TEST REPORT ON THE MT400/401
PREPARED FOR COSPAS/SARSAT

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Endorsement:

1. BACKGROUND AND PURPOSE

The MT400, Class 2 Manually Activated 406MHz EPIRB fitted with strobe and homing transmitter has been issued with TAC139 by COSPAS/SARSAT.

1.1 Water Activated Product Variant

In a proposed future configuration, the current manual activation circuitry will be supplemented with a water sensor switch. The additional componentry required to implement this function is minimal and separate from that of the existing design. As such it can be considered as a very minor modification to the current product.

The fitting of the water sensor is optional within the design. Models with the circuitry fitted will be uniquely distinguished by the Model number MT401 and a yellow chassis colour. Manually activated units will continue to be predominantly orange and identified as a MT400.

So as to avoid the likely levels of false alerts generated by water activated EPIRB being transported out of their mounting brackets, some National Administrations have indicate a strong preference for the continued availability of Manual only type beacons into the growing 406 recreational market. For this reason Standard Communications proposes to produce the MT400 in its base form, and also as the MT401 water activated version.

1.2 Improved Energy Efficiency and Associated Battery Life

Improvements in tuning of the 121.5MHz homing transmitter RF power amplifier have realised considerable gains in operating efficiency. Without change to the homing signals output level, or other characteristics the battery power consumption has decreased when compared to the original MT400 test model. This excess energy capacity now allows the MT400/401 beacon to be rated with a greater battery change interval than in the past.

2. DATA AND SUPPORTING INFORMATION

2.1 UUT

All tests within this report were carried out on a single MT401 beacon, S/N 157. This unit was randomly selected from a pilot run of 16 units and has not been specially prepared in any way for the purposes of this report.

S/N157 was built to normal production standards and assembled using normal production processes within Standard Communications' manufacturing facility at North Ryde NSW, Australia.

The MT400, and water activated variant MT401, share common production fixtures and Automated Test Facilities (ATE).

2.2 Test Requirements

2.2.1 Water Activation

In reference to prior correspondence with COSPAS/SARSAT's Sergey Mikhailov (27/11/2003), and Wayne Carney(13/7/2004) the following manufacturer's test have been carried out and included within this report:

- 7. 406MHz VSWR Check,
- 10. Operating Lifetime at Minimum Temperature, and
- 11. Temperature Gradient.

Furthermore the following test information is also provided:

- 2. Digital Message, and
- 16. Beacon Coding Software.

2.2.2 Battery Life

The application for extension of rated battery life is supported by the following:

- ED041012-06 Rev 1 MT400/401 Qualification Testing, Low Temperature Operating Life - Battery Preconditioning (& Annexes), and
- 10. Operating Lifetime at Minimum Temperature (in common with re-testing for Water Activation).

2.3 Testing

All testing has been carried out by appropriately qualified and experienced Professionals.

2.4 Test Equipment

The following commercially available major test equipment items were used to support the measurements carried out for this report.

Item	Description	Manufacturer	Model	S/N
1	High Resolution Programmable Timer/Counter Analyser	Fluke	PM6681	786931
2	Rubidium Frequency Standard	Stanford Research Systems	FS725	65238
3	9kHz - 1.2GHz Signal Generator	Marconi Inst.	2023	112240/015
4	406MHz Beacon Tester	ARG/SARTECH	ARG5410 MkII	058
5	1 Gs/s Digital Storage Oscilloscope	Tektronix	TDS2014	C031958
6.	9kHz...3GHz Spectrum Analyser	Rohde & Schwarz	1093.4495.03	100303

2.5 Other Information

The following information is also provided:

- Picture of the MT401,
- Chassis artwork unique to MT401 model (all other as per MT400), and
- Electronic copy of Instruction Manual.

3. CONCLUSION

Frequency stability and other performance requirements, including data modulation, are unaffected by the inclusion of water activation circuitry.

Sample messages have been provided to illustrate the correct operation of beacon coding software when used with a MT401.

Furthermore, energy efficiency improvements, through improved factory tuning of the 121.5MHz homer transmitter, now support the increase in stated battery life of the MT400/401 from 5 years to 7.5 years. This is achieved whilst simultaneously also realising an increase in reserve (excess) capacity at the end of the extended shelf life.

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS		RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
				$T_{min.}$ (-20 °C)	$T_{amb.}$ (+22.5 °C)	$T_{max.}$ (+55°C)	
1. POWER OUTPUT							
• transmitter power output		35 - 39	dBm				
• power output rise time		< 5	ms				
• power output 1 ms before burst		must be < -10 dBm	√ *				
2. DIGITAL MESSAGE	Bits number						
• bit sync	1-15	15 bits "1"	√	√	√	√	***Sample printout from ARG 5410 MKII SARSAT Beacon Tester provided. Output at all temperatures is identical.***
• frame sync	16-24	9 bits (000101111)	√	√	√	√	
• format flag	25	1 bit	data bit	***0***	***0***	***0***	
• protocol flag	26	1 bit	data bit	***1***	***1***	***1***	
• identification/position data	27-85	59 bits	√	√	√	√	
• BCH code	86-106	21 bits	√	√	√	√	
• emerg. code/nat. use/supplem. data	107-112	6 bits	data bits	***010000***	***010000***	***010000***	
• additional data/BCH (if applicable)	113-144	32 bits	√	***N/A***	***N/A***	***N/A***	
• position error (if applicable)		< 5	km	***N/A***	***N/A***	***N/A***	

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (-20°C)	$T_{amb.}$ (+22.5°C)	$T_{max.}$ (+55°C)	
3. DIGITAL MESSAGE GENERATOR						
• repetition rate T_R						
average $T_{R=}$	48.5 - 51.5	seconds				
minimum T_R	47.5	seconds				
maximum $T_{R=}$	52.5	seconds				
standard deviation	0.5 - 2.0					
• unique TR sequence						
probability of 2 beacons with identical patterns (analysis to be provided)	< 0.001	√				
• bit rate:						
minimum f_b =	396	bits/sec.				
maximum f_b =	404	bits/sec.				
• total transmission time:						
short message =	435.6 - 444.4	ms				
long message =	514.8 - 525.2	ms				
• unmodulated carrier						
minimum T_1 =	158.4	ms				
maximum T_1 =	161.6	ms				
• first burst delay	> 47.5	seconds				

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (-20°C)	$T_{amb.}$ (+22.5°C)	$T_{max.}$ (+55°C)	
4. MODULATION						
• Biphase-L		√				
• rise time	50 - 250	microsec.				
• fall time	50 - 250	microsec.				
• phase deviation: positive	+(1.0 to 1.2)	radians				
• phase deviation: negative	- (1.0 to 1.2)	radians				
• symmetry measurement	≤ 0.05	√				
5. 406 MHz TRANSMITTED FREQUENCY						
• nominal value	as specified in C/S T.001 and C/S T.012	MHz				
• short term stability	≤ 2 x 10^{-9}	/100 ms				
• medium term stability:						
- slope	(-1 to +1) x 10^{-9}	/minute				
- residual frequency variation	≤ 3 x 10^{-9}					
6. SPURIOUS EMISSIONS** (into 50 Ohms)						
• in-band (406.0 - 406.1 MHz)	see spurious emission mask in C/S T.001	√	√	√	√	***Refer to Plots 3A, 3B & 3C***

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			$T_{min.}$ (-20 °C)	$T_{amb.}$ (+22.5°C)	$T_{max.}$ (+55°C)	
7. 406 MHz VSWR CHECK after open circuit, short circuit, then while VSWR is 3:1, measure:						
• nominal transmitted frequency	as specified in C/S T.001 and C/S T.012	MHz	***406.02799354***	***406.02799907***	***406.02800027***	
Modulation:						
• rise time	50 - 250	microsec.	***182 us***	***165 us***	***164 us***	
• fall time	50 - 250	microsec.	***205 us***	***190 us***	***204 us***	
• phase deviation: positive	+(1.0 to 1.2)	radians	***+1.07***	***+1.08***	***+1.08***	
• phase deviation: negative	- (1.0 to 1.2)	radians	***-1.09***	***-1.08***	***-1.08***	
• symmetry measurement	≤ 0.05	√	√ 0.011	√ 0.025	√ 0.021	
• digital message	must be correct	√	√	√	√	

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
8. SELF-TEST MODE				
• frame sync	9 bits (011010000)	√		
• format flag	1/0	bit		
• single radiated burst	≤ 440/520 (+1%)	ms		
• default position data (if applicable)	must be correct	√		
• description provided		√		
• design data provided on protection against repetitive self-test mode transmissions	protection provided	√		
• single burst verification	one burst	√		
• provides for beacon 15 Hex ID	must be correct	√		
9. THERMAL SHOCK** (30°C change)				
• Soak temperature:			T_{soak} = _____ °C	
• Measurement temperature:			T_{meas} = _____ °C	
the following parameters are to be met within 15 minutes of beacon turn on and maintained for 2 hours:				
• transmitted frequency:				
• nominal value	as specified in C/S T.001 and C/S T.012	MHz		
• short-term stability	≤ 2 x 10^{-9}	/100 ms		
• medium-term stability: - slope	(-1 to +1) x 10^{-9}	/minute		
- residual frequency variation	≤3 x 10^{-9}			
• transmitter power output	35 - 39	dBm		
• digital message	must be correct	√		

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
10. OPERATING LIFETIME AT MINIMUM TEMPERATURE**				***8 hrs 10 min pre-test discharge at 22C, being equivalent to 7.5yrs battery 'rated' life [ie from cell manufacture to user replacement]. See attached calculations ref ED041012-06***
• duration	> 24	hours	***54*** hours at T_{min} = ***-20*** °C	
• transmitted frequency:				
• nominal value	as specified in C/S T.001 and C/S T.012	MHz	***406.02799965MHz min. to 406.02801059 MHz max.***	
• short-term stability	≤ 2 x 10^{-9}	/100 ms	***0.5768 ppb/100ms max.***	***See Plots 1A through 1E***
• medium-term stability:				
- slope	(-1 to +1) x 10^{-9}	/minute	***-0.6587 to +0.2042 ppb/minute***	
- residual frequency variation	≤ 3 x 10^{-9}		***1.0286 ppb max.***	***Each frequency measurement (set S1,S2,S3) included verification of digital message content.***
• transmitter power output	35 - 39	dBm	***36.2 to 36.5dBm***	
• digital message	must be correct	√	√	
11. TEMPERATURE GRADIENT** (5°C/hr)				
• transmitted frequency:				
• nominal value	as specified in C/S T.001 and C/S T.012	MHz	***406.02799065 MHz min. to 406.02800899 MHz max.***	***See Plots 2A through 2E***
• short-term stability	≤ 2 x 10^{-9}	/100 ms	***0.5319 ppb/100ms max.***	
• medium-term stability:				
- slope	(-1 to +1) x 10^{-9}	/minute	***-0.2285 to +0.4582 ppb/minute***	
- residual frequency variation	≤ 3 x 10^{-9}		***1.1417 ppb max.***	***Each frequency measurement (set S1,S2,S3) included verification of digital message content.***
• transmitter power output	35 - 39	dBm	***35.5 to 36.5 dBm***	
• digital message	must be correct	√	√	

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
12. LONG TERM FREQUENCY STABILITY • data provided	as specified in C/S T.001 and C/S T.012	MHz √		
13. PROTECTION AGAINST CONTINUOUS TRANSMISSION • description provided	≤45	seconds √		
14. SATELLITE QUALITATIVE TESTS** • results provided	successfully located by satellites / LUT and position within 5 km	√ √		
15. ANTENNA CHARACTERISTICS • polarization • VSWR • $ERP_{max\ EOL}$ • $ERP_{min\ EOL}$ • azimuth gain variation at 40° elevation angle	linear or RHCP ≤1.5 ≤ 20 ≥ 1.6 ≤ 3	√ √ - Watts Watts dB		
16. BEACON CODING SOFTWARE • sample message provided for each coding option of the applicable coding protocol types • sample self-test message provided for each coding option of the applicable coding protocol types	must be correct must be correct	√ √	√ √	***Sample message types provided.***

GME MT401 - 406 MHz BEACON TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
17. NAVIGATION SYSTEM** (as applicable)				
• position data default values	must be correct	√		
• position acquisition time	< 30 / 1	minutes		
• encoded position data update interval	> 20	minutes		
• position data input update interval (as applicable)	20 / 1	minutes		
• coarse position close to actual position	must be correct	√		
• delta offset:				
- positive direction	must be correct	√		
- negative direction	must be correct	√		
- overrange to 2 times coarse res.	must be correct	√		
• last valid position:				
- retained after navigation input lost	240 (± 5)	min		
- cleared when beacon reactivated	must be correct	√		
• design data provided on protection against beacon degradation due to navigation device, interface or signal failure or malfunction	no degradation	√		
18. ADDITIONAL TYPES OF PROTOCOL**				
print out of the messages provided, if applicable, with encoded positions at least 5 km apart for each applicable coding protocol type	must be correct	√		(attach to report)

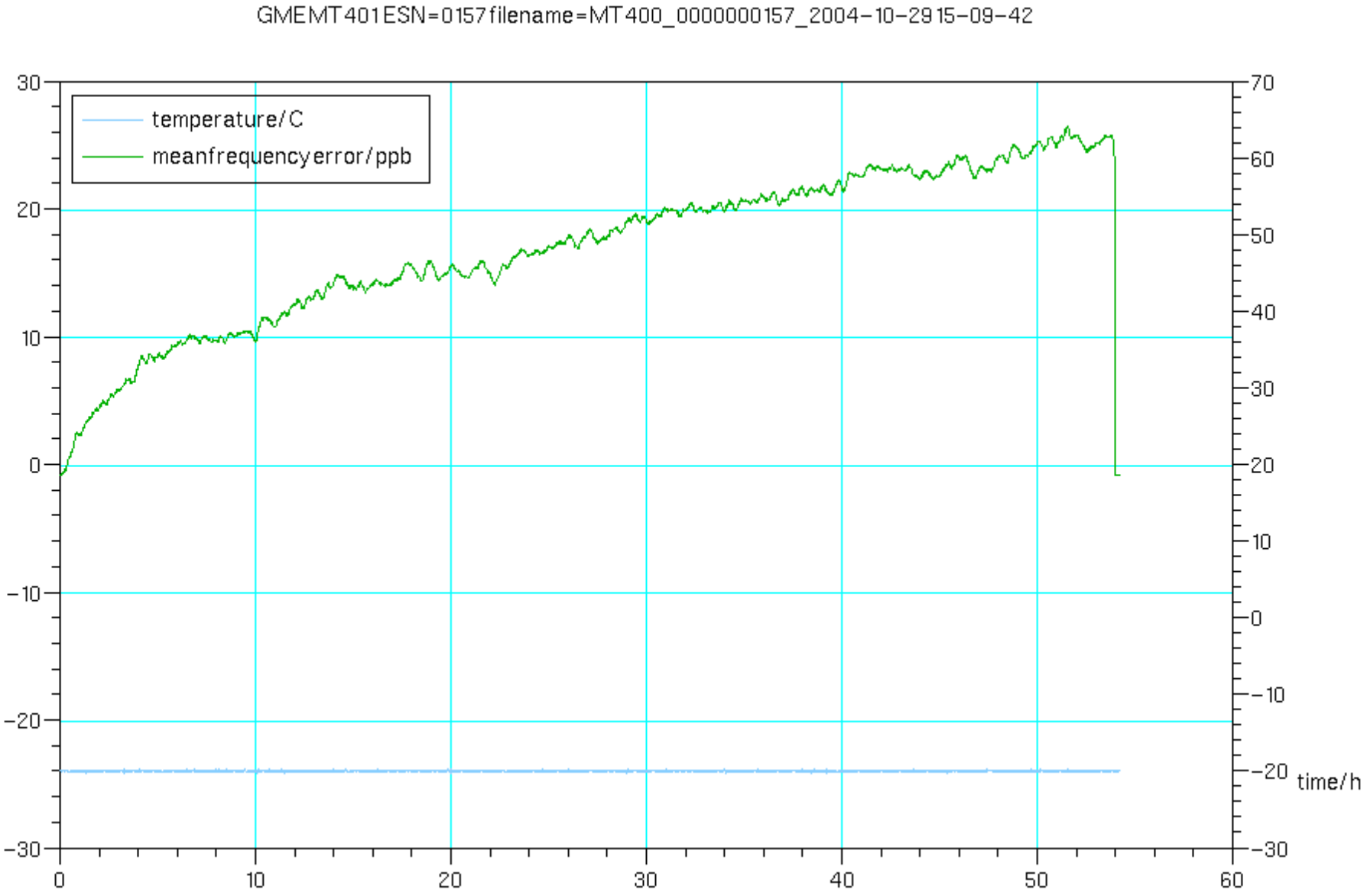
* the tick mark √ can be used where indicated to record that the requirement is met (no value needs to be shown)

** attach graphs of test results for test numbers 6, 9, 10 and 11, and a summary table of results for test numbers 14, 17, and 18

