short)

Protocol: Test User Protocol

Country 201: Albania

National Use: 21990647795613

Emergency type: unspecified

Activation type: Auto

406 MHz Measurements

406 Frequency (EXT REF): 406.027933 MHz

406 Power (5 Watt): 35.7 dBm

Power Rise Time: < 5 ms

Phase Deviation: -1.1 +1.09 radians

Modulation Rise Time: 153 μ s

Modulation Fall Time: 130 μ s

Modulation Symmetry: 0%

Modulation Bit Rate: 400.4 bps

CW Preamble: 161.6 ms

Stability Measure @ 19 Bursts

Nominal Frequency: 406027934.932 Hz

Short Term: 7.80E-11/100ms

Mean Slope: -2.97E-10/minute

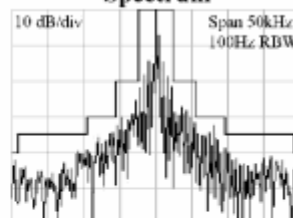
Residual: 4.78E-10

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Power vs. Time ☒



Spectrum



Phase vs. Time



Beacon Test Report Cold Test Salt Water



2.10 THERMAL SHOCK TEST

2.10.1 Test Results

Beacon Test Report

993D40018C00F9D

Organization: TUV Product Service Ltd
 Tested By: Emergency Beacons Dept.
 Date: 24-Aug-06 4:25:45 PM
 Tester Model/Serial No./File Name: BT100S/1025/mcmurdo smart1-3
 Tester Cal Due Date: Nov 10, 2006
 Tester Temperature: 32°C

**PASS****FAIL****INITIALS:** _____

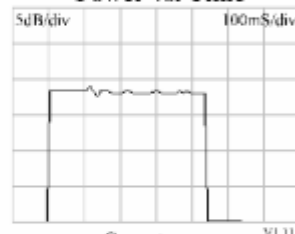
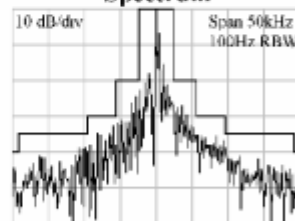
Notes: Add text comments here.

15 Hex ID: 993D40018C00F9D
 Full Hex: FFFE2F4C9EA000C6007CECEA1B50
 Burst Mode: Normal Mode (Short)
 Protocol: Test User Protocol
 Country 201: Albania
 National Use: 21990647795613

Emergency type: unspecified
 Activation type: Auto

406 MHz Measurements
 406 Frequency (EXT REF): 406.027907 MHz
 406 Power (5 Watt): 36.4 dBm
 Power Rise Time: < 5 ms
 Phase Deviation: -1.12 +1.12 radians
 Modulation Rise Time: 153 μ S
 Modulation Fall Time: 142 μ S
 Modulation Symmetry: 0%
 Modulation Bit Rate: 400.2 bps
 CW Preamble: 161.4 ms
 Stability Measure @ 19 Bursts
 Nominal Frequency: 406027909.06 Hz
 Short Term: 1.01E-10/100ms
 Mean Slope: -6.44E-10/minute
 Residual: 1.41E-09

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS
 DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR
 LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS
 MEASUREMENT EQUIPMENT.

Power vs. Time ☒**Spectrum****Phase vs. Time**

Beacon Test Report Hot Test Salt Water

2.11 COSPAS-SARSAT TYPE APPROVAL

2.11.1 Specification Reference

RCTM Paper 77 (A 12.0)

