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# Report On

Emergency Beacons RTCM Standard 11010.2 Testing of the  
ACR Electronics, Inc.  
PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)

**COMMERCIAL-IN-CONFIDENCE**

Document 75905359 Report 09 Issue 1

June 2009



Product Service

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COMMERCIAL-IN-CONFIDENCE

**REPORT ON**

Emergency Beacon Testing of the  
ACR Electronics, Inc.  
PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)

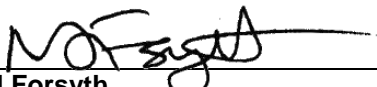
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**DATED**

24 June 2009





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## **SECTION 1**

### **REPORT SUMMARY**

Emergency Beacons Testing of the  
ACR Electronics, Inc.  
PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)



## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Emergency Beacon Testing of the ACR Electronics, Inc. PLB-350A (Non-GPS) & PLB-350B (GPS Enabled) to the requirements of RTCM 11010.2:2008 (RTCM Paper 114-2008-SC110-STD).

Objective	To perform Emergency Beacon Testing to determine the Equipment Under Test's (EUT's) compliance with the specification/Test Plan, for the series of tests carried out.
Manufacturer	ACR Electronics, Inc.
Model Number(s)	PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)
Serial Number(s)	PLB-350A Floatation, Serial Number: #20 PLB-350B Floatation, Serial Number: #22 PLB-350A Slim, Serial Number: #18 PLB-350B Slim, Serial Number: #5 PLB-350A Floatation (50Ω), Serial Number: #7 PLB-350B Slim (50Ω), Serial Number: #2 PLB-350B Slim (50Ω), Serial Number: #3 PLB-350B Slim, Serial Number: #14
Number of Samples Tested	Eight
Test Specification/Issue/Date	RTCM 11010.2:2008 (RTCM Paper 114-2008-SC110-STD)
Incoming Release Date	Application Form 16 January 2009
Order Number Date	95233_001 10 January 2009
Start of Test	28 January 2009
Finish of Test	22 June 2009
Name of Engineer(s)	R Hampton M P Hardy R Henley A C Castle S Mooney A R Hubbard R Bennett



Related Document(s)

The following referenced documents were referenced in the application of RTCM 11010.2:2008.

Cospas-Sarsat C/S T.001 Issue 3 Revision 8 November 2007, Specification for Cospas-Sarsat 406 MHz Distress Beacons

Cospas-Sarsat C/S T.007 Issue 4 Revision 2 November 2007, Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard

Cospas-Sarsat C/S T.012 Issue 1 Revision 4 November 2007, COSPAS-SARSAT 406 MHz Frequency Management Plan

IEC 60945:2002, Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results



**1.2 APPLICATION FORM**

**1.2.1 Beacon Manufacturer and Beacon Model**

<b>Beacon Manufacturer</b>	ACR Electronics, Inc
<b>Beacon Model</b>	PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)
<b>Other Model Names</b>	

**1.2.2 Beacon Type and Operational Configurations**

Beacon Type	Beacon used while:	Tick where appropriate
<b>EPIRB</b>	Floating in water or on deck or in a safety raft	<input type="checkbox"/>
<b>PLB</b>	On ground and above ground	<input checked="" type="checkbox"/>
	On ground and above ground and floating in water	<input type="checkbox"/>
<b>ELT Survival</b>	On ground and above ground	<input type="checkbox"/>
	On ground and above ground and floating in water	<input type="checkbox"/>
<b>ELT Auto Fixed</b>	Fixed ELT with aircraft external antenna	<input type="checkbox"/>
<b>ELT Auto Portable</b>	In aircraft with an external antenna	<input type="checkbox"/>
	On ground, above ground, or in a safety raft with an integrated antenna	<input type="checkbox"/>
<b>ELT Auto Deployable</b>	Deployable ELT with attached antenna	<input type="checkbox"/>
<b>Other (specify)</b>		<input type="checkbox"/>

**1.2.3 Beacon Characteristics**

Characteristic	Specification
Operating temperature range	Tmin = -20°C Tmax = +55°C
Operating lifetime	24 hours
Battery chemistry	LiMnO2
Battery cell size and number of cells	2/3A size, 4 cells (2x2 cells)
Battery cell manufacturer	Sanyo, CR123A
Battery pack manufacturer and part number	ACR, A3-06-2613
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon/C-MAC
Oscillator part name and number	A1-11-0687-2 (E4672)
Oscillator satisfies long-term frequency stability requirements	Yes



Characteristic	Specification
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integrated
Antenna manufacturer	ACR Electronics, Inc.
Antenna part name and number	A3-06-2493

Note: The following Characteristics Table applies to the GPS Enabled variant(s) only.

Characteristic	Specification
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	Yes
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes
For Internal Navigation Devices	
- Geodetic reference system (WGS 84 or GTRF)	WGS 84
- GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes
- Navigation device manufacturer	Wonde Proud
- Navigation device model name and part Number	A1-11-0688-1
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS
For External Navigation Devices	
- Data protocol for GNSS receiver to beacon interface	N/A
- Physical interface for beacon to navigation device	N/A
- Electrical interface for beacon to navigation device	N/A
- Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A





Note: "Optional GNSS Self-Test Mode" characteristics apply to the GPS Enabled variant(s) only.

Characteristic	Specification	
Self-Test Mode Characteristics	Self-Test Mode	Optional GNSS Self-Test Mode
- Self-test has separate switch position (Yes or No)	Yes	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes	Yes
- Self-test activation can cause an operational mode transmission (Yes or No)	No	No
- Self-test causes a single beacon self-test message burst only regardless of how long the self-test activation mechanism applied (Yes or No)	Yes	Yes
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	4 beeps/LED	Beeps/LED
- Self-test can be activated from beacon remote activation points (Yes or No)	No	No
- Self-test performs an internal check and indicates that RF power emitted at 406 MHz and 121.5 MHz if beacon includes a 121.5 MHz homer (Yes or No)	No	No
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	no	no
- Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
- List of Items checked by self-test	Battery,406PWR,Lock Det	GPS ACQ, 406 burst
- Self-test transmission burst duration (440 or 520 ms)	440 ms	520 ms
- Self-test format bit ("0" or "1")	1 (Non-GPS = 0)	
- Maximum duration of GNSS Self Test	N/A	2 minutes
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	12
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5MHz	
-Homer Transmit Power	17dBm	
-Homer Duty Cycle	98%	
-Duty Cycle of Homer Swept Tone	37.5%	



Note: "Beacon includes a strobe light" Characteristic applies only to GPS Enabled variant(s), Non-GPS specification is "No".