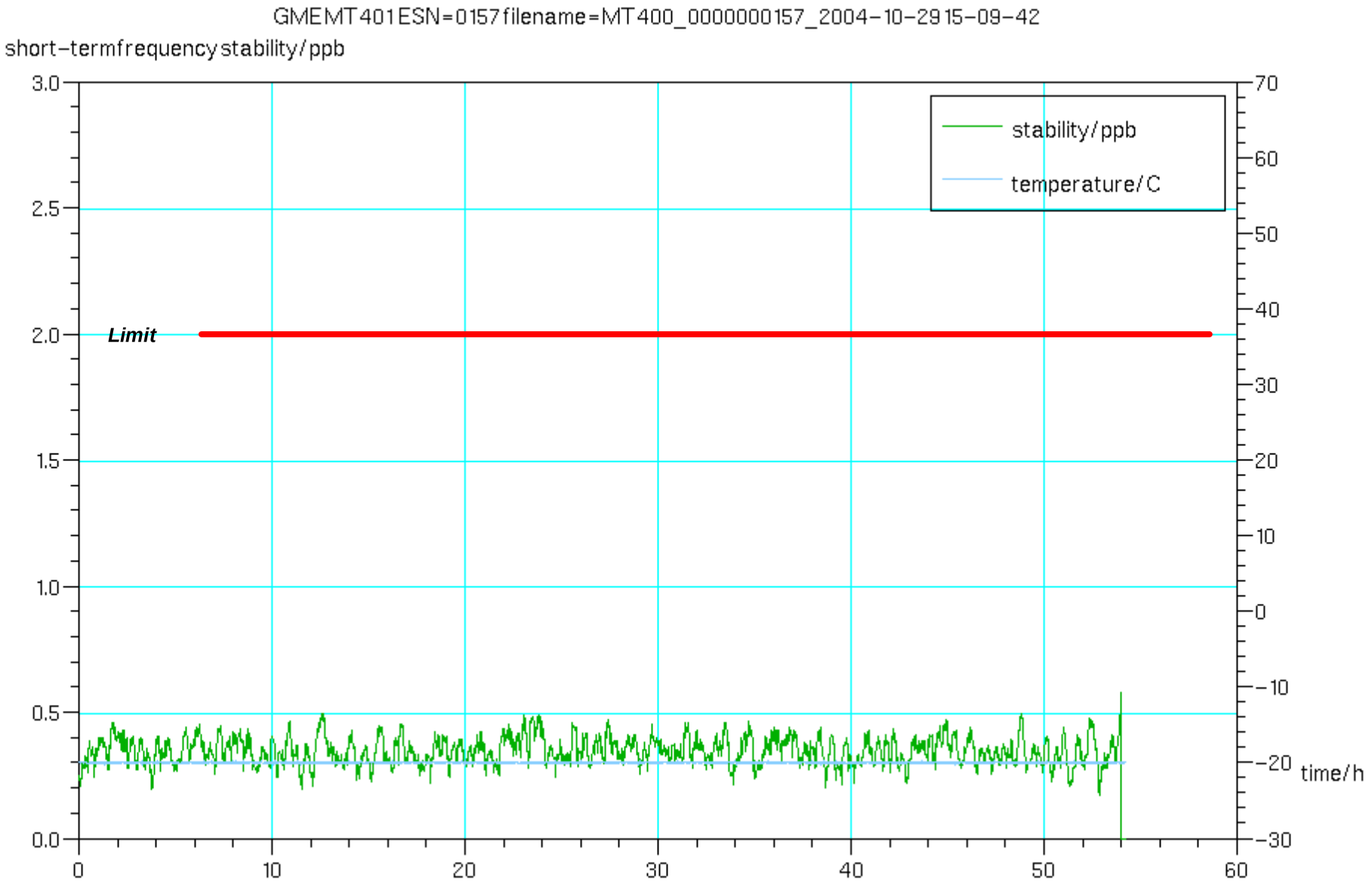
- END OF ANNEX C -

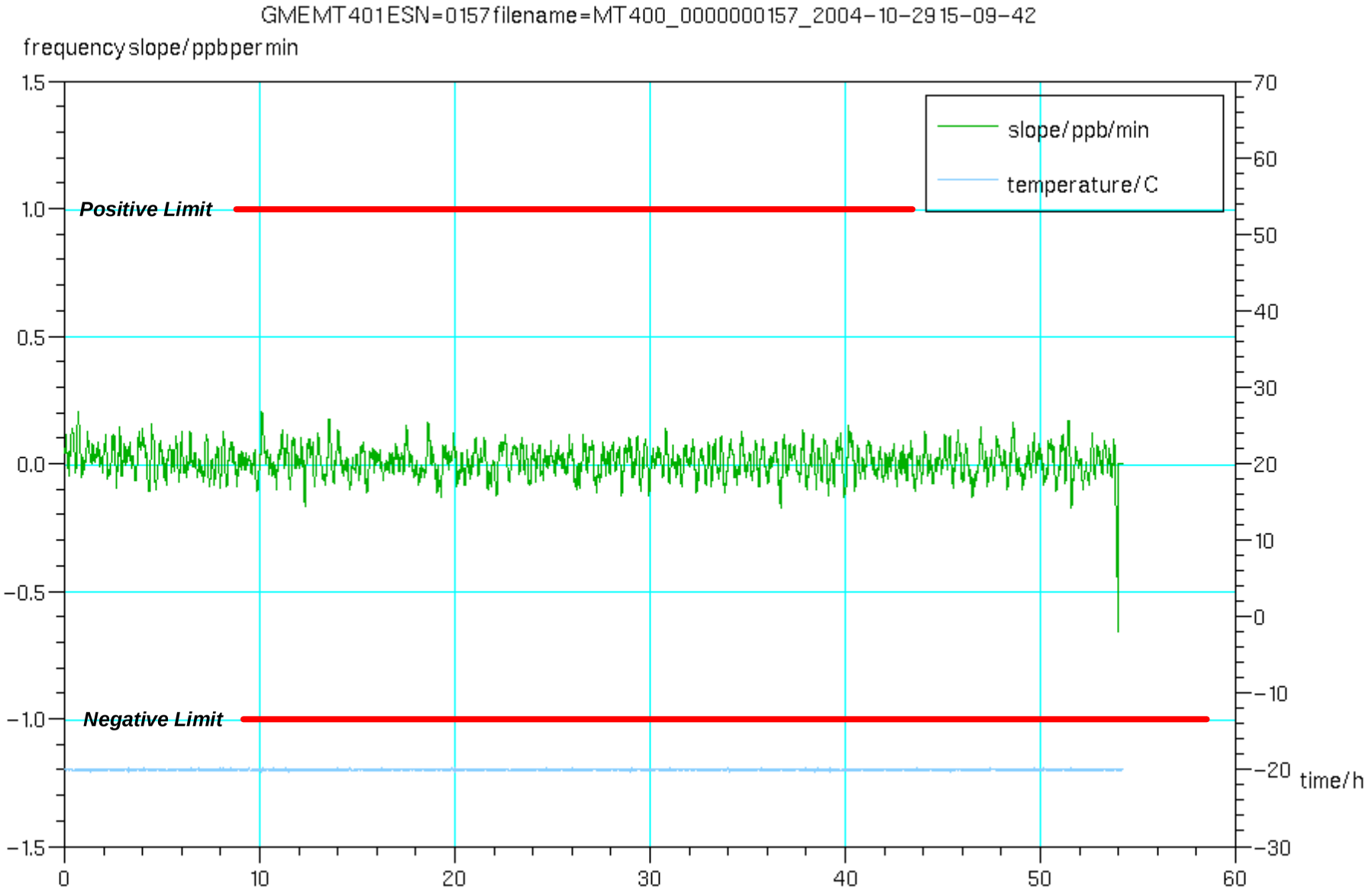
MT401

Battery Life Test - Commenced 2004-10-29 on S/N 157



Plot 1B


GME MT401 ESN=0157 filename=MT400_0000000157_2004-10-29 15-09-42
short-term frequency stability/ppb
stability/ppb
temperature/C
Limit
time/h
3.0
2.5
2.0
1.5
1.0
0.5
0.0
70
60
50
40
30
20
10
0
-10
-20
-30
0
10
20
30
40
50
60

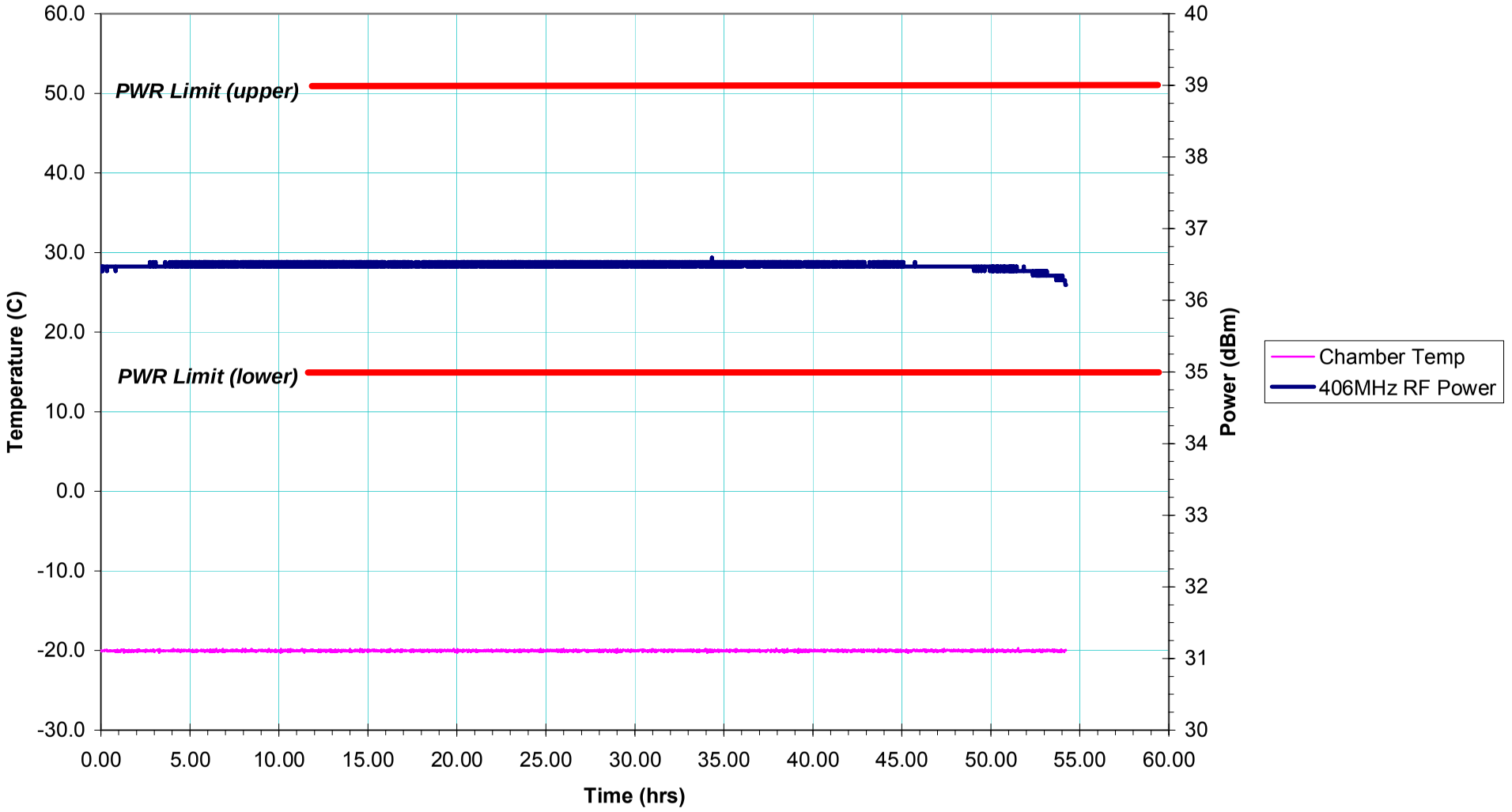

GME MT401 ESN=0157 filename=MT400_0000000157_2004-10-29 15-09-42
frequency slope/ppb per min
slope/ppb/min
temperature/C
Positive Limit
Negative Limit
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
70
60
50
40
30
20
10
0
-10
-20
-30
0
10
20
30
40
50
60
time/h

Plot 1D


GME MT401 ESN=0157 filename=MT400_0000000157_2004-10-29 15-09-42
medium-term frequency stability/ppb
4.50
3.75
3.00
2.25
1.50
0.75
0.00
Limit
stability/ppb
temperature/C
70
60
50
40
30
20
10
0
-10
-20
-30
time/h
0
10
20
30
40
50
60