2.11.2 Refer to C/S Certificate/report

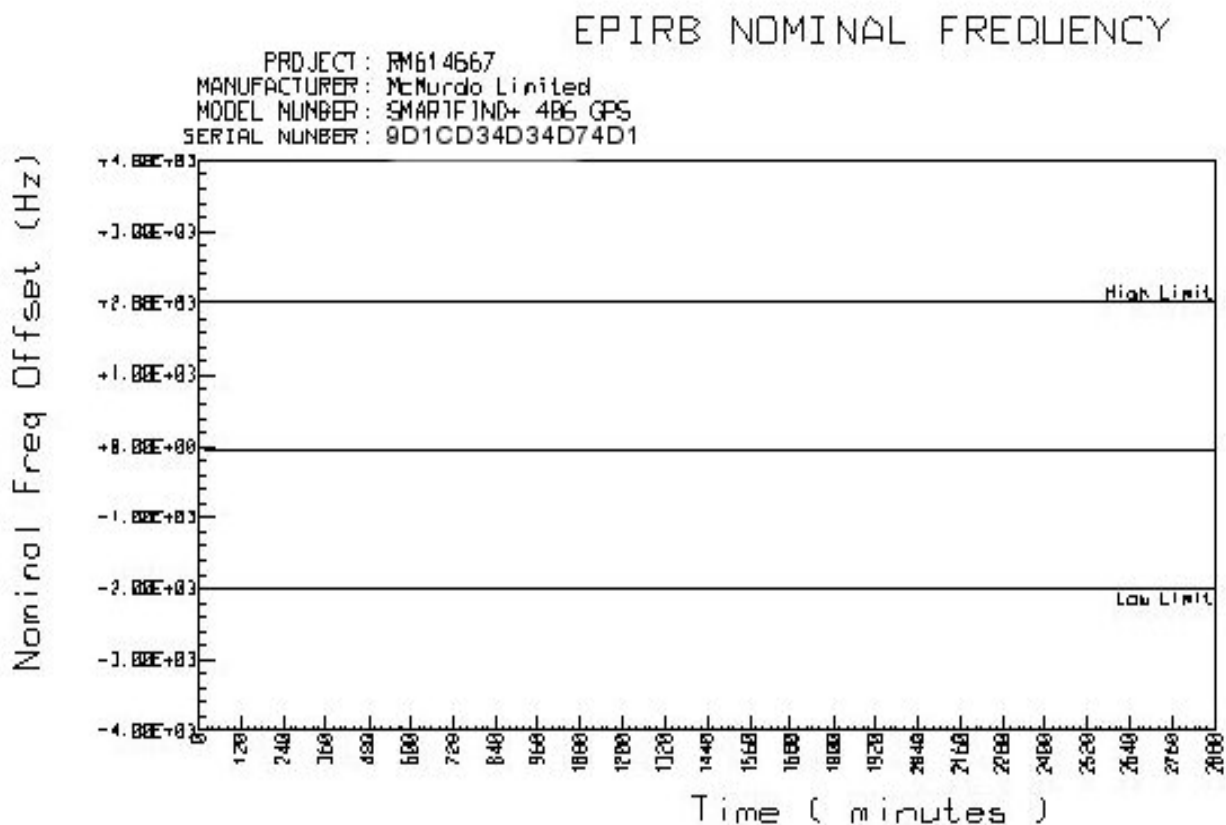


2.12 OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS

2.12.1 Specification Reference

RCTM Paper 77: A 13.0

2.12.2 Test Results



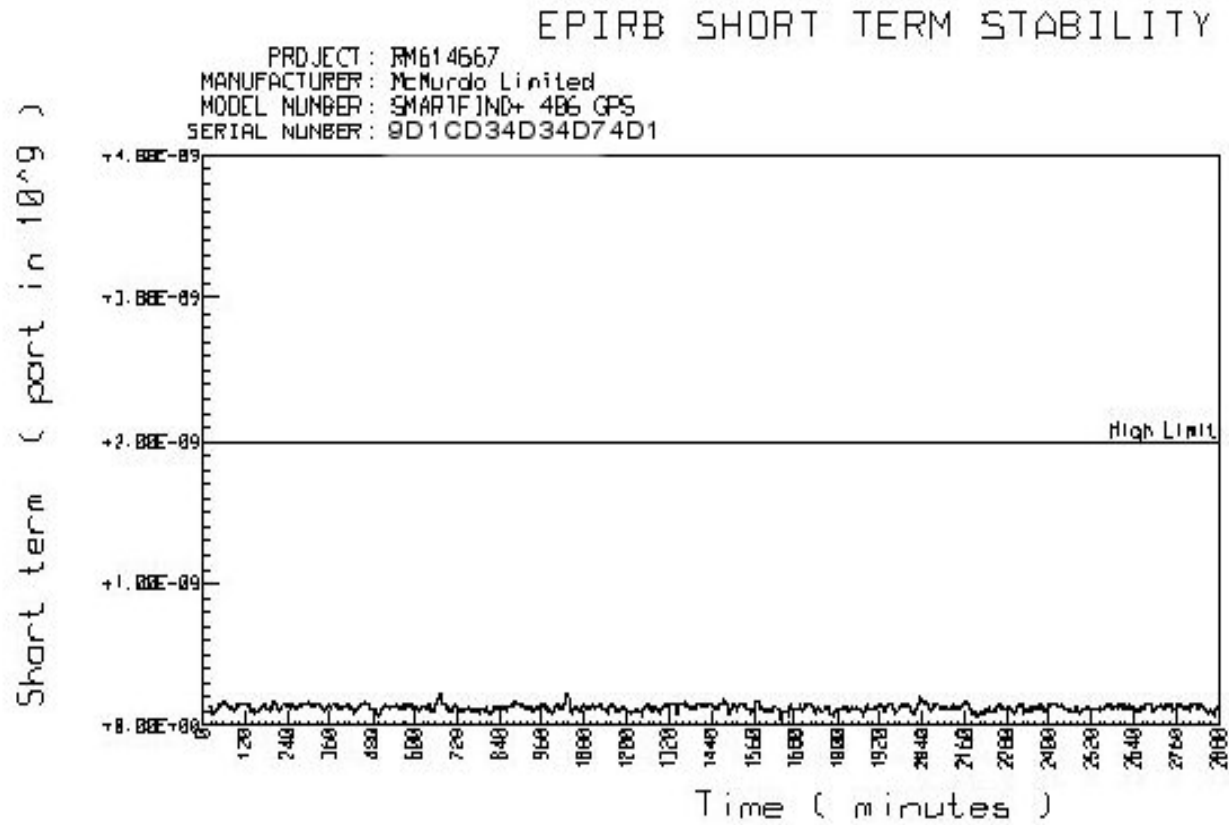
Operating Lifetime at Minimum Temperature - Nominal Frequency



Product Service

2.12 OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS

2.12.2 Test Results



Operating Lifetime at Minimum Temperature - Short Term Stability