Characteristic	Specification
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	N/A
- Strobe light flash rate	21/minutes
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes
Other ancillary devices (e.g. voice transceiver). List details on a separate sheet if insufficient space to describe.	N/A
Beacon includes automatic activation mechanism (Yes or No) Specify type of automatic beacon activation mechanism	No
Beacon includes software or hardware features and functions not listed above and non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space	No



Characteristic	Specification
<b>Message Coding Protocols:</b>	(x) Tick the boxes below against the intended protocol options
User Protocol (tick where appropriate)  (Note: This section applicable to Non-GPS variant(s) <u>only</u> )	<input checked="" type="checkbox"/> Maritime with MMSI
	<input checked="" type="checkbox"/> Maritime with Radio Call Sign
	<input checked="" type="checkbox"/> EPIRB Float Free with Serial Number
	<input checked="" type="checkbox"/> EPIRB Non Float Free with Serial Number
	<input checked="" type="checkbox"/> Radio Call Sign
	<input checked="" type="checkbox"/> Aviation
	<input checked="" type="checkbox"/> ELT with Serial Number
	<input checked="" type="checkbox"/> ELT with Aircraft Operator and Serial Number
	<input checked="" type="checkbox"/> ELT with Aircraft 24-bit Address
	<input checked="" type="checkbox"/> PLB with Serial Number
	<input checked="" type="checkbox"/> National (Short Message Format)
	<input type="checkbox"/> National (Long Message Format)
	Standard Location Protocol (tick where appropriate)
<input checked="" type="checkbox"/> EPIRB with Serial Number	
<input checked="" type="checkbox"/> ELT with 24-bit Address	
<input checked="" type="checkbox"/> ELT with Aircraft Operator Designator	
<input checked="" type="checkbox"/> ELT with Serial Number	
<input checked="" type="checkbox"/> PLB with Serial Number	
National Location Protocol (tick where appropriate)	<input checked="" type="checkbox"/> National Location: EPIRB
	<input checked="" type="checkbox"/> National Location: ELT
	<input checked="" type="checkbox"/> National Location: PLB
User Location Protocol (tick where appropriate)	<input type="checkbox"/> Maritime with MMSI
	<input type="checkbox"/> Maritime with Radio Call Sign
	<input type="checkbox"/> EPIRB Float Free with Serial Number
	<input type="checkbox"/> EPIRB Non Float Free with Serial Number
	<input type="checkbox"/> Radio Call Sign
	<input type="checkbox"/> Aviation
	<input type="checkbox"/> ELT with Serial Number
	<input type="checkbox"/> ELT with Aircraft Operator and Serial Number
	<input type="checkbox"/> ELT with Aircraft 24-bit Address
<input type="checkbox"/> PLB with Serial Number	



#### 1.2.4 Information Provided by the Cospas-Sarsat Accepted Test Facility

Name and Location of Beacon Test Facility: TUV Product Service Ltd, United Kingdom

Date of Submission for Testing: 23 January 2009

**Applicable C/S Standards:**

Document	Issue	Revision	Date
C/S T.001	3	8	Nov-07
C/S T.007	4	2	Nov-07

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat Type Approval Standard (C/S T.007) and complies with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001) as demonstrated in the attached report.

Signed:

A handwritten signature in black ink, appearing to be 'M Jenkins', written over a horizontal line.

Name:

M Jenkins

Position Held:

Authorised Signatory

Date:

24 June 2008



Product Service

**1.2.5 Applicant Details**

Company Name	ACR Electronics, Inc.		
Address	5757 Ravenswood Road Fort Lauderdale, Florida 33312-6645 USA		
Category of Applicant	<input checked="" type="checkbox"/> Manufacturer	<input type="checkbox"/> Importer	
	<input type="checkbox"/> Distributor	<input type="checkbox"/> Agent	
Contact Name	Chung Tong	Telephone	954-981-3333, ext.2186
Email	ctong@acrelectronics.com	Facsimile	954-983-5087

**1.2.6 Manufacturer Details**

Company Name	Same as above		
Address			
Contact Name		Telephone	
Email		Facsimile	

**1.2.7 Declaration of Build Status**

Hardware Version	
- PCB Revision	Rev.A (same as T2)
- Battery Model	A3-06-2613
Software Version	
Firmware Version	Rev.A (same as T2)
Other (Specify)	

**1.2.8 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: Chung Tong

Name: Chung Tong

Position Held: Principal electrical Engineer

Date: 01/15/2009

### 1.3 PRODUCT INFORMATION

#### 1.3.1 Product Variants

Variants of the EUT include:

- PLB-350A (Non-GPS) Slim
- PLB-350A (Non-GPS) Floatation
- PLB-350B (GPS Enabled) Slim
- PLB-350B (GPS Enabled) Floatation

Full details can be found in the Application Form (Section 1.2) and manufacturer's documentation.

One sample of each of the above variants was supplied by the customer, in a configuration as would be found in the final end-user/retail scenario.

The above samples were designated the "Primary Samples". "Secondary Samples" were as follows: For the purposes of certain tests, modified samples incorporating a 50Ω output were provided. Furthermore, some physically identical duplicates were provided with different message coding.

For each test, the intention of the test was analysed and appropriate samples chosen for said test. E.g. where radio characteristics were under scrutiny, 50Ω conducted samples were used. Where physical characteristics were tested, fully packaged 'retail' style units were used.

#### 1.3.2 Technical Description

The Equipment Under Test (EUT) was a ACR Electronics Inc PLB-350B and PLB-350A as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test PLB-350B (Slim) Serial Number: #5



Equipment Under Test PLB-350A (Floatation) Serial Number: #20

### 1.3.3 Physical Configuration

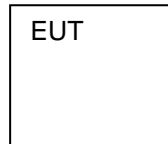
The Primary Equipment Under Test (EUT) samples (see section 1.3.1) were operated using their own power source i.e. internal batteries. They also radiated through their antenna as per normal operation.

Secondary EUT were powered the same way, yet configured so that they could be connected to the 50 $\Omega$  test system using a coaxial cable. The 406MHz and 121MHz transmissions came from separate ports.

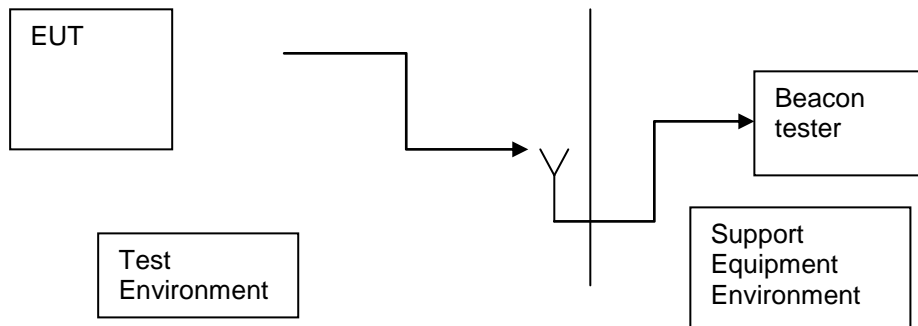


**1.3.4 Test Configuration for EMC Testing**

Standby Mode



Active Mode



**1.3.5 Modes of Operation**

Modes of operation of the EUT during testing were as follows:

Test Mode 1: Idle; Beacon in quiescent state.

Test Mode 2: Operating; Beacon activated using the main “Power” button. 406 MHz and 121 MHz Transmitters active, EUT programmed with test mode as per Cospas-Sarsat T.007. Note: this is sometimes referred to as “Normal” mode due to the normal frame sync.

Test Mode 3: Self-test mode; Beacon activated using the “Test” button. Pre-programmed self-test mode runs and beacon subsequently returns to Idle mode.

Specific test modes used are detailed in the test procedure for each individual test.





### 1.3.6 Monitoring of Performance

#### Performance Check

Performance Check, in the scope of this document, consists of measuring the following parameters using a handheld beacon tester.

- 406 MHz transmitted frequency (single burst only)
- 406 MHz digital message (check of 15 Hex ID and full 112 or 144 message bits as appropriate)
- The presence of Auxiliary Radio-Locating Device transmissions

#### Performance Test

A Performance Test comprises one Self-test (as per Performance Check) followed by a period of activation ("Normal" transmissions). During the Performance Test the following parameters were measured:

- 406 MHz transmitter power output
- 406 MHz digital message
- 406 MHz digital message generator (Bit Rate and Stability (C/S T.007 A.3.1.3) only)
- 406 MHz modulation
- 406 MHz transmitted frequency
- 406 MHz spurious output

### 1.3.7 Performance Criterion

EUT must successfully complete the performance check or performance test if required.