Plot 1E

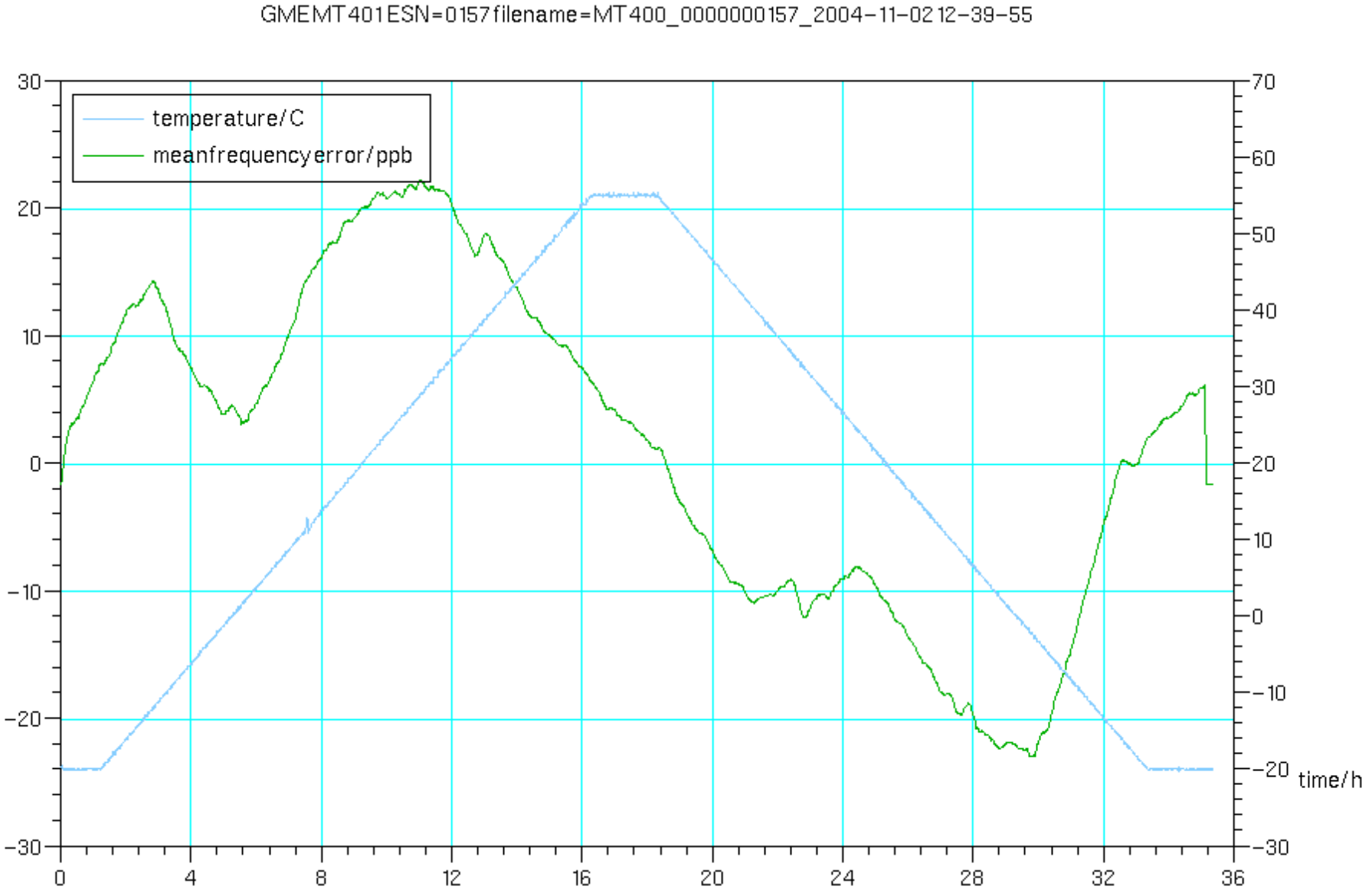
MT401 - RF Output Power



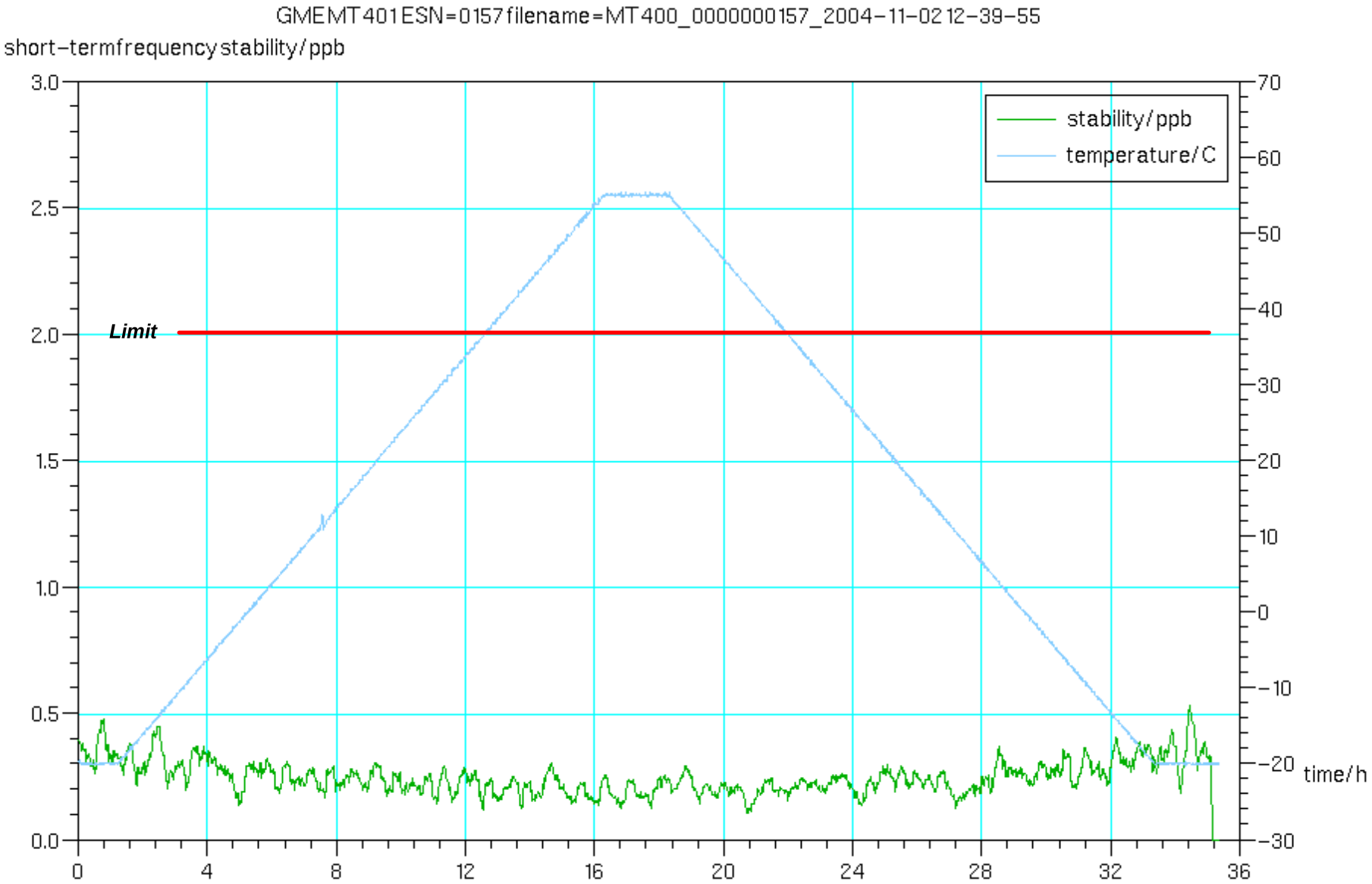
Plot 2A

MT401

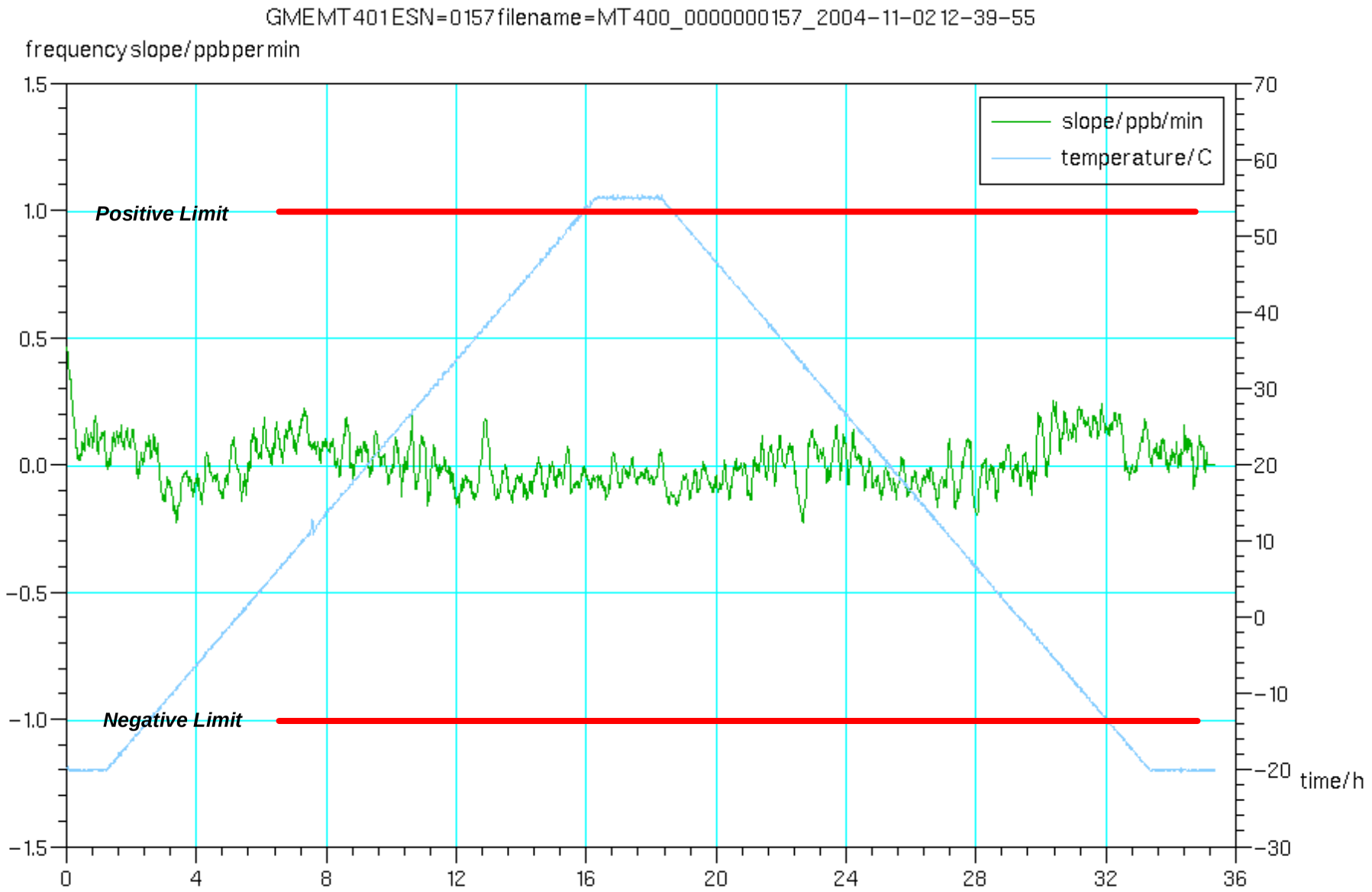
Temperature Gradient Test - Commenced 2004-11-02 on S/N 157



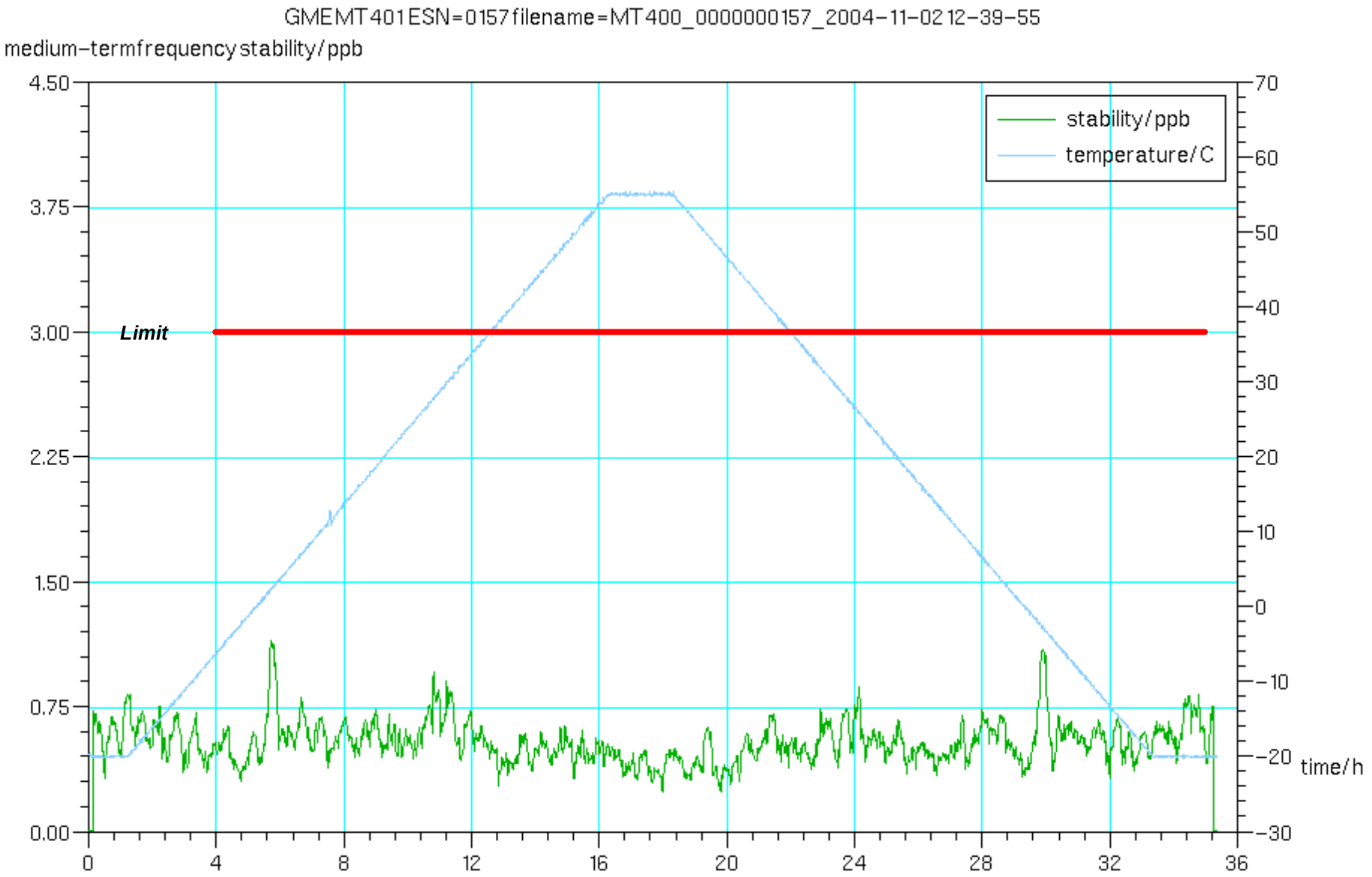
Plot 2B


GME MT401 ESN=0157 filename=MT400_0000000157_2004-11-02 12-39-55
short-term frequency stability/ppb
stability/ppb
temperature/C
Limit
time/h
3.0
2.5
2.0
1.5
1.0
0.5
0.0
70
60
50
40
30
20
10
0
-10
-20
-30
0
4
8
12
16
20
24
28
32
36

Plot 2C

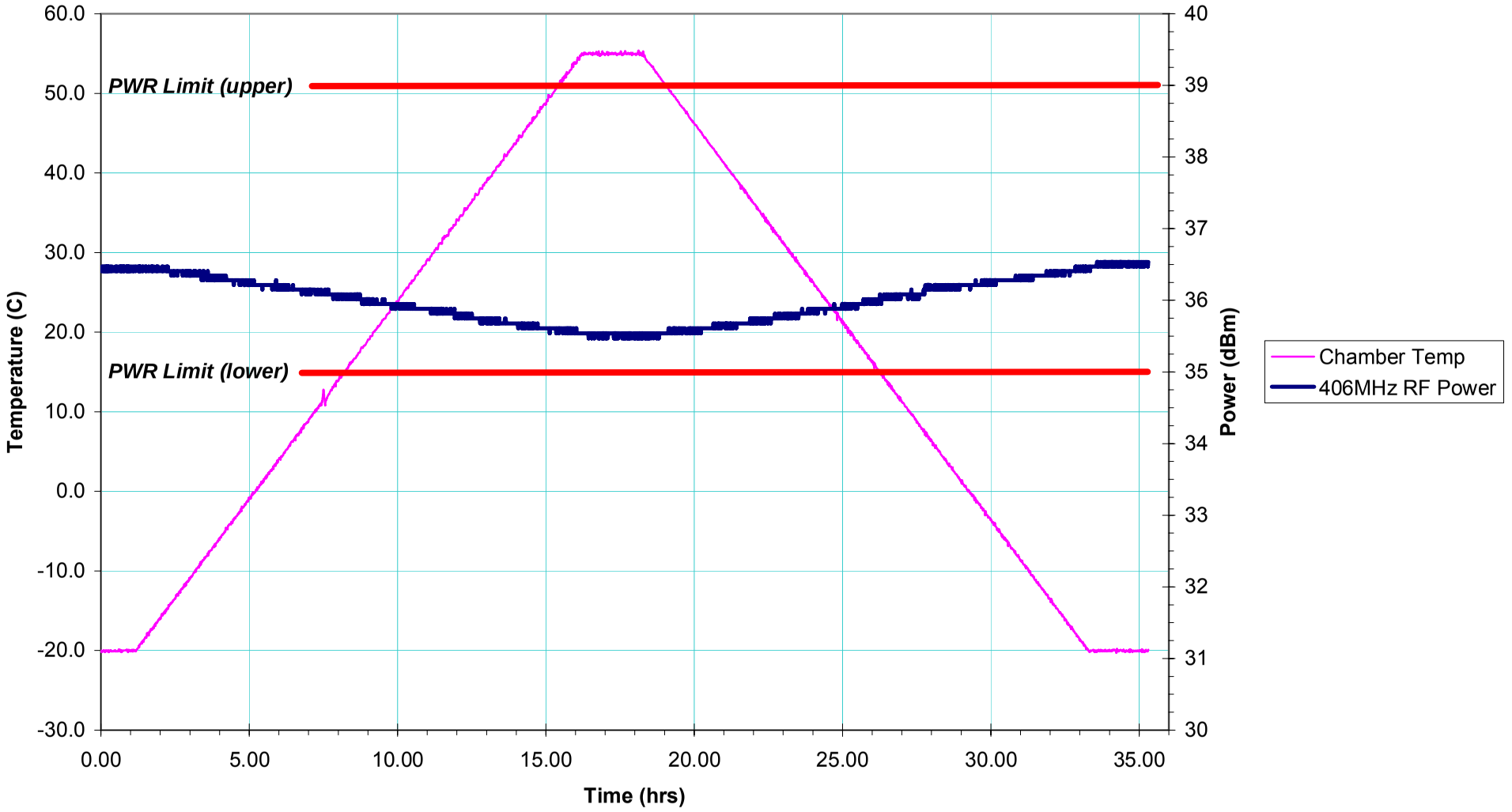


Plot 2D


GME MT401 ESN=0157 filename=MT400_0000000157_2004-11-02 12-39-55
medium-term frequency stability/ppb
4.50
3.75
3.00
2.25
1.50
0.75
0.00
Limit
stability/ppb
temperature/C
70
60
50
40
30
20
10
0
-10
-20
-30
time/h
0
4
8
12
16
20
24
28
32
36

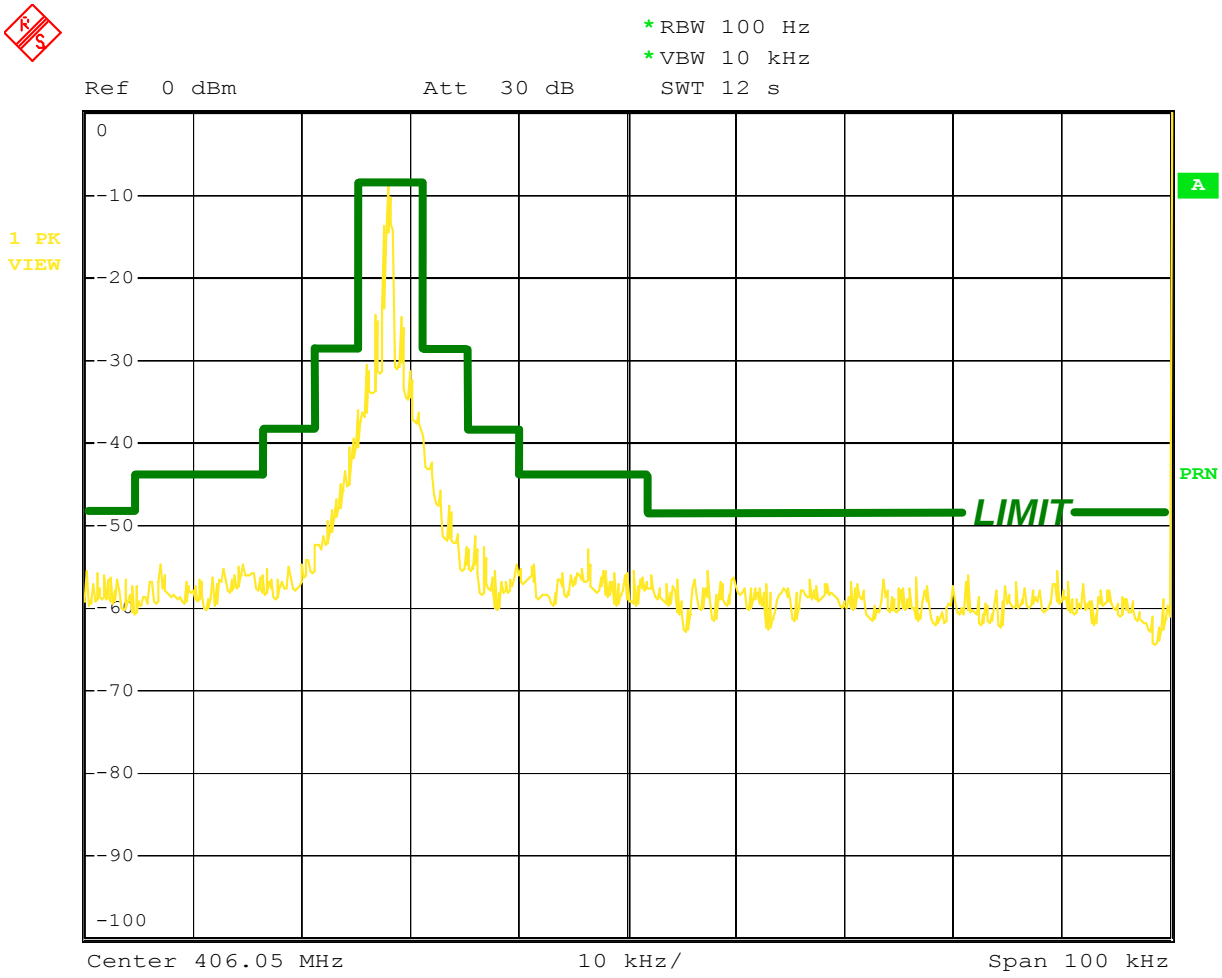
Plot 2E

MT401 - RF Output Power



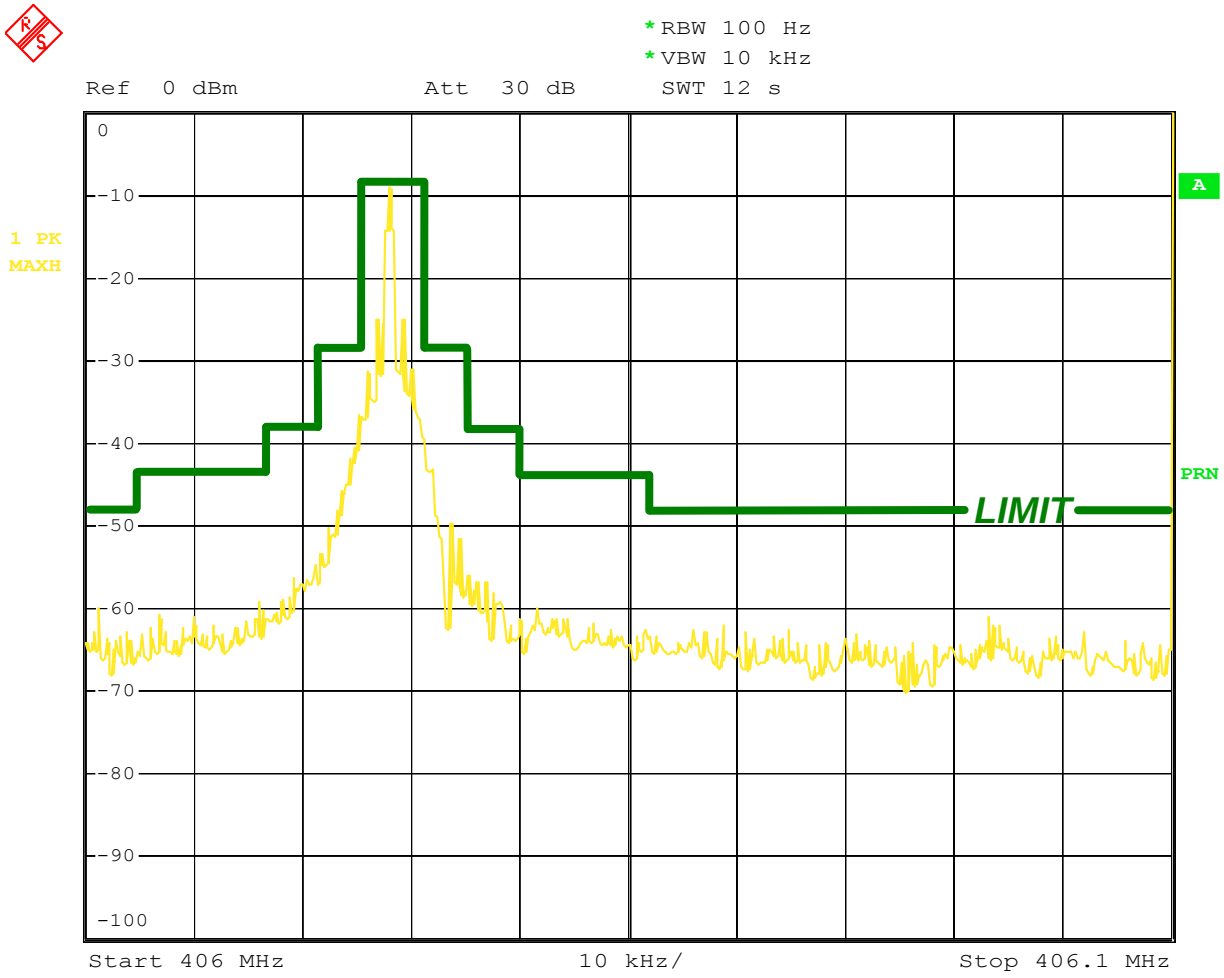
MT401 (S/N 157) - Spurious Emission

Low Temperature (-20°C)



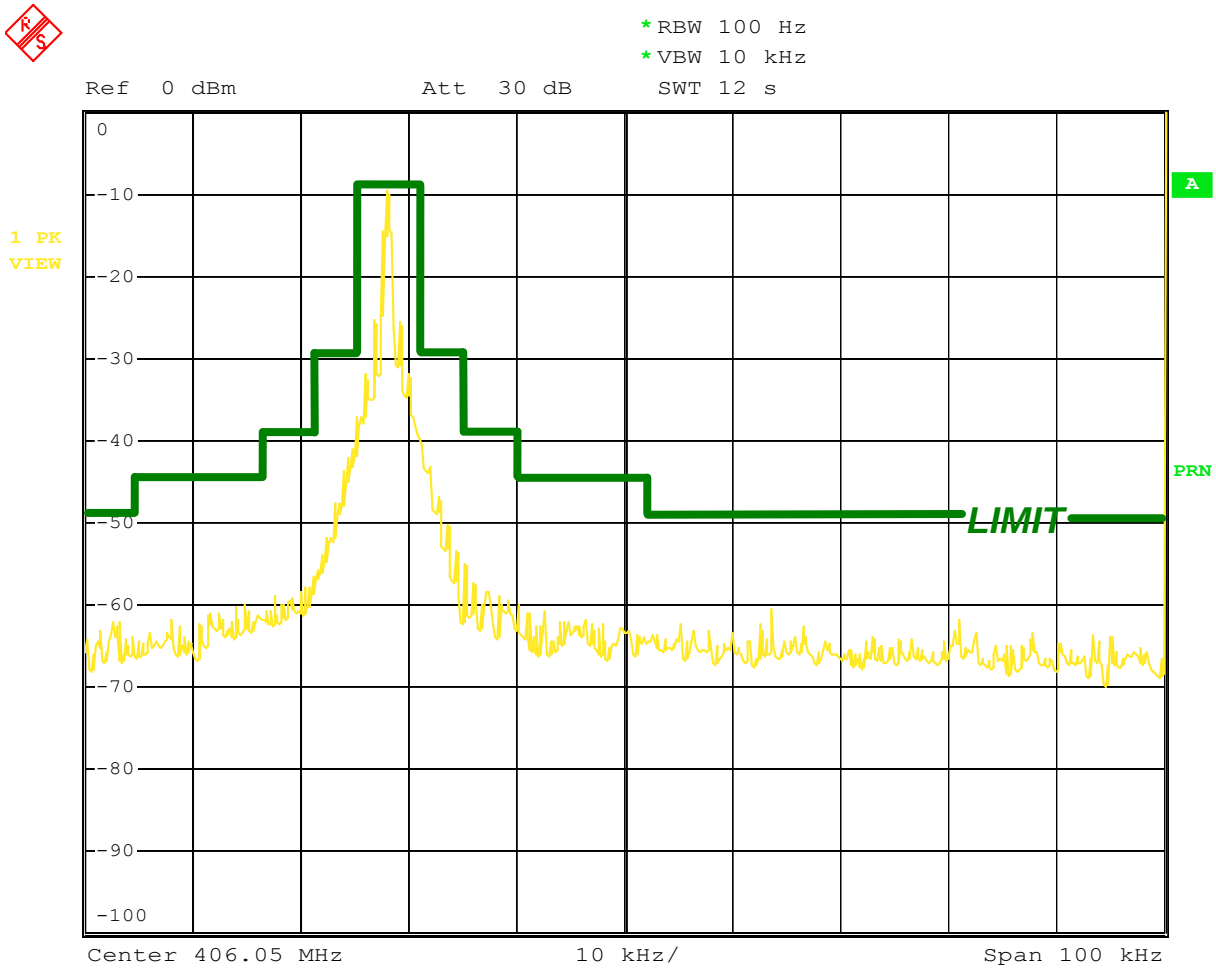
Date: 30.NOV.2004 15:48:17

Ambient Temperature (22.5°C)



Date: 26.NOV.2004 13:38:08

High Temperature (55°C)



Date: 1.DEC.2004 07:18:55

MT400/401 Qualification Testing

Low Temperature Operating Life – Battery Preconditioning

Table of Contents

Tables

1. INTRODUCTION

Cospas-Sarsat C/S T.007, IEC61097-2 and ETSI EN 300 066 all specify a level of battery pre-conditioning prior to conducting an operational life test at the minimum operating temperature condition.
The pre-conditioning requirements of both IEC and ETSI are identical and will therefore be covered by a single analysis within this document. A separate analysis is provided per Cospas-Sarsat C/S T.007.
The more demanding of the two pre-conditioning periods will be adopted for the certification of the MT401, there-by demonstrating compliance to all three specifications.

2. ASSOCIATED DOCUMENTS

Information within the documents identified at Table 1 has been used as the basis for some of the calculations presented here-in. They are provided as attachments for reference purposes.

Description	Designation
Battery Manufacturer's Datasheet	Attachment 1
Battery Self Discharge, Manufacturer's correspondence.	Attachment 2
Interpretation of date code, Manufacturer's correspondence.	Attachment 3

Table 1 - Supporting Documentation

3. DEFINITIONS AND ABBREVIATIONS

Term		Definition/Description
Rated Life	≡	Extends from the date of battery cell manufacture to that date declared on the beacon as the latest date of replacement. The beacon is designed to operate fully within specifications when powered by batteries, which have not reached their replacement date.
Useful Life	≡	The useful life of the battery is defined as the period of time after the date of battery cell manufacture that the beacon will continue to meet the power input requirements f that unto
hrs	≡	Hours. Unless otherwise state are in decimal (i.e. 6.5 hrs is 6 & ½ hrs)
Ah	≡	Ampere-hour
s	≡	second
mA	≡	milli-ampere
ms	≡	milli-second
ETSI	≡	European Telecommunications Standards Institute
IEC	≡	International Electrotechnical Commission
wrt	≡	with respect to

Table 2 - Definitions and Abbreviations

4. CALCULATION

4.1 Determination of Equivalent Activation Period

4.1.1 Energy Consumption per 50s Activation Cycle

The current and duration requirements seen by the battery for each separate MT400/401 function are provided at Table 3.

This demand is then equated to an energy requirement, expressed in Ampere-hours, per unit of operational time. For the MT400/401, and the purposes of this analysis, a convenient unit of time is a single complete 'activation cycle' of nominally 50s duration.

Description	Duration (ms)	Current (mA)	Quantity	Energy (Ah)
406MHz, short message	440	2496	1	0.000305
121.5MHz carrier, modulated	48100	52	1	0.000695
Audible alert	100	61	17.5	0.000030
LED strobe	260	341	17.5	0.000431
Energy per 50s activation cycle				0.001460

Table 3 - Energy per 50s activation cycle

4.1.2 Self Discharge "(a1, a2, E)"

The battery rate of self-discharge (Table 4) has been obtained from the cell datasheet and from direct correspondence with the cell manufacturer. Each figure given is the total loss from date of manufacture (i.e. non-cumulative).

Elapsed Duration (yrs wrt new)	Comment on capacity loss	Capacity Loss (at 21ºC) (% wrt new)	Source
0	New cell	0	---
1	Estimated typ as ≈80% of rated maximum	2.5	Cell Datasheet
5	Typical value	5	Attachment 2
7.5	Typical value	6.5	Interpolated
10	Typical value	8	Attachment 2
15	Typical value	10	Attachment 2

Table 4 - Cell capacity loss over time

Description	**Operation**		units
Cell capacity at new		7.00	Ah
Capacity loss at 1 year	x (Table 4)	2.5	%
Self-discharge energy loss at 1 year		0.18	Ah
Energy per 50s activation cycle	/	0.001460	Ah
No. 50s act cyc consuming equiv. energy to 1yr s'dist		119.82	
Hours per 50s activation cycle	x	(50/60)/60	
"(E)" Equivalent (1yr loss) activation time		**1.66**	**hrs**
Cell capacity at new		7.00	Ah
Capacity loss at 7.5 years	x (Table 4)	6.5	%
Self-discharge energy loss at 7.5 years		0.46	Ah
Energy per 50s activation cycle	/	0.001460	Ah
No. 50s act cyc consuming equiv. energy to 7.5yr s'dist		311.54	
Hours per 50s activation cycle	x	(50/60)/60	
"(a2)" Equivalent (7.5yr loss) activation time		**4.33**	**hrs**
Cell capacity at new		7.00	Ah
Capacity loss at 15 years	x (Table 4)	10	%
Self-discharge energy loss at 15 years		0.70	Ah
Energy per 50s activation cycle	/	0.001460	Ah
No. 50s act cyc consuming equiv energy to 15yr s'dist		479.29	
Hours per 50s activation cycle	x	(50/60)/60	
"(a1)" Equivalent (15yr loss) activation time		**6.66**	**hrs**

Table 5 - Calculation of "(a1)" ,"(a2)" and "(E)"

4.1.3 Self Test "(b)"

The current and duration requirements seen by the battery for each separate MT400/401 function during a routine 'Self-Test' operation are provided at Table 6.

This demand is then equated to an energy requirement, expressed in Ampere-hours for completion of a single self-test.

It is worthy to note that the 121.5MHz homer is un-modulated during self-test, which accounts for the current draw being significantly higher than in normal swept tone operation.

Description	Duration (ms)	Current (mA)	Quantity	Energy (Ah)
406MHz, short message	440	2496	1	0.000305
121.5MHz carrier, unmodulated	300	127	1	0.000011
Audible alert	100	61	2	0.000003
LED strobe	260	341	1	0.000025
				0.000344

Table 6 - Energy per self-test

The MT400/401 is specified for a routine monthly self-test over its 7.5 year rated battery life.

Description	Operation		units
Number of Years		7.5	
Months per year	x	12	
Number of self-test over battery life		90	
Energy consumed per self-test cycle	x (Table 6)	0.000344	Ah
Total self-test energy consumed over battery life		0.030930	Ah
Energy per 50s activation cycle	/	0.001460	Ah
No. 50s act cyc consuming equiv. energy to tot s'test		21.18	
Hours per 50s activation cycle	x	(50/60)/60	
"(b)" Equivalent (Self-test) activation time		**0.29**	**hrs**

Table 7 - Calculation of "(b)"

4.1.4 Stand-by "(c1, c2)"

The MT400 does not draw current in the inactive (OFF) state. The introduction of water sensing activation circuitry in the MT401 does introduce a small, yet significant Stand-by current draw. The respective current consumptions "(c1)"and "(c2)" for the MT400 and MT401 are given in the table below.

Description	Operation		units
MT400			
MT400 Stand-by current consumption		0	A
"(c1)" MT400 Equivalent (Stand-by) activation time		**0**	**hrs**
MT401			
Number of years		7.5	
Days per year	x	365	
Hours per day	x	24	
Total Stand-by hours		65700	hrs
MT401 Stand-by current consumption	x	1.30E-06	A
Total Stand-by Energy Consumption		0.085410	Ah
Energy per 50s activation cycle	/	0.001460	Ah
No. 50s act cyc consuming equiv. Energy to 7.5yr stby		58.48	
Hours per 50s activation cycle	x	(50/60)/60	
"(c2)" MT401 Equivalent (Stand-by) activation time		**0.81**	**hrs**

Table 8 –Calculation of "(c1)" and "(c2)"

4.2 Battery Pre-Conditioning Prior to Low Temp Life Test

4.2.1 IEC/ETSI Specification Method "(a1, b, c1/c2, E)"

Calculations according to the IEC/ETSI method are shown in Table 9.

Description	Formula	Equivalent Activation Period (hrs)	
MT400			
Self Discharge, Useful life (15yrs)	(a1)	6.66	
Self Test (monthly over 7.5yrs)	(b)	0.29	
MT400 Standby Load (7.5yrs)	(c1)	0	
Total pre-conditioning activation period for new cells	(p1)=(a1+b+c1)		6.95
Discharge due to existing test cell age	(E)	0.89	
		-	0.89
Pre-conditioning activation period for actual test cells	(P1)=(p1)-(E)		**6.06**
MT401			
Self Discharge, Useful life (15yrs)	(a1)	6.66	
Self Test (monthly over 7.5yrs)	(b)	0.29	
MT401 Standby Load (7.5yrs)	(c2)	0.81	
Total pre-conditioning activation period for new cells	(p2)=(a1+b+c2)		7.76
Discharge due to existing test cell age	(E)	0.89	
		-	0.89
Pre-conditioning activation period for actual test cells	(P2)=(p2)-(E)		**6.87**

Table 9 - IEC/ETSI Pre-conditioning Calculations

4.2.2 C/S T.007 Test Specification Method "(a2, b, c1/c2, E)"

Calculations according to the COSPAS SARSAT method are shown in Table 10.
Note, it is believed that the intention is that energy loss due to self-discharge should be included (although this is not explicitly stated in C/S T.007). For the purpose of this analysis self-discharge has been included as represents a more stringent requirement.