#### 1.4 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

#### 1.5 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
<b>Sample Number: 055</b>			
0	As supplied by manufacturer.	N/A	N/A
1	Software modification to change the 121 Morse P duration.	Chung Tong	11/06/2009

#### 1.6 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV Product Service Ltd conducted the following tests at Bearley, Stratford-upon-Avon Test Laboratory:

2.24 Peak Equivalent Isotropic Radiated Power



## **SECTION 2**

### **TEST DETAILS**

Emergency Beacons Testing of the  
ACR Electronics, Inc.  
PLB-350A (Non-GPS) & PLB-350B (GPS Enabled)



**TABLE OF TEST RESULTS**

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
1. PERFORMANCE CHECK						Section 2.1
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
Visual Inspection	No Damage	✓		✓		
Carrier Frequency	406.025 MHz ± 0.002 MHz or Other ± 0.001 MHz			✓		
Digital Message	15 Hex / 30 Hex Correct	✓		✓		
121 MHz Homer						
<b>Note</b> Wherever a Performance Check is called for in these Test Results Tables it also includes a Visual Inspection of the PLB.	Functional	✓		✓		
2. DRY HEAT TEST (A.3)						Section 2.2
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
Post-Storage Performance Check	Pass/Fail	✓			✓	
Performance Test	Pass/Fail	✓			✓	
Performance Check	Pass/Fail	✓			✓	
3. DAMP HEAT TEST (A.4)						Section 2.3
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
Performance Check	Pass/Fail	✓			✓	



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
4. LOW TEMPERATURE TEST(A.5)						Sections 2.4 and 2.5
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
Post-Storage Performance Check	Pass/Fail	✓	✓			*Combined with Operational Life Test.
Performance Test	Pass/Fail	✓	N/A *			
Performance Check	Pass/Fail	✓	N/A *			
5. VIBRATION TEST (A.6)						Section 2.6
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
During Test no Activation	No activation during test	✓		✓		
Performance Check	Pass/Fail	✓		✓		
6 BUMP TEST (A.7)						Section 2.7
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
During Test, No Activation	No activation during test	✓		✓		
Performance Check	Pass/Fail	✓		✓		
7. CORROSION TEST (A8)						Section 2.8
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
No sign of corrosion, peeling paint and other signs of deterioration.	Pass/Fail	✓		N/A		* Test waived, see Annex A for details.
Performance Check	Pass/Fail	✓		N/A		



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
8. DROP TEST (A.9)						Section 2.9
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
During Test no Activation	No activation during test	✓	✓			
Performance Check	Pass/Fail	✓	✓			
9. THERMAL SHOCK (A.10)						Section 2.10
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
After test examine for signs of water ingress	No evidence of water ingress	✓	✓			
Performance Check	Pass/Fail	✓	✓			
9. IMMERSION TEST (A.11)						Sections 2.11 & 0
<b>Test Samples:</b> PLB-350A Floatation - S/N #20, PLB-350B Floatation - S/N #22, PLB-350A Slim - S/N #18 & PLB-350B Slim - S/N #5						<b>Result:</b> Pass
Performance Check	Pass/Fail	✓		✓		
Open unit and examine for sign any water ingress	No evidence of water ingress	✓		✓		
10. SPURIOUS EMISSIONS TEST (A.12)						Section 2.13
<b>Test Samples:</b> - S/N						<b>Result:</b> Pass
Close in emissions	Comply with Figures 2 and 6	✓	✓	✓	✓	
Aeronautical, Maritime and Satellite Band Emissions	No signal to exceed 25µW in stated bands	✓		✓		



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
12. OPERATIONAL LIFE AND SELF TESTS (A.13)						Sections 0 & 2.15
<b>Test Samples:</b> PLB-350B Slim - S/N #2 & PLB-350A Floatation - S/N #7						<b>Result:</b> Pass
Operational Life	24 Hours min	✓	✓			Note: Test combined with that of C/S T.007 test campaign.
Pre-test battery discharge duration (operating) required	-	hours	9.07			Operational Life = 33.2 hours (Time to First Failure – (required pre-test discharge – actual discharge)).
Pre-test battery discharge duration (operating)	-	hours	4.27			
Time to First Failure	-	hours	38.00			
Transmitted Frequency	Pass/Fail	✓	✓			Where two results are displayed the upper is the minimum value across 24 hours, the lower is the maximum.
Nominal value	C/S T.001	MHz	406.036660 406.036664			
Short-term stability	≤ 2x10 <sup>-9</sup>	/100ms	6.467x10 <sup>-11</sup> 2.502x10 <sup>-10</sup>			Operational life test performed with GPS variant only as this represents the highest current drain.
Medium-term stability – Slope	(-1 to +1)x10 <sup>-9</sup>	/min	-8.612x10 <sup>-11</sup> 1.625x10 <sup>-10</sup>			
Medium-term stability – Residual frequency variation	≤ 3x10 <sup>-9</sup>		5.789x10 <sup>-11</sup> 6.464x10 <sup>-10</sup>			
Transmitter power output	35 - 39	dBm	36.935 38.003			See main section for plots.
Digital message	correct	✓	✓			
121 Peak Envelope Output Power	✓	✓	✓			
Self-test						
RF Pulse Duration	≤ 0.444 sec or ≤ 0.525 sec	✓		✓		
Frame synchronization pattern	0 1101 0000	✓		✓		
Number of RF bursts	1-burst	✓		✓		
Beacon 15 Hex ID	Must be provided	✓		✓		
121.5 MHz transmission	≤ 1 sec / 3 sweeps	✓		✓		



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
13. Cospas-Sarsat TYPE APPROVAL TESTS (A.14)	C-S Certificate (attach C/S test report)	✓	✓			Section 2.16
14. BUOYANCY TEST (Category 1 PLBs only) (A.15)						Section 2.17
<b>Test Samples:</b> PLB-350A Floatation - S/N #20 & PLB-350B Floatation - S/N #22						<b>Result:</b> Pass
A.15.1 Buoyancy	Floats	✓		✓		
A.15.2 Floating Upright (PLBs designed to work floating in water only)	Self rights	<2s		N/A		
15. 121.5 MHz AUXILLY RADIO-LOCATING DEVICE TRANSMITTER TEST (A.16)						
<b>Test Sample:</b> PLB-350A Floatation - S/N #7						<b>Result:</b> Pass
Carrier Frequency	121.5 ± 0.006075					Section 2.18
Transmitter Duty Cycle	Continuous interrupted for up to a maximum of 2 seconds encompassing the 406 MHz burst and plus the additional time required for the Morse "P" transmission.	✓	✓		✓	Section 2.19
Modulation						Section 2.20
Frequency	≥ 700 Hz within 300 – 1600Hz	✓	✓		✓	
Duty Cycle	33 – 55	%	34.63		36.94	
Factor	0.85 – 1.0	✓	0.961		0.935	Section 2.21
Sweep Repetition Rate	2 – 4	Hz	2.65		2.65	
Frequency Coherence	✓	✓	✓		✓	Section 2.22





PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
15. 121.5 MHz AUXILLY RADIO-LOCATING DEVICE TRANSMITTER TEST (A.16)						
<b>Test Sample:</b> PLB-350B Slim - S/N #2						<b>Result:</b> Pass
Carrier Frequency	121.5 ± 0.006075	MHz	121.5009417		121.4999525	Section 2.18
Transmitter Duty Cycle	Continuous interrupted for up to a maximum of 2 seconds encompassing the 406 MHz burst and plus the additional time required for the Morse "P" transmission.	✓	✓		✓	Section 2.19
Modulation						Section 2.20
Frequency	≥ 700 Hz within 300 – 1600Hz	✓	✓		✓	
Duty Cycle	33 – 55	%	34.63		36.94	
Factor	0.85 – 1.0	✓	0.946		0.935	Section 2.21
Sweep Repetition Rate	2 – 4	Hz	2.65		2.65	
Frequency Coherence	✓	✓	✓		✓	Section 2.22



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
15. 121.5 MHz AUXILLY RADIO-LOCATING DEVICE TRANSMITTER TEST (A.16)						Section 2.23
<b>Test Sample:</b> PLB-350B Slim Not Serialised, TUV Reference 75905359_055						<b>Result:</b> Pass
Morse Letter P						Testing performed on one sample only as the manufacturer has declared that there is no difference between PLB-350A and PLB-350B in the 121.5MHz design.
Dot Length	115 ms ± 5%	ms	113.380		113.220	
Dash Length	345 ms ± 5%	ms	350.245		350.238	
Gap	115 ms ± 5%	ms	117.450		117.615	
Mod Frequency	1000 Hz ± 50Hz	Hz	989.1		999.4	
<b>Test Sample:</b> PLB-350A Floatation - S/N #20						<b>Result:</b> Pass
PEIRP (Radiated)	Median 25 – 100 mW	mW		28.085		Section 2.24
Max PEIRP	Value	mW		28.085		
Min PEIRP	Value	mW		26.821		
Ratio Max – Min	< 4:1 (<6dBm)	dB		0.20		
Off Ground Plane PEIRP	≥ 2 mW	mW		13.756		
<b>Test Sample:</b> PLB-350B Floatation - S/N #22						<b>Result:</b> Pass
PEIRP (Radiated)	Median 14 – 20 dBm (25 – 100 mW)	mW		30.79		Section 2.24
Max PEIRP	Value	mW		30.795		
Min PEIRP	Value	mW		28.739		
Ratio Max – Min	< 4:1 (<6dBm)	dB		0.29		
Off Ground Plane PEIRP	≥ 2 mW	mW		12.838		



Product Service

PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
15. 121.5 MHz AUXILLY RADIO-LOCATING DEVICE TRANSMITTER TEST (A.16)						
<b>Test Sample:</b> PLB-350B Slim - S/N #5						<b>Result:</b> Pass
PEIRP (Radiated)	Median 14 – 20 dBm (25 – 100 mW)	mW		30.094		Section 2.24
Max PEIRP	Value	mW		32.246		
Min PEIRP	Value	mW		28.085		
Ratio Max – Min	< 4:1 (<6dBm)	dB		0.06		
Off Ground Plane PEIRP	≥ 2 mW	mW		11.981		
16. SOLAR RADIATION TEST (A.17)						Section 2.25
After Test visually inspect unit and carry out Performance Check (see 1 above)	Pass/Fail	✓		N/A *		* Test waived, see Annex A for details.
17. OIL RESISTANCE TEST (A.18)						Section 2.26
After Test visually inspect unit and carry out Performance Check (see 1 above)	Pass/Fail	✓		N/A *		* Test waived, see Annex A for details.



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
18. COMPASS SAFE DISTANCE TEST (A.19)						Section 2.27
<b>Test Sample:</b> PLB-350B Slim - S/N #14						<b>Result:</b> Pass
Standard Compass Safe Distance	-	m		0.3		
Emergency Compass Safe Distance	-	m		0.2		
<b>Test Sample:</b> PLB-350A Floatation - S/N #20						<b>Result:</b> Pass
Standard Compass Safe Distance	-	m		0.2		
Emergency Compass Safe Distance	-	m		0.2		
19. MISCELLANEOUS TESTS (A.20)						Section 2.28
A.20.1 Controls and Indicators						Note: For Section 19 of this table "✓" denotes that the particular parameter or feature was inspected and observations reported at the main section or that Information supplied by the customer is supplied at Annex A. No final decision or comment is made upon compliance.
PLB complies with 4.4.1	Inspection	✓		✓		
Two independent step activations	Inspection	✓		✓		
Means to indicate previous activation	Inspection	✓		✓		
Visual or Audible indication of activation	Inspection	✓		✓		
A.20.2 Self-Test and GNSS Self Test Function						
Self Test automatically resets	Inspection	✓		✓		
Self Test has indication of activation	Inspection	✓		✓		
Manufacturers declaration complies with 4.4.2 a), b) and c)	Inspection	✓		✓		
GNSS Self Test (if applicable)						
Distinct Means of Operation	Inspection	✓		✓		
Prevents Inadvertent Operation	Inspection	✓		✓		
Distinct Pass/Fail Indicators	Inspection	✓		✓		
Manufacturers declaration complies with 4.4.2 c), d), e) and f)	Inspection	✓		✓		



PARAMETER TO BE MEASURED	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			T <sub>min</sub> (-20°C)	T <sub>amb</sub>	T <sub>max</sub> (+55°C)	
19. MISCELLANEOUS TESTS (A.20) continued...						Section 2.28
A.20.3 Battery						
Labelling complies with 4.5.2.1	Inspection	✓		✓		
Manufacturer has provided evidence that Battery and Cells are either exempt from or meet UN Dangerous Goods regulations	Inspection	✓		✓		
A.20.4 General Construction						
PLB complies with 4.5	Inspection	✓		✓		
A.20.5 Exterior Finish						
PLB complies with 4.5.1	Inspection	✓		✓		
A.20.6 Labelling						
Labelling complies with 4.5.2.2 to 4.5.2.2.4	Inspection	✓		✓		
Labelling tested for Abrasion Resistance	Inspect manufacturers report	✓		✓		
Instructions and Pictograms tested for Comprehension	Inspect manufacturers report	✓		✓		
A.20.7 Documentation						
Manual complies with 4.5.3	Inspection	✓		✓		
Packaging complies with 4.5.4	Inspection	✓		✓		



## 2.1 PERFORMANCE CHECK

### 2.1.1 Specification Reference

RTCM 11010.2:2008, Clause A.1.13

### 2.1.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.1.3 Date of Test and Modification State

23 January 2009 - Modification State 0

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Operating Modes

The test was performed with the EUT in the following mode(s): Normal and Self-test

### 2.1.6 Environmental Conditions

Ambient Temperature	21.2 °C
Atmospheric Pressure	987 mbar

### 2.1.7 Test Results

#### Visual Inspection

Prior to the start of the testing schedule the EUT was visually inspected. No signs of damage were found.

#### Performance Check

A Performance Check was conducted to ensure EUT was functional before all upcoming tests; measurements were made using a handheld beacon tester and a spectrum analyser for 121MHz measurements. A calibrated frequency reference was connected to the beacon tester to ensure traceable frequency measurements. A summary of the results follows.