Description	Formula		Equivalent Activation Period (hrs)
MT400			
Self Discharge, Rated life (7.5yrs)	(a2)	4.33	
Self Test (monthly over 7.5yrs)	(b)	0.29	
Standby Load (7.5yrs)	(c1)	0	
Total pre-conditioning activation period for new cells	(p1)=(a2+b+c1)	4.62	
Correction Co-efficient	(f)	1.65	
Corrected pre-conditioning act. period for new cells	(p1)x(f)		7.62
Discharge due to existing test cell age	(E)	0.89	
		-	0.89
Required pre-conditioning act. period (actual cells)	(P1)=(p1 x f)-(E)		**6.73**
MT401			
Self Discharge, Rated life (7.5yrs)	(a2)	4.33	
Self Test (monthly over 7.5yrs)	(b)	0.29	
Standby Load (7.5yrs)	(c2)	0.81	
Total pre-conditioning activation period for new cells	(p2)=(a2+b+c2)	5.43	
Correction Co-efficient	(f)	1.65	
Corrected pre-conditioning act. period for new cells	(p2)x(f)		8.96
Discharge due to existing test cell age	(E)	0.89	
		-	0.89
Required pre-conditioning act. period (actual cells)	(P2)=(p2 x f)-(E)		**8.07**

Table 10 - COSPAS-SARSAT Pre-conditioning Calculations

4.2.3 Selected Method and Pre-Test Discharge Duration

Calculations within this document are based on a target 7.5yr battery life from date of cell manufacture.

The values within Table 11 recognise the existing age of the actual cells under test and represent the appropriate minimum pre-test discharge according to the various specifying organisations calculation method.

Model Variant Identification	IEC/ETSI Method (hrs)	C/S Method (hrs)
MT400	6.06	6.73
MT401	6.87	8.07

Table 11 – Summary of Calculated Pre-Test Discharge Durations

It can be seen that for either calculation method the MT401 beacon configuration requires the greatest pre-test activation period. This is due to the stand-by load current attributed to the water activation sensor. Furthermore the C/S calculation method is always the most demanding.

For the purpose of the low temperature life test the most demanding pre-test activation period of 8.07 hrs will be adopted to substantiate compliance against all standards for both beacon model configurations.

REQUIRED PRE-TEST DISCHARGE DURATION > 8.07 hrs

(i.e. 8 hrs 4 1/2 minutes)

It is proposed to discharge the MT401 beacon cells for a period of approximately 8 hours and 10 minutes.

PRIMARY LITHIUM BATTERIES

LO 26 SX

3.0 V Primary lithium - sulfur dioxide (Li-SO_2) High Drain capability Spiral D-size cell

For high drain applications up to 3 A continuous, 10 A pulse currents, possibly combined with exposure to extreme temperatures.

Key features

- High and stable discharge voltage
- Performance not affected by cell orientation
- Low self discharge rate *(less than 3% after 1 year of storage at +21°C/+70°F)*
- Hermetic glass-to-metal sealing
- Built-in safety vent (at the negative end of the cell)
- 1 A-fused version not restricted for transport
- UL Component Recognition (File Number MH 15076)
- Meets shock, vibration and other environmental requirements of military specifications
- Made in the USA

Main applications

- Radiocommunications and other military applications
- Beacons and Emergency Location Transmitters
- Sonobuoys

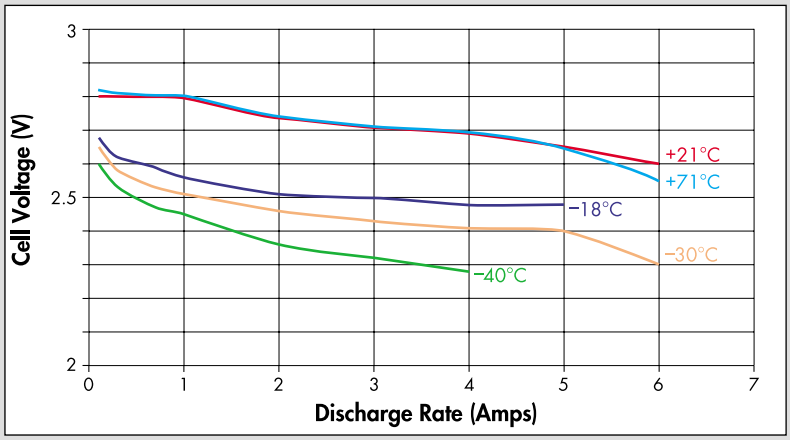
... etc.

Cell size reference	**R20 - D**
Electrical characteristics *(typical values for cells stored for one year or less)*	
Nominal capacity *(at 240 mA +21°C/+70°F 2.0 V cut off. The capacity restored by the cell varies according to current drain, temperature and cut off).*	7.5 Ah
Open circuit voltage *(at +21°C)*	3.0 V
Nominal voltage *(at 240 mA +21°C/+70°F)*	2.8 V
Maximum recommended continuous current *(to avoid over-heating. Higher currents possible, consult Saft).*	3 A
Pulse capability : *varies according to pulse characteristics (frequency, duration), temperature, cell history (storage conditions prior to usage) and the application's acceptable minimum voltage. Consult Saft.*	
Storage *(recommended)*	+30°C/+86°F
max *(possible without leakage)*	-60°C (-76°F) / +85°C (+185°F)
Operating temperature range *(Short excursions up to 85°C possible at currents below1 A).*	-60°C (-76°F) / +71°C (+160°F)
Physical characteristics	
Diameter *(max)*	33.8 mm (1.33")
Height *(max; finish with radial tabs)*	59.3 mm (2.33")
Typical weight	85 g (2.98 oz)
Weight of Li metal	2.4g
Standard cell comes with two radial 0.15 mm thick nickel tabs	
Finish with positive button on request	
Finish with 1 A fuse on request	

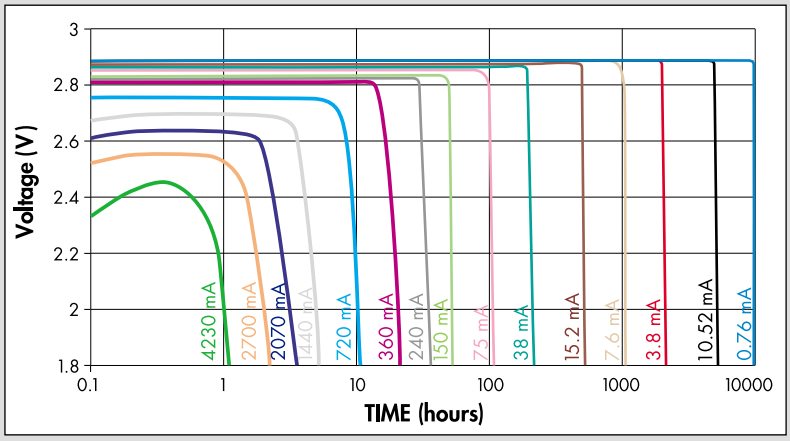
SAFT

LO 26 SX

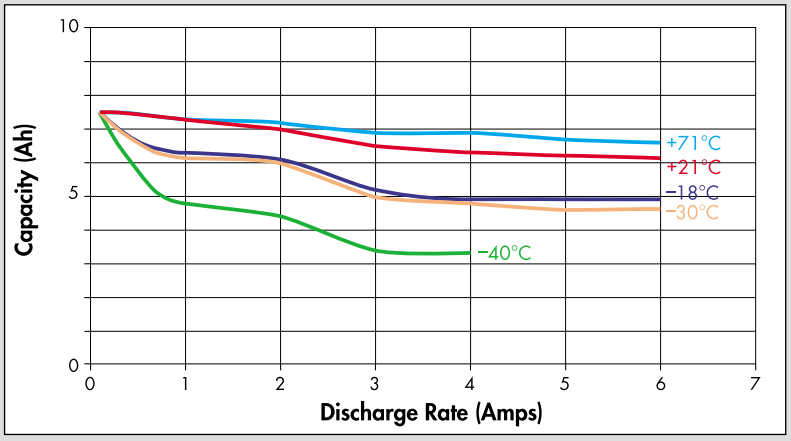
Voltage at mid-discharge versus Current and Temperature (2.0 V cut off)

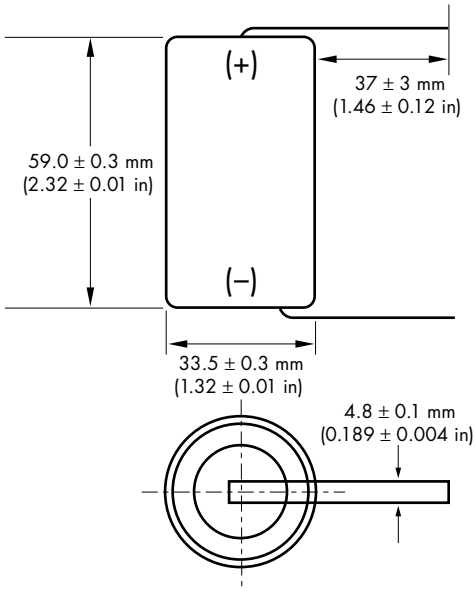


Typical discharge profiles at +21°C/+70°F



Capacity versus Current and Temperature (2.0 V cut off)





overall dimensions

Handling precautions

- Do not puncture, open or mutilate. Cell is pressurised.
- Do not obstruct the safety vent mechanism.
- Do not short circuit or charge
- Do not expose to fire or temperatures above 70°C (160°F).

SAFT

12, rue Sadi Carnot
93170 Bagnolet - France
Tel +33 (0)1 49 93 17 70
Fax +33 (0)1 49 93 19 69

313, Crescent Street
Valdese NC 28690 USA
Tel +1 (828) 874 41 11
Fax +1 (828) 879 39 81

Internet: http://www.saftbatteries.com

Doc. N°. 12.00 - 31030.2
Published by the Communications Department

SAFT

To: Craig Duncan June 26, 2003

Subject: Capacity Retention of LO26SX(D size $LiSO_2$ primary lithium cell)

Saft has performed a number of tests on capacity retention of our $LiSO_2$ cells and batteries. $LiSO_2$ is the most prevalently used chemistry for military portable batteries, and the LO26SX cell is the most used cell type in military batteries. The excellent capacity retention after long periods of storage is one of the major strengths of $LiSO_2$ that has resulted in its popularity for use in military applications.

Saft LiSO2 cells and batteries stored in warehouse conditions have been tested after up to 15 years storage. The average temperature during the storage period is in the range of 20 to 25°C with a maximum temperature of 40°C. Military batteries up to 5 years storage in military use(including deployment in the Middle East during Dessert Storm) have been capacity tested as well. From the results of testing of aged batteries Saft has developed typical capacity retention rates. The capacity loss is greatest in the first 1 to 2 years and gradually reduces to almost negligible loss with time after that. After 5 years aging typical $LiSO_2$ battery capacity is 95% of its initial capacity; after 10 years approximately 92%; and after 15 years the typical capacity is still greater than 90%.

Respectfully,

Michael S. Sink
Mgr. New Business Development
Direct Voice: 828-879-5031 Fax: 828-879-3981
email: mike.sink@saftamerica.com

From: Wayne.Pitt@saft.alcatel.com.au
To: 'Kevan Wilson-Elswood'
Sent: Friday, April 04, 2003 4:53 PM
Subject: RE: Lithium battery application information

Hi Kevan,
The cells will be market with a code, similar to the following; 991127Y. This is year month day, with the letter being a production identifier. If you do not find the identification code on the outside of the white sleeve, you may have to peel off the outside white heat shrink sleeve, and check the cell can underneath. If you have any problems at all, please do not hesitate in contacting me.

Regards
Wayne

-----Original Message-----
From: Kevan Wilson-Elswood [mailto:kelswood@gme.net.au]
Sent: Friday, 4 April 2003 15:14
To: Wayne.Pitt@saft.alcatel.com.au
Subject: Re: Lithium battery application information
Importance: High

Hello Wayne,
Sorry to bother you again but this is fairly important. To get an accurate idea of how to simulate self dicharse on the LO26SX cells we need to know when they were manufactured. I note that the cell bodies are stamped with a code. Can we deduce the date of Manufacture from that code.
Thanks for any help you can provide

Kevan Wilson-Elswood
Senior Design Engineer
Standard Communications Pty Ltd
Gladesville, Australia

PROTOCOL: SERIAL USER

A) PROGRAMMING SOFTWARE

UNIT INFORMATION

Date & Time:	19/11/2004 9:31:17 AM
Model:	EPIRB MT401
S/N (Year + Month + Serial):	YMM00157
Firmware Version:	OS4.00.003c
PCB Version:	2
Transmission Frequency:	406.028 MHz

MESSAGE INFORMATION

Message Format[25]:	0 (Short)
Protocol Flag[26]:	1
Country Code[27-36]:	503 (Australia)
User Protocol Type[37-39]:	3 (Serial user protocol)
Beacon Type[40-42]:	4 (Non float free EPIRB with serial number)
TAC Flag[43]:	0
User Defined Serial Number[44-63]:	157
National Use Field 1[64-73]:	Not used, all 0s
National Use Field 2[74-83]:	Not used, all 0s
Auxiliary Radio-Locating Device[84-85]:	1 (121.5 MHz)
Activation Type[108]:	Water & Manual
15-HEX ID/UIN[26-85]:	BEEE00027400001
Full Message[25-112]:	5F7700013A0000088003D0

B) COSPAS/SARSAT WEB BASED DECODE SOFTWARE

Home | Description | Status | Beacons | Documentation | Management

406 MHz Decode Program
(Version 2.3)

5F7700013A0000088003D0 ○ 15 Hexadecimal ID ◉ 22 Hexadecimal ○ 30 Hexadecimal [process]

Click here for the ITU List of MID Country Code Numbers.

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 503	27-36	0111110111
User type: Serial User	37-39	011
Serial Type: Non Float Free EPIRB with Serial Identification	40-42	100
Cospas-Sarsat Certificate Number in bits 74-83: No	43	0
Serial Number: 157	44-63	00000000000010011101
All 0s or National Use	64-73	0000000000
C/S Number or National Use (bit 43 refers): Nationally Assigned (not Cospas-Sarsat)	74-83	0000000000
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	00010000000000001111
Calculated BCH 1:	N/A	00010000000000001111
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	BEEE00027400001

C) ACTUAL DECODE OF PROGRAMMED BEACON

SELF TEST

```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:50:4719 Jul 2004 ****
MESSAGE No.24
RECEIVED AT: 09:31:2819 Jul 2004
FRAMING/STATUS: S'TEST OK
FREQUENCY:406.0287 MHzPASS
COUNTRY:503 AUSTRAL
30 HEX ID:5F7700013A00000
 88003D000000000
15 HEX ID:BEEE00027400001
PROTOCOL: SERIALISED
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: #157
HOMING:121.5MHz
OTHER INFO:
406MHz Power 128
121.5MHz Power 80
```

NORMAL

```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:50:5719 Jul 2004 ****
MESSAGE No.25
RECEIVED AT: 09:32:3119 Jul 2004
FRAMING/STATUS: NORMAL OK
FREQUENCY:406.0288 MHzPASS
COUNTRY:503 AUSTRAL
30 HEX ID:5F7700013A00000
 88003D000000000
15 HEX ID:BEEE00027400001
PROTOCOL: SERIALISED
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: #157
HOMING:121.5MHz
OTHER INFO:
406MHz Power 110
121.5MHz Power 45
```

PROTOCOL: MARITIME USER

A) PROGRAMMING SOFTWARE

```
UNIT INFORMATION

Date & Time:                                19/11/2004 9:37:42 AM
Model:                                      EPIRB MT401
S/N (Year + Month + Serial):                YMM00157
Firmware Version:                           OS4.00.003c
PCB Version:                                2
Transmission Frequency:                     406.028 MHz

MESSAGE INFORMATION

Message Format[25]:                         0 (Short)
Protocol Flag[26]:                          1
Country Code[27-36]:                        503 (Australia)
User Protocol Type[37-39]:                  2 (Maritime user protocol)
Trailing 6 Digits of MMSI[40-75]:           000013
Specific Beacon Number[76-81]:              2
Spare[82-83]:                               0
Auxiliary Radio-Locating Device[84-85]:     1 (121.5 MHz)
Activation Type[108]:                       Water & Manual
15-HEX ID/UIN[26-85]:                       BEE8D34D35D4191
Full Message[25-112]:                       5F7469A69AEA0C8BB81C10
```

B) COSPAS/SARSAT WEB BASED DECODE SOFTWARE

Home | Description | Status | Beacons | Documentation | Management

406 MHz Decode Program
(Version 2.3)

5F7469A69AEA0C8BB81C10 ○ 15 Hexadecimal ID ◉ 22 Hexadecimal ○ 30 Hexadecimal [process]

Click here for the ITU List of MID Country Code Numbers.