Summary of Performance Check results

Parameter	Result for S/N #20	Result for S/N #22
Self-test Mode:		
Self-test Message	FFFED04C9EA00004000D6F145F40	FFFED096EE2F80057FDFF9C52977
Normal Mode:		
Normal Message	FFFE2F4C9EA00004000D6F145F40	FFFE2F96EE2F80057FDFF9C5297783E0F66C
406 MHz Frequency	406.036609 MHz	406.036911 MHz
121 MHz Presence	✓	✓

Parameter	Result for S/N #18	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED04C9EA00006000D6B58CF40	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F4C9EA00006000D6B58CF40	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036608 MHz	406.036606 MHz
121 MHz Presence	✓	✓

## 2.2 DRY HEAT TESTS

### 2.2.1 Specification Reference

RTCM 11010.2:2008, Clause A.3

### 2.2.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.2.1 Date of Test and Modification State

29 and 30 January 2009 - Modification State 0

### 2.2.2 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.3 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.

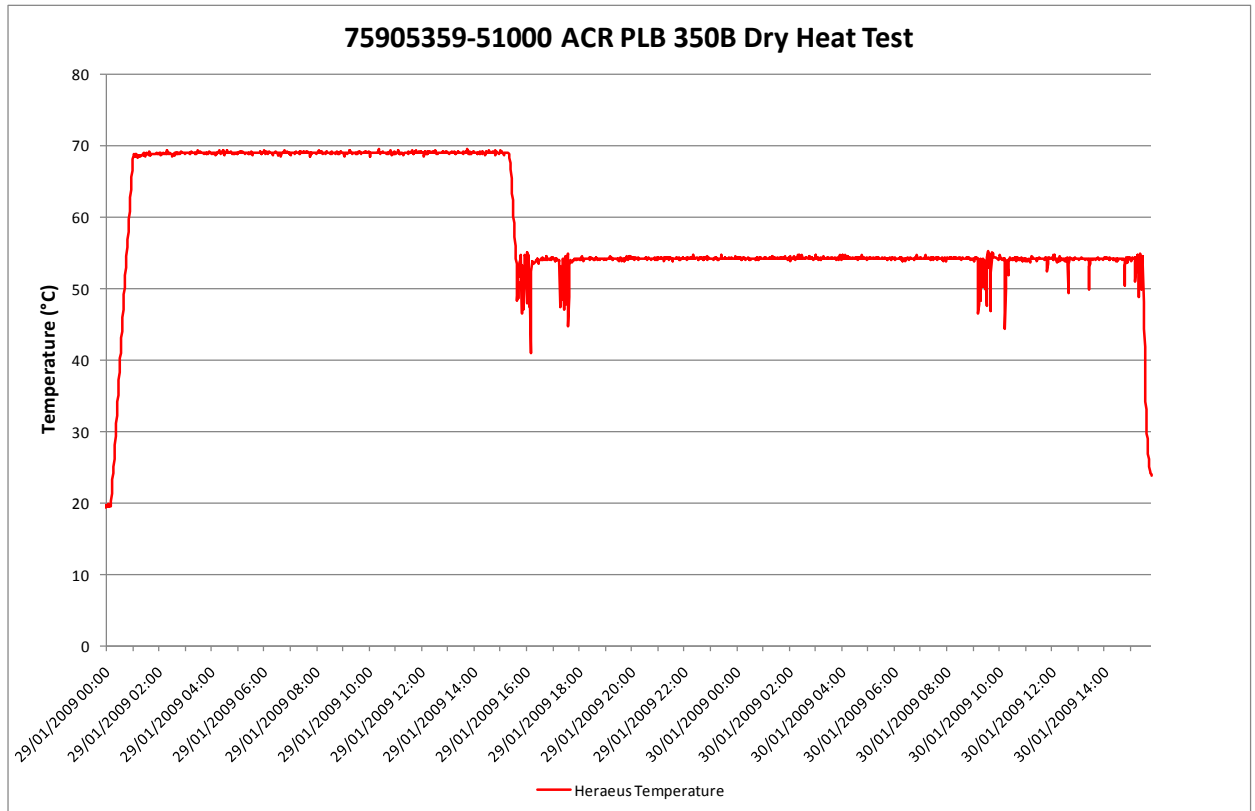


Test Set-up



## 2.2.4 Environmental Conditions

### Dry Heat Cycle Temperature Plot



## 2.2.5 Performance Checks and Tests

As the two EN 60945 tests (storage and functional) were combined so as to be similar to the Dry Heat Test of EN 302 152-1 (for the purposes of another type approval) the required performance checks and tests were as follows (in order performed):

(Format is: <Stage Check/Test Performed>: <Standard Requiring the Test>, <Type of Check/Test>)

- Post-Storage Period at +70°C: EN 60945 (Storage), Performance Check
- During +55°C Operational Period: EN 60945 (Functional), Performance Test (first part)
- End of 2 hour Operational Period at +55°C: EN 302 152-1, Performance Check.  
(Doubles as During +55°C Operational Period: EN 60945 (Functional), Performance Check)
- Post- +55°C Extended Operational Period: EN 60945 (Functional), Performance Check



**2.2.6 Test Results**

Post-Storage Period at +70°C: EN 60945 (Storage), Performance Check PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED096EE2F80057FDFF9C52977	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Output Frequency	406.036914 MHz	406.036602 MHz
121 MHz Presence	✓	✓

Post-Storage Period at +70°C: EN 60945 (Storage), Performance Check PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FFFED04C9EA00004000D6F145F40	FFFED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFE2F4C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Output Frequency	406.036621 MHz	406.036605 MHz
121 MHz Presence	✓	✓



During +55°C Operational Period: EN 60945 (Functional), Performance Test

Parameter	Result for S/N #22	Result for S/N #5
Output Power	N/A	N/A
Digital Message	FFFE2F96EE2F800532E02A3C72 F79CC03741	FFFE2F96EE2F80037FDFFCA6E 1B783E0F66C
15 Hex ID	2DDC5 F000A FFBFF	2DDC5 F0006 FFBFF
Bit Rate: Average (bps)	399.8	399.8
Modulation: Rise Time (uS)	177	220
Modulation: Fall Time (uS)	177	188
Positive Deviation (rad)	+1.19	+1.12
Negative Deviation (rad)	-1.04	-1.09
Nominal Frequency (MHz)	406.036923911	406.036602037
Short-term Stability (/100ms)	9.17E-11	1.82E-10
Medium-term Stability – Slope (/minute)	-4.82E-11	1.30E-11
Medium-term Stability – Residual Frequency Stability (no units)	1.16E-10	1.49E-10
Spurious Emissions	P (see Plot)	P (see Plot)

Parameter	Result for S/N #20	Result for S/N #18
Output Power	N/A	N/A
Digital Message	FFFE2F 4C9EA00004000D6F145F40	FFFE2F 4C9EA00006000D6B58CF40
15 Hex ID	993D4 00008 001AD	993D4 0000C 001AD
Bit Rate: Average (bps)	399.8	400
Modulation: Rise Time (uS)	177	177
Modulation: Fall Time (uS)	188	177
Positive Deviation (rad)	+1.15	+1.1
Negative Deviation (rad)	-1.05	-1.11
Nominal Frequency (MHz)	406.0366009	406.0366032
Short-term Stability (/100ms)	3.27E-10	2.29E-10
Medium-term Stability – Slope (/minute)	1.01E-09	9.58E-11
Medium-term Stability – Residual Frequency Stability (no units)	2.31E-09	2.34E-10
Spurious Emissions	P (see Plot)	P (see Plot)

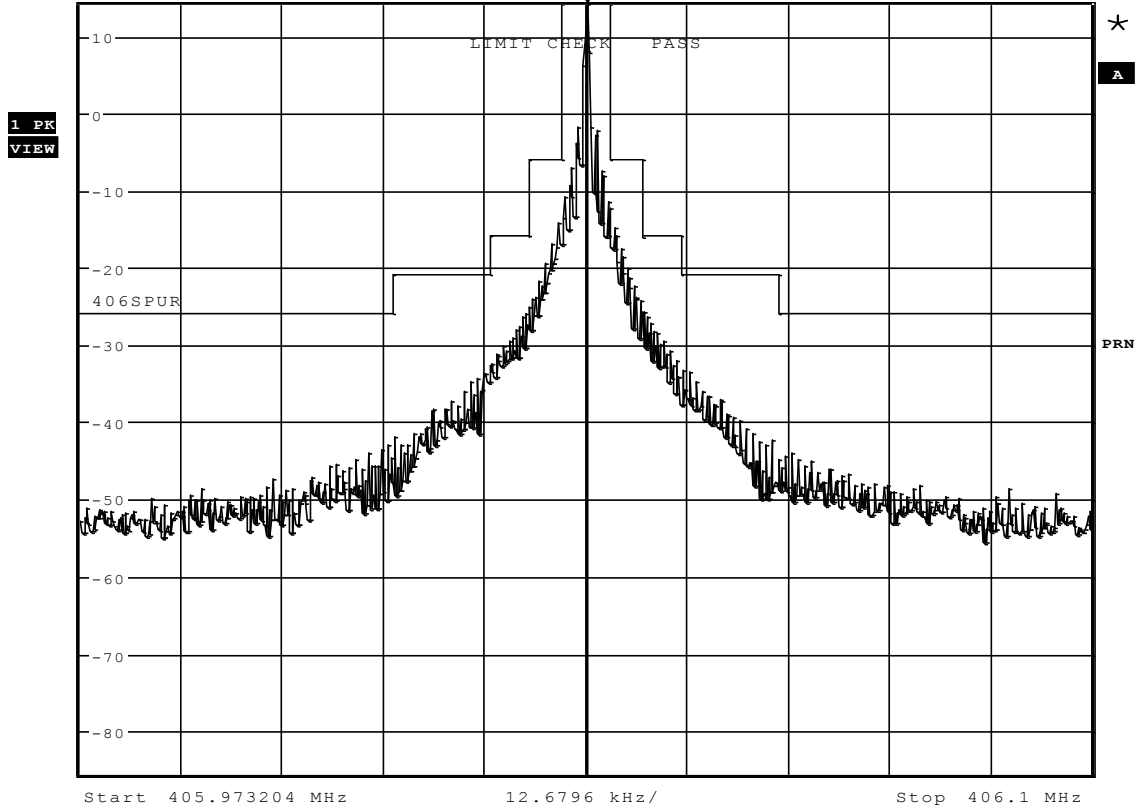
Note: Results here were from a Beacon Tester that was out of calibration, traceability maintained for frequency measurement by using a calibrated external reference. All other measurements are for reference/indication of operation only.





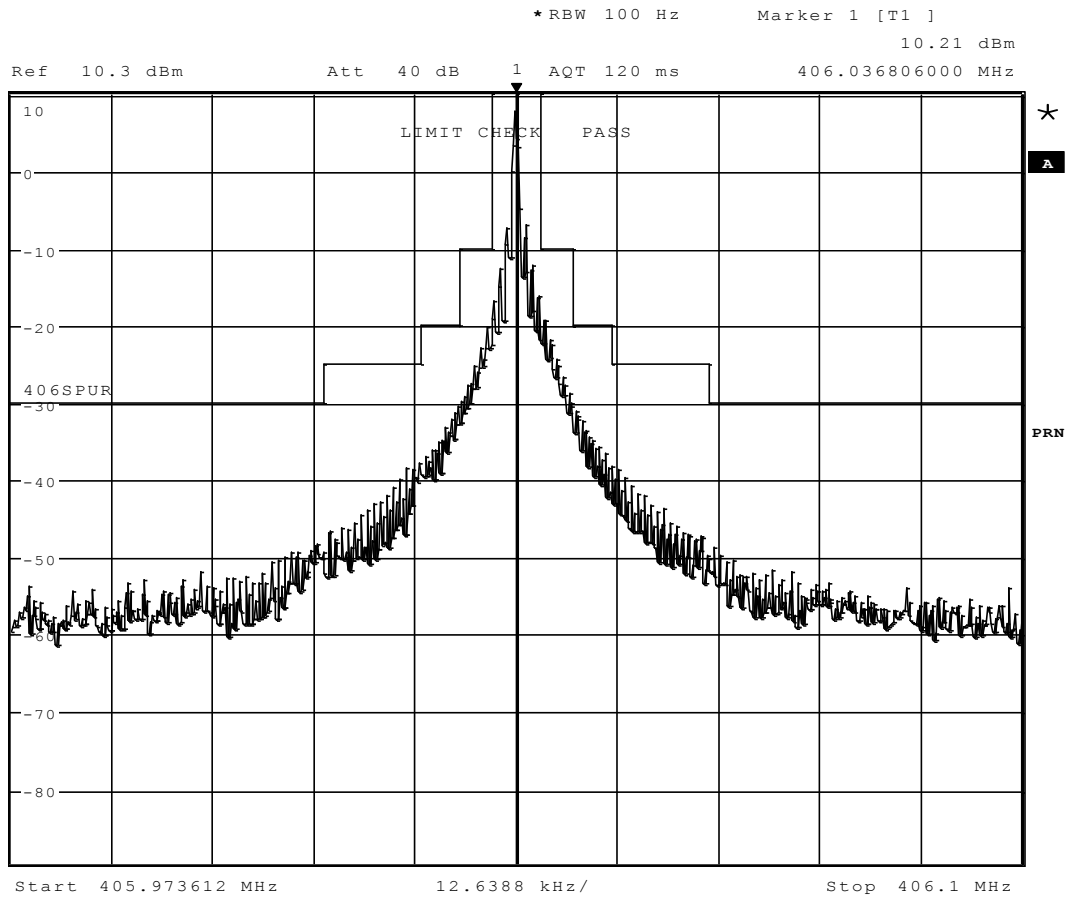
\*RBW 100 Hz      Marker 1 [T1 ]  
14.28 dBm