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 503	27-36	0111110111
User type: Maritime User	37-39	010
Maritime MMSI (6 digits): 000013	40-75	0011010011010011010011010111010010000
Specific bcn: 2	76-81	011001
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	01110111000000111000O
Calculated BCH 1:	N/A	01110111000000111000O
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered or Nationally assigned	109-112	0000
15 Hex ID:	N/A	BEE8D34D35D4191

C) ACTUAL DECODE OF PROGRAMMED BEACON

SELF TEST

```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:51:0419 Jul 2004 ****
MESSAGE No.26
RECEIVED AT: 09:35:5819 Jul 2004
FRAMING/STATUS: S'TEST OK
FREQUENCY:406.0287 MHzPASS
COUNTRY:503 AUSTRAL
30 HEX ID:5F7469A69AEA0C8
 BB81C1000000000
15 HEX ID:BEE8D34D35D4191
PROTOCOL: MARITIME U
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: Callsign: 000013 2
HOMING:121.5MHz
OTHER INFO:
406MHz Power 117
121.5MHz Power 141
```

NORMAL

```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:51:1819 Jul 2004 ****
MESSAGE No.27
RECEIVED AT: 09:37:5119 Jul 2004
FRAMING/STATUS: NORMAL OK
FREQUENCY:406.0289 MHzPASS
COUNTRY:503 AUSTRAL
30 HEX ID:5F7469A69AEA0C8
 BB81C1000000000
15 HEX ID:BEE8D34D35D4191
PROTOCOL: MARITIME U
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: Callsign: 000013 2
HOMING:121.5MHz
OTHER INFO:
406MHz Power 103
121.5MHz Power 67
```

PROTOCOL: CALL SIGN USER

A) PROGRAMMING SOFTWARE

UNIT INFORMATION

Date & Time:	19/11/2004 9:43:21 AM
Model:	EPIRB MT401
S/N (Year + Month + Serial):	YMM00157
Firmware Version:	OS4.00.003c
PCB Version:	2
Transmission Frequency:	406.028 MHz

MESSAGE INFORMATION

Message Format[25]:	0 (Short)
Protocol Flag[26]:	1
Country Code[27-36]:	233 (United Kingdom)
User Protocol Type[37-39]:	6 (Radio call sign user protocol)
Radio Call Sign[40-75]:	MZLP6
Specific Beacon Number[76-81]:	7
Spare[82-83]:	0
Auxiliary Radio-Locating Device[84-85]:	1 (121.5 MHz)
Activation Type[108]:	Water & Manual
15-HEX ID/UIN[26-85]:	9D3A7C69B5AA9C1
Full Message[25-112]:	4E9D3E34DAD54E0E97FD50

B) COSPAS/SARSAT WEB BASED DECODE SOFTWARE

Home | Description | Status | Beacons | Documentation | Management

406 MHz Decode Program
(Version 2.3)

4E9D3E34DAD54E0E97FD50 ○ 15 Hexadecimal ID ◉ 22 Hexadecimal ○ 30 Hexadecimal [process]

Click here for the ITU List of MID Country Code Numbers.

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 233	27-36	0011101001
User type: Radio Call Sign	37-39	110
Radio Call Sign Identification: MZLP6	40-75	1001111100011010011011010110101010
Specific bcn: 7	76-81	011100
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	11010010111111110101
Calculated BCH 1:	N/A	11010010111111110101
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	9D3A7C69B5AA9C1

C) ACTUAL DECODE OF PROGRAMMED BEACON

SELF TEST

```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:51:2319 Jul 2004 ****
MESSAGE No.28
RECEIVED AT: 09:41:3519 Jul 2004
FRAMING/STATUS: S'TEST OK
FREQUENCY:406.0288 MHzPASS
COUNTRY:233 UK
30 HEX ID:4E9D3E34DAD54E0
 E97FD5000000000
15 HEX ID:9D3A7C69B5AA9C1
PROTOCOL: RADI0 CLSN
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: Callsign: MZLP6ZL* 7
HOMING:121.5MHz
OTHER INFO:
406MHz Power 139
121.5MHz Power 111
```

NORMAL

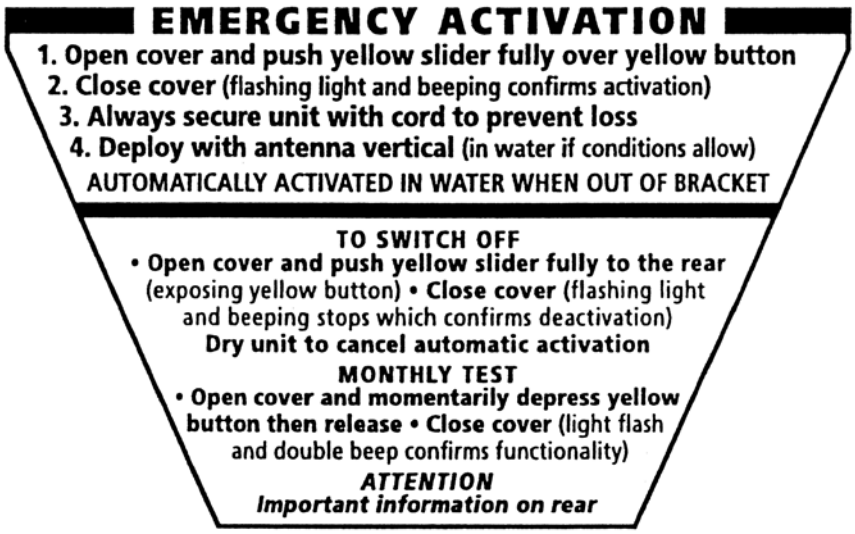
```
**** SARTECH ARG5410 BEACON TESTER ****
***** 09:51:2919 Jul 2004 ****
MESSAGE No.29
RECEIVED AT: 09:42:3719 Jul 2004
FRAMING/STATUS: NORMAL OK
FREQUENCY:406.0289 MHzPASS
COUNTRY:233 UK
30 HEX ID:4E9D3E34DAD54E0
 E97FD5000000000
15 HEX ID:9D3A7C69B5AA9C1
PROTOCOL: RADI0 CLSN
BEACON TYPE: EPIRB AUTOMATIC
IDENTITY: Callsign: MZLP6ZL* 7
HOMING:121.5MHz
OTHER INFO:
406MHz Power 152
121.5MHz Power 103
```

NOTE: * *The Sartech ARG5410 MKII at present incorrectly displays 'spaces' within the callsign. Currently the manufacturer is working to correct this problem and will release new firmware in the near future. It should be noted that the decoded 15 Hex ID matches that programmed into the beacon (see sub-sections A) & B). ARG5410 MKI units correctly display the call sign when used with the above test beacon.*

(ABOVE) MT400 Series EPIRB: 'MT401' in bracket with antenna stowed.

(LEFT) Antenna shown vertical

MT401 Face B (Rev 2)



Chemistry: $LiSO_2$ (2.4 g Lithium per cell).

No./Size: 2 D size cells.

PHYSICAL

Operating: -20°C to +55°C.

Storage: -30°C to +70°C.

Weight: 555 g (plus 98 g for bracket).

Compass Safe Distance: MT400 - 0.1m
MT401 - 0.7m (ind mounting bracket) from magnetic navigational device when inactive.

Dimensions: 260 mm (H) x 102 mm (W) x 83 mm (D) max. when stowed in bracket.

Materials: UV stabilized plastic chassis.

Performance: IEC 61097; IEC 60945; AS/NZS 4280.1; ETSI EN 300 066.

OTHER FEATURES

Retention Lanyard: Buoyant type approximately 5.5 metres long.

Reflector: SOLAS retro-reflective tape encircling unit above waterline.

Solid-state Strobe: High reliability solid state 3 emitter design exceeds IMO requirements.

Antenna: Flexible self straightening stainless steel design.

Bracket: Quick release mechanism (manual). Retained by four (4) vessel fixing points.

*Standard factory setting. Dealer programmable via external interface.

Specifications are subject to change without notice or obligation.

GME FIVE YEAR WARRANTY

GME limit this warranty to the original Purchaser of the equipment.

GME warrant this product to be free from defects in material and workmanship for a period of 5 years from the date of purchase from the authorised Dealer.

Replacement of batteries due to expiry or usage is excluded from this Warranty.

Should the product require servicing during this period, all labour and parts used to effect repairs will be supplied free of charge. GME reserve the right to determine whether damage has been occasioned by accident, misuse or improper installation, whereby the Warranty could be void.

In the event of a defect occurring during the Warranty period, the original purchaser may return the defective unit along with suitable proof of purchase (i.e. receipt, credit card slip etc.) and a full description of the defect to the Dealer from whom the unit was purchased. The Dealer will forward the unit to an authorised GME Service Depot in your State.

All freight charges incurred for transportation by the Dealer or GME are the Purchasers' responsibility.

NATIONAL AUTHORITY DETAILS

Australia
24 hour Emergency Contact
Phone: 1 800 641 792

Registration
Beacon Registration Section, AusSAR
Australian Maritime Safety Authority
Reply Paid No 81
GPO Box 2181, Canberra ACT 2601
Fax: +61 (0)2 6230 6868
Email: aus_beacon_query@amsa.gov.au
Phone: +61 (0)2 6230 6811

New Zealand
24 hour Emergency Contact
Phone: 0508 4 72269
Fax: +64 (0)4 914 8388

Registration
Rescue Co-ordination Centre New Zealand
PO Box: 30050, Lower Hutt 6009
Fax: +64 (0)4 914 8388
Email: 406registry@msa.gov.nz
Phone: +64 (0)4 914 8383

NATIONAL DISTRIBUTOR DETAILS

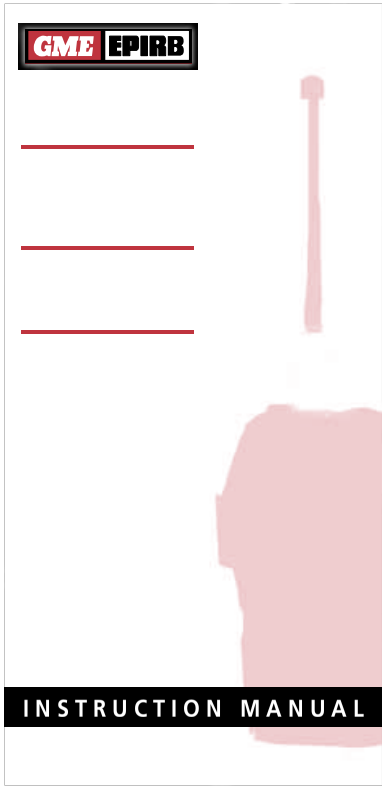
Standard Communications PTY LTD.

HEAD OFFICE: Locked Bag 2086, North Ryde, N.S.W. 1670, Australia.
Tel: +61 (0) 2 9844 6666 • Fax: +61 (0) 2 9844 6600

INTERNATIONAL ENQUIRIES
International enquiries should be directed to:
export@gme.net.au

www.gme.net.au

P/N: 310221 Dwg No: 42210-1



INSTRUCTION MANUAL

OWNER DETAILS

Name:

Address:

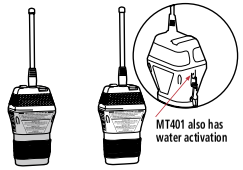
Phone:

Beacon UIN/15-HEX ID:

Congratulations on purchasing your new MT400 series EPIRB. The GME MT400 and MT401 are the most advanced 406 MHz digital satellite beacons available today. Using new digital frequency generation technology, GME have developed and approved world wide, a new family of affordable high performance 406 MHz beacons.

A CAUTIONARY NOTE: The satellite EPIRB is the most significant advance in search and rescue technology in many years. It is not a substitute for a marine radio – mariners should not be over-reliant on any single system. Wise, safe mariners plan carefully, ensure that shore contacts know their sail plan, carry a marine radio and the right range of other safety equipment and operate their craft sensibly to suit conditions at sea.

GENERAL DESCRIPTION



MT400 (orange – chassis)

MT401 (yellow – chassis)

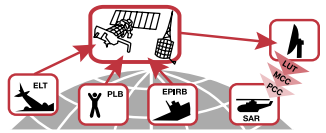
The GME MT400 and MT401 digital Emergency Position Indicating Radio Beacons (EPIRB) are designed for use when the safety of your craft and crew is endangered and you have no other means of communication. The EPIRB can save your life and the lives of others on board by leading an air/sea rescue to your precise location. In the past, extensive and lengthy searches have been carried out for missing craft, sometimes to no avail.

Your GME EPIRB is a self contained 406 MHz radio transmitter that emits an internationally-recognized distress signal on a frequency monitored by the COSPAS-SARSAT satellite system. The MT400 and MT401 contain a unique identity code which can be cross referenced to a database of registered 406 MHz beacons, allowing the beacon's owner or vessel to be immediately identified in the event of an emergency. Both models can be manually activated by the operator in an emergency situation. The MT401 will also automatically activate out of the mounting bracket if it is floated in water. Additionally each includes a ultra high performance solid state strobe and 121.5 MHz VHF homing beacon to assist in leading rescuers to your precise location.

ABOUT THE COSPAS-SARSAT SYSTEM

The COSPAS-SARSAT system is a complete global search and rescue service using geostationary and polar orbiting satellites. Many countries provide ground facilities known as Local User Terminals (LUTs).

Polar orbiting satellites provide complete, although non-continuous, coverage of the earth (due to fact that these satellites can only view a portion of the earth at any given time) and can accurately resolve an active beacons' location. Additionally, geostationary satellites can give an immediate alerting function in many regions of the world.



The basic COSPAS-SARSAT concept is illustrated in the figure above.

ABOUT 406 MHZ BEACONS

406 MHz beacons provide more accurate and reliable alert data to search and rescue agencies than the older 121.5/243 MHz systems presently being phased out. The older 121.5 MHz analogue system required that the satellite be within view of both the beacon and the LUT before it could transmit the beacons' position. This limited the coverage to an area immediately surrounding the LUT. However, the digital nature of the 406 MHz system means that the satellites are able to store the beacons' position and digital message, no matter where in the world it is received. These details are then relayed to the next LUT that comes into range, giving the 406 MHz system true global coverage.

REGISTRATION AND TRANSFER OF OWNERSHIP

Registration of your 406 MHz satellite EPIRB with the Registration Section of your National Authority is important because of the global alerting nature of the COSPAS-SARSAT system.

Owner Registration Forms for registering your beacon may be supplied within the packaging, otherwise, your National Authority will be able to provide the correct forms. Up to date forms are often available online.

The information provided in the registration is used only for search and rescue purposes. Promptly fill in the owner registration form upon completion of the sales transaction, then mail, fax or email it to your National Authority. If the beacon is to enter service immediately, complete the registration form and fax or email the information.

Should the beacon be transferred to a new owner, as the previous owner you are to inform your National Authority by email, fax, letter or telephone of the name and address of the new owner.

The new owner of the beacon is required to provide their National Authority with the information as shown on the registration form. This obligation transfers to all subsequent owners.

NOTE: Your MT400/401 has been programmed with a unique identifying code which will be transmitted by the beacon in an emergency. Registering your beacon provides the authorities with immediate access to your details when the beacon is detected. This means they will know who you are, who your emergency contacts are and what type of vessel or craft you are in. In situations of accidental activation they can also immediately eliminate your beacon as an emergency situation by contacting you when activation is detected.

PREVENTING ACCIDENTAL ACTIVATION

The signal from an EPIRB is regarded by authorities as an indication of distress and is given an appropriate response. It is the responsibility of every owner of an EPIRB to ensure that it is not activated unintentionally or in situations that do not justify its use.

Most cases of accidental transmission result from poor or inappropriate storage or failure to totally disable an old model EPIRB before disposal. The need to treat EPIRBs responsibly cannot be too highly emphasized.

The MT400/401 will not commence transmitting until approximately 60 seconds after activation, providing a safety period of audible and visual warning. If you hear the beacon beeping while it is being carried or stowed, you may still be able to deactivate it during this time period without actually transmitting a distress signal. If in doubt, report the incident to your local authorities just in case.

To minimize the possibility of accidental activation, EPIRB owners are urged to pay careful attention to the following points:

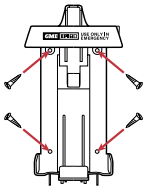
1. Always stow the EPIRB in the mounting bracket and with the switch cover closed. The mounting bracket and switch cover are designed specifically to prevent accidental activation.
2. Avoid stowing the EPIRB where it may lie in water.
3. Avoid mounting the EPIRB where it will be subjected to continuous direct sunlight. This could cause the beacon's internal temperature to exceed the maximum storage temperature of +70°C. Long term stowage under these conditions could result in reduced battery life, poor performance or degradation of the plastics due to excessive U.V. light.
4. Do not allow children to interfere with the EPIRB.

5. Educate others on board your vessel regarding the consequences of activation.

NOTE: (MT401 only): This model should always be stowed in its bracket to minimise the possibility of an accidental automatic activation in the presence of moisture. The yellow collar, provided only with this model's bracket, contains special features which temporarily inhibit automatic water activation of the EPIRB. If transporting the MT401 out of it's mounting bracket, ensure that it remains completely dry at all times.

INSTALLATION

The MT400/401 can be mounted upright or horizontally against a panel or bulkhead. When selecting a location, consider the following:



- Select a location that is readily accessible in an emergency.
- Ensure the unit is protected against the environment. Avoid locations where it will be subject to water spray or continuous sunlight.
- Mount the unit in a location where it will be safe from physical damage.
- The specifications section contains the 'Compass Safe Distance' for your particular model EPIRB. This is the minimum distance that must be maintained between an inactive stowed beacon and any magnetic navigational device.
- Confirm the selected location allows sufficient clearance to remove the beacon from the bracket when required.