Ref 14.3 dBm      Att 40 dB      1      AQT 120 ms      406.036805199 MHz



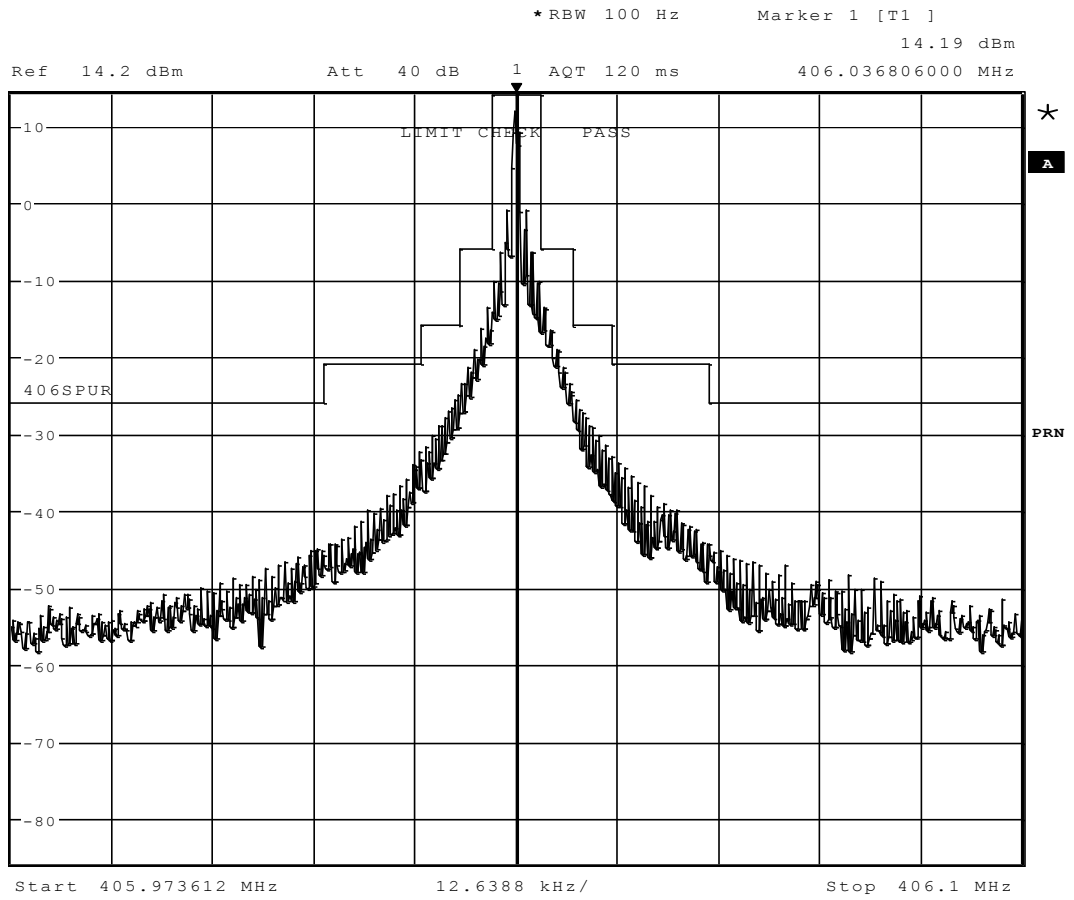
Date: 30.JAN.2009 15:52:16

Spurious Emissions During +55°C Operational Period TUV 16



Date: 30.JAN.2009 16:28:19

Spurious Emissions During +55°C Operational Period TUV 003



Date: 30.JAN.2009 16:22:36

Spurious Emissions During +55°C Operational Period TUV 009



End of 2 hour Operational Period at +55°C: EN 302 152-1, Performance Check

Note: Doubles as During +55°C Operational Period: EN 60945 (Functional), Performance Check

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036923 MHz	406.036606 MHz
121 MHz Presence	✓	✓

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FED04C9EA00004000D6F145F40	FF FED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFE2F4C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Frequency	406.036604 MHz	406.036599 MHz
121 MHz Presence	✓	✓





Post- +55°C Extended Operational Period: EN 60945 (Functional), Performance Check

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED096EE2F80057FDFF9C52977	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036599 MHz	406.036598 MHz
121 MHz Presence	✓	✓

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FFFED04C9EA00004000D6F145F40	FFFED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFE2F4C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Frequency	406.036599 MHz	406.0366 MHz
121 MHz Presence	✓	✓

## 2.3 DAMP HEAT CYCLE

### 2.3.1 Specification Reference

RTCM 11010.2:2008, Clause A.4

### 2.3.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.3.3 Date of Test and Modification State

30 January to 03 February 2009 - Modification State 0

### 2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.3.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Self-test as per Specification Reference above.

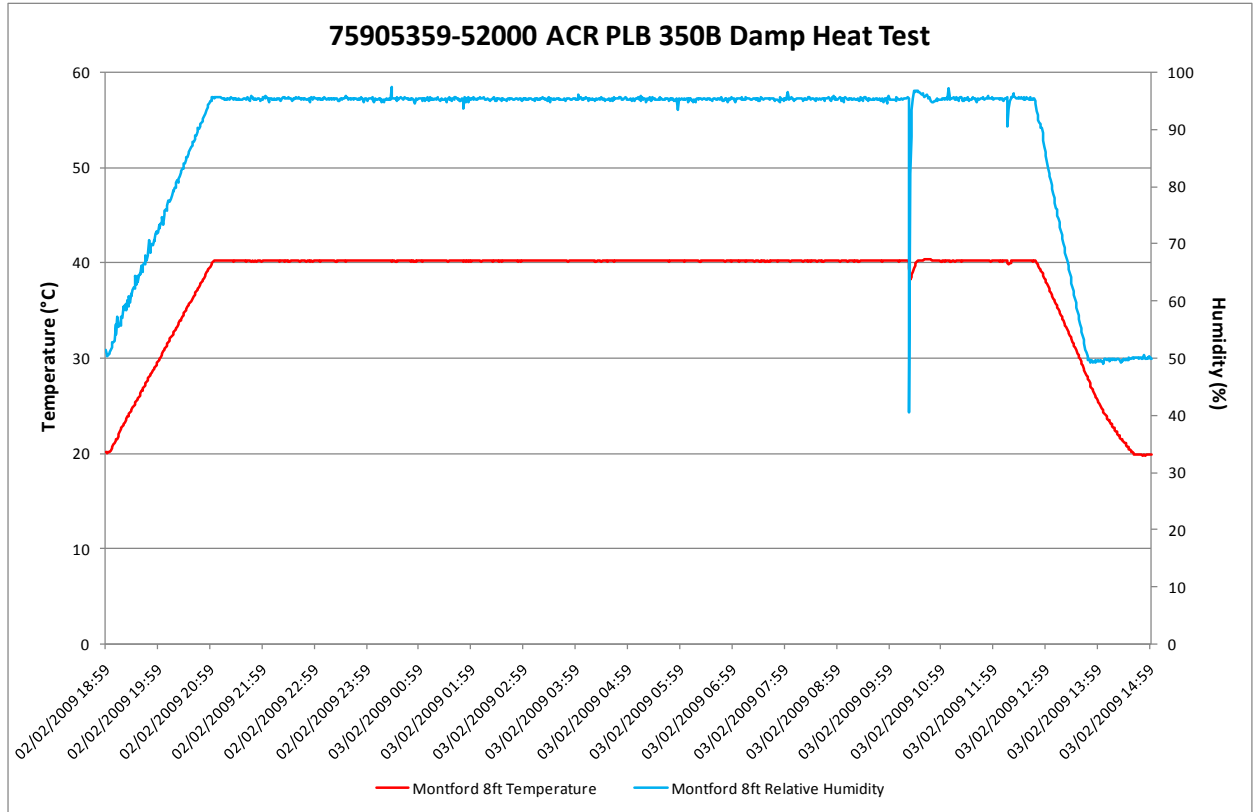


Test Set-up



### 2.3.6 Environmental Conditions

#### Damp Heat Cycle Temperature Plot





**2.3.7 Test Results**

Summary of Performance Check Results (PLB-350B)

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED096EE2F80057FDFF9C52977	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036886 MHz	406.036594 MHz
121 MHz Presence	✓	✓

Summary of Performance Check Results (PLB-350A)

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FFFED04C9EA00004000D6F145F40	FFFED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFED04C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Frequency	406.036604 MHz	406.036576 MHz
121 MHz Presence	✓	✓

## 2.4 LOW TEMPERATURE TEST (STORAGE)

### 2.4.1 Specification Reference

RTCM 11010.2:2008, Clause A.5 (Paragraph 1)

### 2.4.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.4.3 Date of Test and Modification State

05 February to 10 February 2009 - Modification State 0

### 2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.4.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Self-test as per "Specification Reference", above.