Hold the mounting bracket in place (with the EPIRB removed) and mark the location of the mounting holes. Screw the bracket to the panel or bulkhead using the stainless steel screws supplied.

NOTE: The placement of the mounting holes for the mounting bracket are identical to those used on the earlier MT300 EPIRB.

Once the bracket is fixed in place, fit the MT400/401 to the bracket.

IN AN EMERGENCY

If an emergency occurs, you should first try to use your radio to summon assistance.

Distress procedures should only be used where grave and imminent danger threatens your craft and assistance is required. If contact is made, it may not be necessary to use the beacon. Notify the 'Emergency Facility' that you have a beacon and that you will turn it on upon their instructions.

Use the Beacon as a Last Resort.

If dire emergency threatens life and you have been unable to make radio contact or have lost radio contact, use the beacon. The distress signal transmitted by your beacon identifies you as a craft in distress and will initiate an air/sea search and rescue.

BRACKET RELEASE AND STOWAGE

To remove the EPIRB

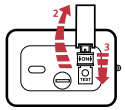
WARNING: (MT401 only) DO NOT remove the MT401 from its' mounting bracket if the unit is wet, it may automatically activate. Ensure the unit is thoroughly dry before removal.

1. With one hand, press down on the tab marked **'RELEASE'** at the base of the bracket.
2. Grasp the EPIRB with the other hand and pull it outwards and downwards.
3. The antenna will release automatically and spring to the upright position.

To re-fit the EPIRB

1. Insert the EPIRB, antenna first, upwards into the bracket.
2. Press the tip of the antenna against the bottom of the three ridges in the antenna slot and slide the EPIRB upwards into the frame of the bracket so that the antenna folds over.
3. Press downwards on the **'RELEASE'** lever and push the EPIRB base firmly into the bracket until the lever clicks upwards.

MANUAL ACTIVATION (MT400 AND MT401)



1. Remove the beacon from the bracket.
2. Lift the switch cover (marked **'LIFT'**).
3. Slide the **'ON'** slider switch fully forward in the direction of the arrows. The unit will initially self test, then after two seconds the flashing strobe and beeps will indicate the beacon is operating.
4. Close the cover to secure the switch.

WATER ACTIVATION (MT401 ONLY)

1. Remove the beacon from the bracket.
2. Deploy the beacon in water if sea conditions permit. The unit will initially self test, then shortly after the flashing strobe and beeps will indicate the beacon is operating.

The MT401 has been designed to maintain continuity of operation even when the units sensors leave the water for periods of several seconds at a time. Uninterrupted operation is however always best guaranteed by also manually activating the EPIRB.

If the beacon is to be deployed but not in water the manual activation method must be used.

DEPLOYING THE EPIRB

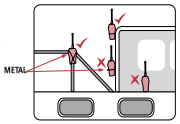
Unwind the cord and secure the EPIRB to prevent loss.

When activated, the MT400/401 will transmit the **strongest signal** to the satellites when:

- It is floating in water.
- It is well clear of surrounding and overhanging objects.
- The antenna is vertical.

In extreme sea conditions, you should not float the EPIRB free of the vessel or the life raft if there is the possibility of loss or damage to the EPIRB.

By observing the following guidelines satisfactory operation should still be achieved when operating the EPIRB out of water.



- The EPIRB signal **will not pass through metal** but will pass through fiberglass, wood or fabric with some loss when wet.
- The body of the EPIRB can be attached to metal fittings, but the antenna must be **vertical and clear of the metal.**
- If the cabin is metallic (such as steel or aluminium), the EPIRB should be mounted on a clear space outside with the antenna vertical and clear of surrounding objects.

WARNING: Switching a beacon on and off interferes with the satellites ability to determine your location. Once activated in an emergency allow the beacon to operate without interruption until your rescue.

NOTE: Normal operation of your beacon will cease once battery capacity is depleted. Special circuitry within the MT400/401 however directs any remaining capacity towards extended operation of the homing transmitter. Although the beacon may otherwise have appeared to cease functioning it is likely that a homing signal is still being emitted.

TURNING THE EPIRB OFF

It is important that you turn the EPIRB off as soon as possible **after** being rescued. If you leave the EPIRB running when it is no longer needed it may make it difficult for the satellites to detect other beacons that may be transmitting in the area.

1. Remove beacon from the water.
2. Lift the switch cover (marked **'LIFT'**).
3. Slide the yellow slider switch fully towards the **'OFF'** (MT400) or **'READY'** (MT401) position.
4. Close the cover to secure the switch.
5. To cancel Water Activation (MT401 only) dry the beacon or restow the beacon in the bracket. It may take a number of seconds for the EPIRB to de-activate.
6. Check that both the strobe light and the **'beep'** have stopped.

IN THE EVENT OF ACCIDENTAL ACTIVATION

If you suspect that an EPIRB has been activated inadvertently, you MUST turn it off and report it immediately to your National Authority's Rescue Co-ordination Centre to prevent an unnecessary search.

If at sea call your local VHF coast station, or Rescue Co-ordination centre. In international waters contact a Maritime Rescue Co-ordination Centre or Coast Radio Station (CRS) by any available means.

When reporting you should include the following:

1. Your EPIRB's 15 character Unique Identifier Number (UIN), which is marked on the unit body.
2. Date, time and duration of activation.
3. Cause of activation.
4. Location at time of activation.

Search and Rescue authorities will not penalize an EPIRB owner or operator in cases of genuine accidental activation.

BATTERIES AND MAINTENANCE

The MT400/401 is fitted with the very latest in high capacity Lithium battery technology. These batteries are able to operate within a temperature range of -20°C to +55°C.

The full operational capability of your beacon may not be available if the batteries fitted have exceeded their replacement date, as shown on the body of the unit. Prior to reaching this date, make arrangements to have your MT400/401 returned for service.

NOTE: The replacement of batteries due to expiry or usage is not covered by the product's Warranty. EPIRB maintenance operations, including battery replacement, require that the beacon be returned to a manufacturer approved service facility.

Although the MT400/401 is otherwise maintenance free, routinely following these few simple steps will help ensure that your beacon will be operationally ready if called upon:

1. Test the EPIRB at the recommended interval.
2. Confirm the SAFETY SEAL has not been broken.
3. Check that the batteries have not passed their replacement date.
4. Inspect the MT400/401 and bracket for damage or deterioration.
5. Keep the unit clean by wiping over with a damp cloth (warm water and mild detergent are suitable), then dry.
6. Verify that the unit releases correctly from the bracket and is securely retained when returned to it.

If there is any doubt as to the products' serviceability, immediately contact your authorised dealer or service centre for advice.

NOTE: Some installations may be covered by state, national or international carriage requirements. Such legislation may impose additional inspection and maintenance requirements beyond those listed above. Contact the relevant authority for further information.

SAFETY SEAL

The safety seal which covers the tab behind the **'ON'** slider is designed to tear if the unit is switched on. A safety seal that is not broken serves to indicate that the beacon has never been manually activated.

NEVER remove or break the seal unless deploying the EPIRB in an emergency.

If the beacon has been activated for any length of time, the batteries can no longer be guaranteed to have the capacity to operate for the minimum 48 hour period and therefore must be replaced.

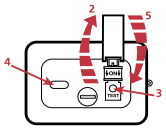
TESTING THE EPIRB

It is recommended that you test the MT400/401 at regular intervals (approximately monthly) to ensure it is fully functional. You should also test the EPIRB prior to an extended journey.

DO NOT over test – testing consumes some battery power.

WARNING: (MT401 only) DO NOT remove the MT401 from its' mounting bracket if the unit is wet, it may automatically activate. Ensure the unit is thoroughly dry before removal.

You may test the EPIRB at any time using the following procedure:



1. Remove the beacon from the bracket. Keep the antenna well clear of metalic objects during testing.
2. Lift the cover marked **'LIFT'**.
3. Briefly press then release the yellow **'TEST'** button.
4. The Strobe light will flash once and the unit will give two quick beeps to show that it is functioning.
5. Close the switch cover and press firmly into place until it clicks.
6. Return the beacon into the bracket.

If the EPIRB fails the testing process you should return it to your Dealer or nearest GME branch office for maintenance.

UNACCOMPANIED TRANSPORTATION

Your MT400/401 EPIRB contains Lithium batteries. Some transportation or courier companies may have special requirements for transporting devices containing Lithium Batteries.

If returning your MT401 to your dealer or GME branch office for repair or scheduled battery replacement, you should inform the transportation company beforehand that your beacon contains Lithium batteries.

DO NOT send your beacon through the postal system.

DISPOSAL

Special precautions must be taken when finally disposing of your beacon at the end of it's useful life. Legislation may determine the specific requirements which apply to you. In the first instance contact your National Authority for advice.

The following information may also be helpful:

- To permanently disable the beacon remove the 4 screws retaining the cover, open unit, unplug battery lead, then reseal.
- Lithium batteries are generally not considered as hazardous waste when fully discharged. Qualified personnel may be able to slowly and safely discharge the cells for you.

DO NOT short circuit the cells or battery. DO NOT incinerate.

SPECIFICATIONS - MT400 AND MT401

MODES OF OPERATION

Activated:	UHF (406) and VHF (homer) complete with high intensity strobe and audible activation alert.
Self test:	Comprehensive internal diagnostics with visual and audible operator feedback. UHF test message (inverted synchronisation compatible with portable beacon testers).

OPERATION

Activation:	MT400/401 - Manually by operator MT401 - Automatic when deployed in water.
Bracket Type:	Manual Release.
Duration:	48 hours minimum.
Transmission Delay:	121.5 and 406 MHz distress signals commence ~ 60 seconds after activation.
Warm Up:	None required (due to digital frequency generation).
VHF:	121.5 MHz, 50 mW ±3 dB, swept tone AM.
UHF:	406.028 MHz*, 5 W ± 2 dB, PSK (digital).
Strobe:	20 flashes/minute at greater than 0.75 cd effective intensity.
COSPAS-SARSAT	Certified to C/S T.001 (Class 2) requirements.
UHF-Protocol/Data:	Serial User*.
Repetition Period:	50 s mean, digitally generated randomization.
VHF:	Satellite compatible phase coherent.

BATTERY

Replacement Period:	Prior to expiry date marked on case.
Replacement Method:	Service centre, or factory only (non-user replaceable).

ANNEX F

DESIGNATION OF ADDITIONAL NAMES OF A COSPAS-SARSAT TYPE APPROVED 406 MHz BEACON MODEL

The Manufacturer of the following Cospas-Sarsat Type Approved 406 MHz Distress Beacon:

Beacon Manufacturer:
(name and address)

STANDARD COMMUNICATIONS PTY LTD
6 Frank St., Gladesville
N.S.W. Australia

406 MHz Beacon model:

MT400 (Class 2, manually activated and manually released EPIRB)

having Cospas-Sarsat Type Approval Certificate Number: ***TAC 139***

hereby informs Cospas-Sarsat that the above beacon will also be sold as:

Additional name and model number of beacon:

MT401 (Class 2 manually / water activated and manually released EPIRB) when suitably configured for water activation.

by Agent/Distributor:
(name and address)

STANDARD COMMUNICATIONS PTY LTD
6 Frank St., Gladesville
N.S.W. Australia

telephone: ***+61 (0) 2 9844 6666***

fax: ***+61 (0) 2 9844 6600***

contact person/title: ***Mr Craig DUNCAN***

I certify that ~~we have an agreement with this agent/distributor to market~~ the above-referenced 406 MHz beacon, which we will manufacture ~~and which~~ will be identical to the Cospas-Sarsat type approved beacon, ***model MT400, except for water activation circuitry/features, product colour (now yellow) and labelling/operating instructions.***

Dated: ***18th November, 2004*** Signed: .....

(for manufacturer)

ANNEX E

CHANGE NOTICE FORM

The Manufacturer of the Cospas-Sarsat Type Approved 406 MHz Distress Beacons:

Manufacturer: ***STANDARD COMMUNICATIONS PTY LTD***

(name and address) ***6 Frank St., Gladesville***

N.S.W. Australia

406 MHz Beacon Model Numbers: ***MT400 (Class 2 manually activated and manually released EPIRB)***

Cospas-Sarsat Type Approval Certificate Numbers: ***TAC 139***

Proposed New Model Numbers of Beacon: ***MT401 (Class 2 manually / water activated and manually released EPIRB)***

hereby informs Cospas-Sarsat of the following changes to production beacons

planned date of change ***Q1, 2005***

Oscillator type: ***No***

Battery: ***No*** (specify): _____

Antenna type: ***No***

Homing transmitter: ***No***

Strobe light: ***No***

Size or shape of beacon package: ***No***

Significant change to circuit design: ***No***

Internal navigation device: ***No*** (specify): _____

Other ***Yes*** (specify): ***Water activation switch operates in parrallel with existing mechanical switch.***

and substantiates these changes with the attached technical documentation and beacon test results (if applicable).

Manufacture of the existing MT400 WILL CONTINUE after production of the MT401 commences.

I hereby confirm that with these changes the above 406 MHz beacon models are technically equivalent to the type approved beacon and continue to meet the Cospas-Sarsat requirements.

Dated: ***18th November, 2004*** Signed: .....

(for manufacturer)

ANNEX E

CHANGE NOTICE FORM

The Manufacturer of the Cospas-Sarsat Type Approved 406 MHz Distress Beacons:

Manufacturer: ***STANDARD COMMUNICATIONS PTY LTD***

(name and address) ***6 Frank St., Gladesville***

N.S.W. Australia

406 MHz Beacon Model Numbers: ***a) MT400 (Class 2 manually activated and manually released EPIRB)***
b) MT401 (Class 2 manually / water activated and manually released EPIRB)

Cospas-Sarsat Type Approval Certificate Numbers: ***TAC 139***

Proposed New Model Numbers of Beacon: ***No change, ongoing product improvement.***

hereby informs Cospas-Sarsat of the following changes to production beacons

planned date of change ***Immediate for MT400, AND MT401 when model is C/S approved***

Oscillator type:	***No***	
Battery:	***No***	(specify):
Antenna type:	***No***	***Design optimisation in the tuning and test of the 121.5MHz RF power amplifier has achieved improved energy efficiency. Current consumption of the homer is therefore reduced resulting in excess battery capacity which can be used to extent the allowable battery shelf life. Homer RF output levels remain unchanged from the MT400 originally approved.***
Homing transmitter:	***Yes***	
Strobe light:	***No***	
Size or shape of beacon package:	***No***	
Significant change to circuit design:	***No***	
Internal navigation device:	***No***	(specify):
Other	***No***	(specify):

and substantiates these changes with the attached technical documentation and beacon test results (if applicable).

I hereby confirm that with these changes the above 406 MHz beacon models are technically equivalent to the type approved beacon and continue to meet the Cospas-Sarsat requirements.

Dated: ***18th November, 2004*** Signed: .....

(for manufacturer)

ANNEX J

BEACON QUALITY ASSURANCE PLAN

We, manufacturer of Cospas-Sarsat 406 MHz beacons *(Manufacturer name and address)*

STANDARD COMMUNICATIONS PTY LTD

6 Frank St., Gladesville

N.S.W. Australia

confirm that ALL PRODUCTION UNITS of the following beacon model(s),

MT400 series beacon to be produced in either MT400 or MT401 configuration

(model, part number)

designed by us will be subjected to following tests at ambient temperature:

- Digital message
- Bit rate
- Rise and fall times of the modulation waveform
- Modulation Index (positive/negative)
- Output power
- Frequency stability (short, medium)*

Note*: Beacon manufacturer shall provide technical data on the beacon frequency generation to demonstrate that the frequency stability tests at ambient temperature are sufficient for ensuring that each production beacon will exhibit frequency stability performance similar to the beacon submitted for type approval over the complete operating temperature range. If such assurance of adequate performance over the complete operating temperature range cannot be deduced from the technical data provided and the frequency stability test results at ambient temperature, a thermal gradient test shall be performed on all production units.

NOT APPLICABLE MT400/401

Each production unit to be temperature cycled over operating temperature range during calibration and test.

- Other tests:

Extensive test of circuit parameters including, but not limited to, current consumption in each operational state.

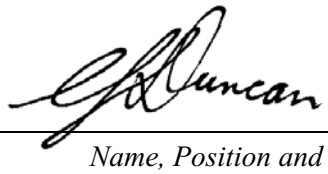
We confirm that the above tests will be performed as appropriate to ensure that the complete beacon satisfies Cospas-Sarsat requirements, as demonstrated by the test unit submitted for type approval.

We agree to keep the test result sheet of every production beacon for inspection by Cospas-Sarsat, if required, for a minimum of 10 years.

We confirm that Cospas-Sarsat representative(s) have the right to visit our premises to witness the production and testing process of the above-mentioned beacons. We understand that the cost related to the visit is to be borne by Cospas-Sarsat.

We also accept that, upon official notification of Cospas-Sarsat, we may be required to re-submit a unit of the above beacon model selected by Cospas-Sarsat for the testing of parameters chosen at Cospas-Sarsat discretion at a Cospas-Sarsat accepted test facility selected by the Cospas-Sarsat. We understand that the cost of the testing shall be borne by Cospas-Sarsat.

We understand that the Cospas-Sarsat Type Approval Certificate is subject to revocation should the beacon type for which it was issued, or its modifications, cease to meet the Cospas-Sarsat specifications, or Cospas-Sarsat has determined that this quality assurance plan is not implemented in a satisfactory manner.

2nd December, 2004  ***Craig Duncan, Project Engineering Manager***

Date *Name, Position and Signature of beacon Manufacturer Representative*

LIVE SATELLITE TEST - MT401 S/N 157

Beacon Location: -33.8199 151.1202 Gladesville, AUSTRALIA

Rec Num	Rec Type	Sat ID	Lut ID	15-Hex/UIN	TCA	Lat A (Degrees) (Minutes)		Long A (Degrees) (Minutes)		Lat A Error (km)	Long A Error (km)	ABSOLUTE ERR. MAGNITUDE (km)
28217	SNGL	S08	5121	BEEE061 A7C00001	341 03:30	33 49.3	S	151 6.0	E	-0.196	-1.879	1.889
28250	RDND	S08	5032	BEEE061 A7C00001	341 03:30	33 49.7	S	151 7.4	E	-0.937	0.291	0.981
28251	RDND	S08	5032	BEEE061 A7C00001	341 03:30	33 49.7	S	151 7.4	E	-0.937	0.291	0.981
28255	RDND	S08	3384	BEEE061 A7C00001	341 03:30	33 49.3	S	151 6.9	E	-0.196	-0.484	0.522
28256	RDND	S08	3384	BEEE061 A7C00001	341 03:30	33 49.7	S	151 7.3	E	-0.937	0.136	0.947
28267	RDND	S08	4311	BEEE061 A7C00001	341 03:30	33 49.2	S	151 6.7	E	-0.011	-0.794	0.794
28268	RDND	S08	4311	BEEE061 A7C00001	341 03:30	33 49.7	S	151 7.3	E	-0.937	0.136	0.947
28275	RDND	S08	2571	BEEE061 A7C00001	341 03:30	33 48.8	S	151 7.3	E	0.730	0.136	0.742
28276	RDND	S08	2571	BEEE061 A7C00001	341 03:30	33 49.6	S	151 7.3	E	-0.752	0.136	0.764
28299	RDND	S08	5121	BEEE061 A7C00001	341 03:30	33 49.2	S	151 6.7	E	-0.011	-0.794	0.794
28300	RDND	S08	5121	BEEE061 A7C00001	341 03:30	33 49.6	S	151 7.3	E	-0.752	0.136	0.764
28350	RNDA	S08	5033	BEEE061 A7C00001	341 03:30	33 49.2	S	151 6.7	E	-0.011	-0.794	0.794
28351	AMBIG	S08	5033	BEEE061 A7C00001	341 05:11	33 49.6	S	151 7.3	E	-0.752	0.136	0.764
28352	RNDA	S08	5033	BEEE061 A7C00001	341 05:11	33 49.2	S	151 6.9	E	-0.011	-0.484	0.484
28353	AMBIG	S08	5033	BEEE061 A7C00001	341 05:11	33 49.5	S	151 7.3	E	-0.567	0.136	0.583
28360	RNDA	S08	3383	BEEE061 A7C00001	341 05:11	33 49.6	S	151 7.7	E	-0.752	0.756	1.067
28361	AMBIG	S08	3383	BEEE061 A7C00001	341 05:11	33 49.5	S	151 7.3	E	-0.567	0.136	0.583
28364	RNDA	S08	4771	BEEE061 A7C00001	341 05:11	33 49.3	S	151 7.1	E	-0.196	-0.174	0.262
28365	AMBIG	S08	4771	BEEE061 A7C00001	341 05:11	33 49.5	S	151 7.3	E	-0.567	0.136	0.583
28371	RNDA	S08	2571	BEEE061 A7C00001	341 05:11	33 49.2	S	151 7.3	E	-0.011	0.136	0.137
28372	AMBIG	S08	2571	BEEE061 A7C00001	341 05:11	33 49.4	S	151 7.3	E	-0.382	0.136	0.405

```
AUMCC $ QUERY_CMD/ID=BEEE061A7C00001/RED/SIN


Input file name : OCC$406_HISTORY
Output time     :  6-DEC-2004 06:42:13.28

Last Record Number Used  : 028425
Last Update Time         :  6-DEC-2004 06:39:00.41

-----------------------------------------------------------------------------------------------

Decoded ELT ID        : AUS/SER/SUR 0099999 000 000/AH
ELT ID (30 hex)       : 5F77030D3E00000B4EFE1000000000
```

Rec Num	Rec Type	Sat ID	Lut ID	ELT ID (15-hex)	B	CFW	%	TCA DAY	TCA HR:MN	Passes /Soln	Lat A Dg	Lat A Min	Lng A Dg	Lng A Min	Lat B Dg	Lat B Min	Lng B Dg	Lng B Min	#MP A/B	Freq Bias (Hz)	Err Frq (Hz)	Drift (Hz/min)	Pts	CTA SepDi (Dg/Km
28217	SNGL	S08	5121	BEEE061 A7C00001	+9	4	0	94	341	03:30	1/ 1	33	49.3S	151	6.0E	25	45.7S	171	28.2W	0/0	2967.0	2.0	-1.1	14	16.
28250	RDND	S08	5032	BEEE061 A7C00001	-9	3	0	99	341	03:30	1/ 1	33	49.7S	151	7.4E	25	45.8S	171	28.2W	0/0	2984.8	1.8	-0.1	17	16.
28251	RDND	S08	5032	BEEE061 A7C00001	-9	4	0	99	341	03:30	1/ 2	33	49.7S	151	7.4E	25	45.8S	171	28.2W	0/0	2976.8	1.9	-0.6	16	16.
28255	RDND	S08	3384	BEEE061 A7C00001	-4	3	0	98	341	03:30	1/ 1	33	49.3S	151	6.9E	25	45.2S	171	28.0W	0/0	2983.1	0.5	-0.4	17	16.
28256	RDND	S08	3384	BEEE061 A7C00001	-9	4	0	99	341	03:30	1/ 3	33	49.7S	151	7.3E	25	45.8S	171	28.2W	0/0	2981.8	1.4	-0.5	16	16.
28267	RDND	S08	4311	BEEE061 A7C00001	-4	3	0	98	341	03:30	1/ 1	33	49.2S	151	6.7E	25	43.1S	171	26.8W	0/0	2975.0	1.0	-0.4	17	16.
28268	RDND	S08	4311	BEEE061 A7C00001	-9	4	0	99	341	03:30	1/ 4	33	49.7S	151	7.3E	25	45.8S	171	28.2W	0/0	2975.0	1.3	-0.5	16	16.
28275	RDND	S08	2571	BEEE061 A7C00001	-4	4	0	97	341	03:30	1/ 1	33	48.8S	151	7.3E	25	32.1S	171	4.8W	0/0	2981.5	0.7	0.0	17	16.
28276	RDND	S08	2571	BEEE061 A7C00001	-9	4	0	99	341	03:30	1/ 5	33	49.6S	151	7.3E	25	45.8S	171	28.2W	0/0	2976.3	1.2	-0.4	16	16.
28299	RDND	S08	5121	BEEE061 A7C00001	-4	4	0	98	341	03:30	1/ 1	33	49.2S	151	6.7E	25	43.1S	171	26.8W	0/0	2968.0	1.0	-0.4	17	16.
28300	RDND	S08	5121	BEEE061 A7C00001	-9	4	0	99	341	03:30	1/ 6	33	49.6S	151	7.3E	25	45.8S	171	28.2W	0/0	2968.0	1.2	-0.4	16	16.
28350	RNDA	S08	5033	BEEE061 A7C00001	-4	4	0	98	341	03:30	1/ 1	33	49.2S	151	6.7E	25	43.1S	171	26.8W	0/0	2976.0	1.0	-0.4	17	16.
28351	AMBIG	S08	5033	BEEE061 A7C00001	-9	4	0	99	341	05:11	2/ 8	33	49.6S	151	7.3E	33	49.2S	151	6.7E	0/0	2976.0	1.0	-0.4	15	1.
28352	RNDA	S08	5033	BEEE061 A7C00001	-9	4	0	96	341	05:11	1/ 1	33	49.2S	151	6.9E	36	00.0S	140	44.5E	0/0	2974.0	1.0	-0.1	13	-4.
28353	AMBIG	S08	5033	BEEE061 A7C00001	-9	4	0	99	341	05:11	2/ 9	33	49.5S	151	7.3E	33	49.2S	151	6.9E	0/0	2975.0	1.0	-0.1	15	1.
28360	RNDA	S08	3383	BEEE061 A7C00001	-4	4	0	99	341	05:11	1/ 1	33	49.6S	151	7.7E	36	0.7S	140	45.5E	0/0	2981.7	0.4	0.0	16	4.
28361	AMBIG	S08	3383	BEEE061 A7C00001	-9	4	0	99	341	05:11	2/10	33	49.5S	151	7.3E	33	49.6S	151	7.7E	0/0	2981.1	0.4	0.0	15	0.
28364	RNDA	S08	4771	BEEE061 A7C00001	-4	4	0	99	341	05:11	1/ 1	33	49.3S	151	7.1E	36	0.3S	140	45.5E	0/0	2982.0	1.0	0.0	16	4.
28365	AMBIG	S08	4771	BEEE061 A7C00001	-9	4	0	99	341	05:11	2/11	33	49.5S	151	7.3E	33	49.3S	151	7.1E	0/0	2982.0	1.0	0.0	15	0.
28371	RNDA	S08	2571	BEEE061 A7C00001	-4	4	0	98	341	05:11	1/ 1	33	49.2S	151	7.3E	35	59.1S	140	55.4E	0/0	2980.3	0.4	0.0	16	4.
28372	AMBIG	S08	2571	BEEE061 A7C00001	-9	4	0	99	341	05:11	2/12	33	49.4S	151	7.3E	33	49.2S	151	7.3E	0/0	2981.7	0.4	0.0	15	0.

```
   QUERY : Request completed.
Query Session Terminated.
AUMCC $
```

Australian Government
Geoscience Australia

Geoscience Australia Earth Monitoring
Minerals and Geohazards Division
Geoscience Australia

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"Compass Safe Distance" tests for GME MT401 EPIRB s/n 0155

Test performed by Peter Crosthwaite and Andrew Lewis at Magnetometer Calibration Facility, Canberra Magnetic Observatory, Monday 13 September, 2004.

Results

These conclusions apply only to the unit s/n 0155 and cannot be guaranteed to apply to all units of the same model, or indeed to the same unit should it be subjected to any magnetic or physical stress that might change its magnetic characteristics.

Tests 2 and 4 confirmed that a cubic function reasonably represented the decay of the magnetic field with distance.

The maximum magnitude of the anomaly caused by the EPIRB at 30cm over all measured orientations was 1.03μT. This is equivalent to 0.028μT at 1m.

According to the following definition of "compass-safe distance" d,

> *the distance at which this unit will not produce a deviation of more than 5.4º/H (H is horizontal component of the magnetic flux in μT)*
>
> for all H from 1μT to 40μT : $0.028 / d^3 / H = \tan(5.4º/H) \Rightarrow d = 0.7m.$

Similarly, the distance (d) at which it will not produce a deviation of more than 18º/H is:

for all H from 1μT to 40μT : $0.028 / d^3 / H = \tan(18º/H) \Rightarrow d = 0.5m.$

Where the distances (d) have been rounded up to the nearest 0.1m.

Method

The vector-magnetic effect of the EPIRB was measured by a stationary vector variometer. The EPIRB was rotated around two independent axes of rotation and translated along the magnetic east-west direction from the variometer.

All magnetic measurements were corrected for temporal changes in the background geomagnetic field using data from the Canberra Magnetic Observatory.

The Repeat Station Narod vector variometer was installed on the floor of the Magnetometer Calibration Facility approximately horizontal with the X, Y, and Z channels measuring magnetic north, east, and vertically down components respectively.

The test EPIRB was located in a cradle to the magnetic-east of the variometer sensor.
The cradle enabled

- the EPIRB to be rotated about a horizontal axis passing through the long axis of the EPIRB
- that horizontal axis to be rotated about the vertical axis passing through the centre of the EPIRB so that the horizontal axis could be pointed to any azimuth

The REFERENCE ORIENTATION of the EPIRB had the EPIRB facing downwards (its own mounting bracket facing upwards), and the horizontal axis of rotation pointing to the magnetic north (with the EPIRB aerial to the magnetic north).

The cradle was marked every 30º on the horizontal axis of rotation and also every 30º of rotation in magnetic azimuth. The angles on the horizontal axis of rotation increased clockwise when viewed from the north.

The geomagnetic field was very quiet during these tests – K-index = 0 for all measurements. The value of H at Canberra where the tests were carried out is 23.7μT.

The data file from the Narod variometer was H042570K.CTA for all tests.

Test 1. 02:20 – 03:20 UTC, EPIRB 30cm from the variometer sensor

The EPIRB was rotated in azimuth, pausing every 30°, for one complete circle, for each 30° mark of the horizontal axis of rotation. (144 independent orientations.)

Test 2. 03:30 – 03:35 UTC, EPIRB in the REFERENCE ORIENTATION

The EPIRB was moved from 30cm to 130cm magnetic east of the variometer sensor pausing at each 10cm increment.

Test 3. 03:42:45 – 03:43:45 UTC

The EPIRB was removed from the vicinity of the variometer sensor to establish a reference baseline.

Test 4. 03:50 – 03:55 UTC. EPIRB in the Horizontal axis = 0°, azimuth = 180° orientation

The EPIRB was moved from 130cm to 30cm magnetic east of the variometer sensor pausing every 10cm increment.

Test 5. 04:01 – 04:06 UTC. EPIRB in the Horizontal axis = 180°

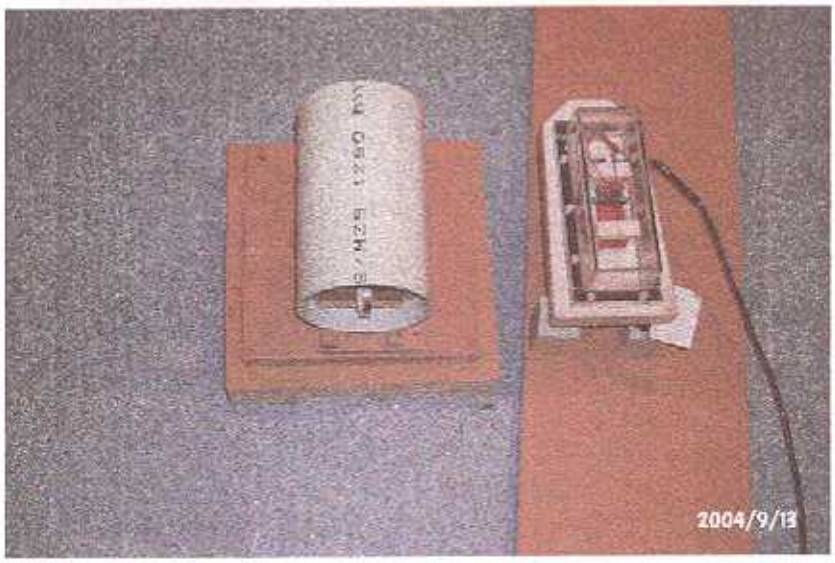
The EPIRB was rotated a full circle in azimuth at each distance 40cm, 50cm, 60cm, and 70 cm magnetic east of the variometer sensor.

Test 6. 04:16 – 04:27 UTC. EPIRB 50cm from the variometer sensor

The EPIRB was rotated about the horizontal axis for each azimuth setting of 0°, 90°,180°,270°, and 60°.

Test 7. 04:30:45 – 04:31:45 UTC.

The EPIRB was removed from the vicinity of the variometer sensor to establish a reference baseline.




EPIRB
EMERGENCY ACTIVATION


OPERATING
-20°C to +55°C
(-4°F to +131°F)
STORAGE
-30°C to +70°C
(-22°F to+158°F)
COMPASS
SAFE
0.1m (0.3ft)
LiSO2

Main Identity

From: <Peter.Hopgood@ga.gov.au>
To: <jbanks@gme.net.au>
Sent: Thursday, 23 September 2004 4:12 PM
Subject: RE: COMPASS SAFE

To: John Banks
Technical Services Manager
STANDARD COMMUNICATIONS PTY LTD
Email: jbanks@gme.net.au

23 September 2004

Dear John,

The magnetic properties of the MT401 EPIRB 0155 were measured with our Narod variometer (s/n 9004-4). This was last calibrated in the coils of our National Magnetic Calibration Facility on 24 March 2004. The coils of the calibration facility themselves were calibrated at installation to international standards and has been checked since. This is a highly accurate system - orders of magnitude more than were required for the EPIRB tests.

The staff involved in the tests were qualified geophysicists with decades of experience in geomagnetism between them.

Regards,

Dr Peter Hopgood Tel: +61 2 6249 9359
Geomagnetism Email: peter.hopgood@ga.gov.au
Geoscience Australia Web: http://www.ga.gov.au

The repeat station .

Peter also used the Canberra variometer data to remove temporal variations.

> -----Original Message-----
> **From:** John Banks [mailto:jbanks@gme.net.au]
> **Sent:** Thursday, 23 September 2004 12:59
> **To:** Hopgood Peter
> **Cc:** Craig Duncan; Ingo Golab
> **Subject:** COMPASS SAFE
>
> ED040607-02A
>
> Your Ref 91/1009 MT401 EPIRB 0155
>
> Dear Peter,
> Thank you for the report and Epirb received today.
>
> We however require from yourself a statement as to the equipment used in the test procedure - variometer - and its calibration status, and if possible the qualifications of the person or persons carrying out or overseeing the test procedure.
>
> Regards
>
> John
>
> jbanks@gme.net.au