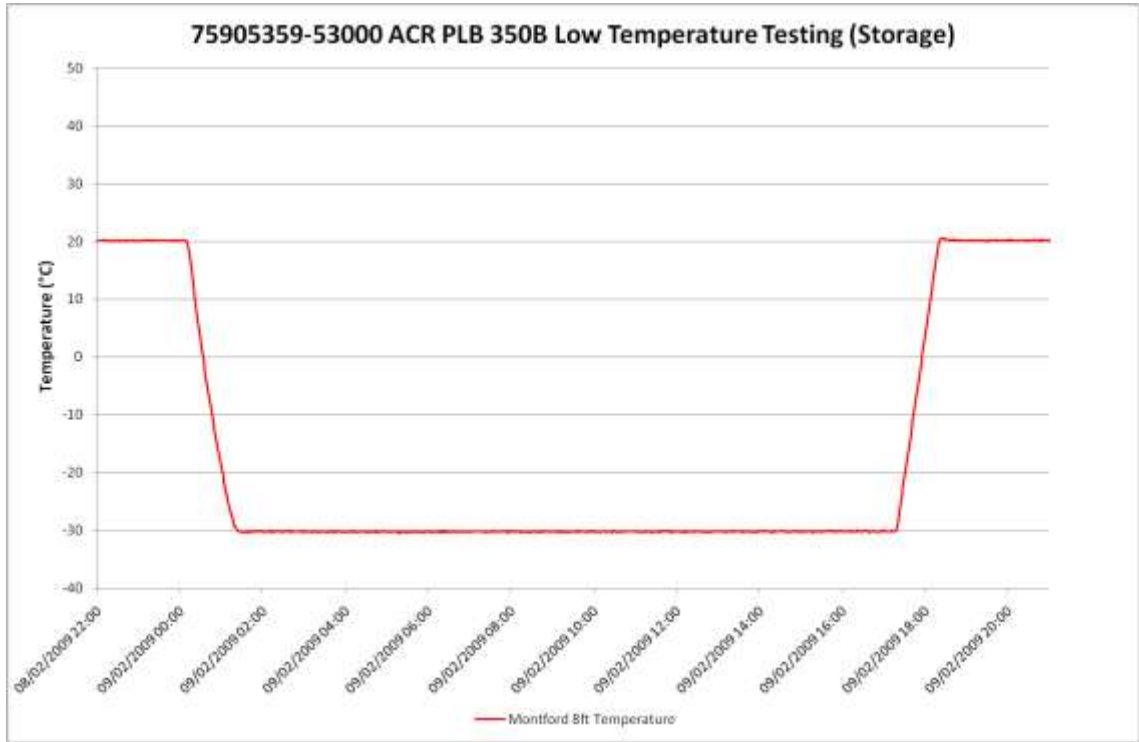


Test Set-up



### 2.4.6 Environmental Conditions

#### Low Temperature Plot (Storage)





**2.4.7 Test Results**

The EUT was placed in a climatic chamber and the temperature was reduced to -30°C. After 16 hours, the EUT was subjected to a performance check. Completing the performance check at -30°C represents a worst case scenario compared to normal environmental conditions.

Summary of Performance Check Results

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036931 MHz	406.03666 MHz
121 MHz Presence	✓	✓

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FED04C9EA00004000D6F145F40	FF FED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFE2F4C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Frequency	406.036648 MHz	406.036699 MHz
121 MHz Presence	✓	✓



## **2.5 LOW TEMPERATURE TEST (FUNCTIONAL)**

### **2.5.1 Specification Reference**

RTCM 11010.2:2008, Clause A.5 (Paragraph 2)

### **2.5.2 Test Results**

RTCM 11010.2: *"The low temperature functional test may be combined with the Operational Life test in A.13.1"*

The test was combined with the Operational Life test, details can be found at Section 2.14



## 2.6 VIBRATION TESTS

### 2.6.1 Specification Reference

RTCM 11010.2:2008, Clause A.6

### 2.6.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.6.3 Date of Test and Modification State

12 and 13 February 2009 - Modification State 0

### 2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.6.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle



Test Set-up



**2.6.6 Test Results**

For each axis a resonance search was conducted, see Control Channel (input) and Response Channel (output/EUT response) plots. If no resonance was found the endurance run was performed at 30Hz, see following Control Channel and Response Channel plots. The resonance search was not performed for the slim variant, as the circuitry is identical to the floatation variant.

Summary of Performance Check Results

Stage/Parameter	Results	
	S/N #22	S/N #20
Vertical Axis		
Resonance Search	None found	None found
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED096EE2F80057FDF9C52977	FFFED04C9EA00004000D6F145F40
Normal Message	FFFE2F96EE2F80057FDF9C5297783E0F66C	FFFE2F4C9EA00004000D6F145F40
406 MHz Frequency	406.03691 MHz	406.036627 MHz
121 MHz Presence	✓	✓
Lateral Axis		
Resonance Search	None found	None found
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED096EE2F80057FDF9C52977	FFFED04C9EA00004000D6F145F40
Normal Message	FFFE2F96EE2F80057FDF9C5297783E0F66C	FFFE2F4C9EA00004000D6F145F40
406 MHz Frequency	406.03691 MHz	406.036627 MHz
121 MHz Presence	✓	✓
Longitudinal Axis		
Resonance Search	None found	None found
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED096EE2F80057FDF9C52977	FFFED04C9EA00004000D6F145F40
Normal Message	FFFE2F96EE2F80057FDF9C5297783E0F66C	FFFE2F4C9EA00004000D6F145F40
406 MHz Frequency	406.03691 MHz	406.036627 MHz
121 MHz Presence	✓	✓



Stage/Parameter	Results	
	S/N #18	S/N #5
Vertical Axis		
Resonance Search	Not Performed	Not Performed
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED04C9EA00006000D6B58CF40	FFFED096EE2F80037FDFFCA6E1B7
Normal Message	FFFE2F4C9EA00006000D6B58CF40	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036582 MHz	406.03658 MHz
121 MHz Presence	✓	✓
Lateral Axis		
Resonance Search	Not Performed	Not Performed
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED04C9EA00006000D6B58CF40	FFFED096EE2F80037FDFFCA6E1B7
Normal Message	FFFE2F4C9EA00006000D6B58CF40	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036582 MHz	406.03658 MHz
121 MHz Presence	✓	✓
Longitudinal Axis		
Resonance Search	Not Performed	Not Performed
Endurance Run	2 Hours at 30Hz	2 Hours at 30Hz
Self-test Message	FFFED04C9EA00006000D6B58CF40	FFFED096EE2F80037FDFFCA6E1B7
Normal Message	FFFE2F4C9EA00006000D6B58CF40	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036582 MHz	406.03658 MHz
121 MHz Presence	✓	✓

Mechanical Inspection

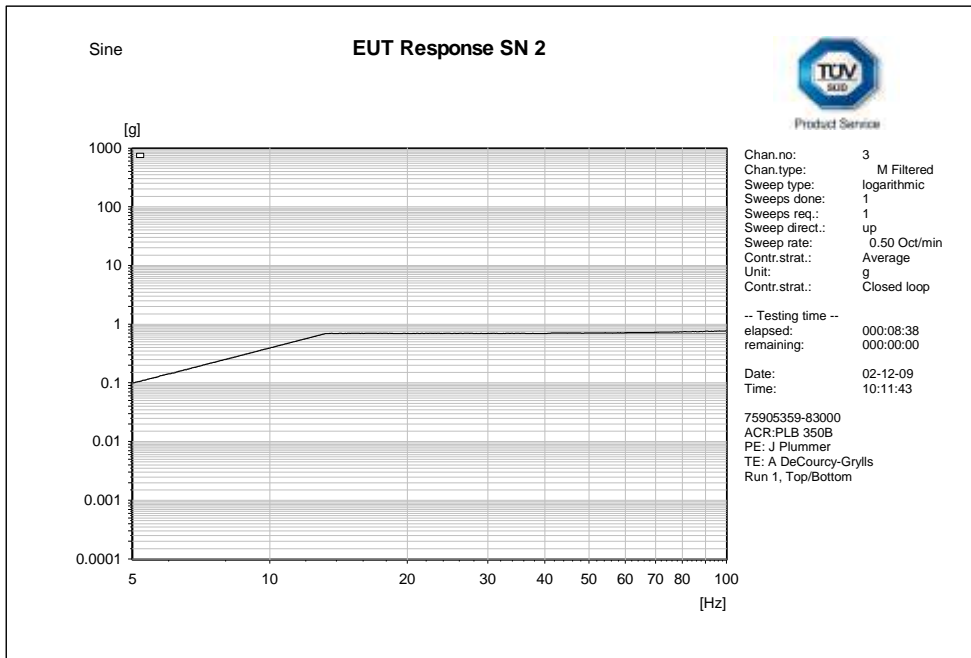
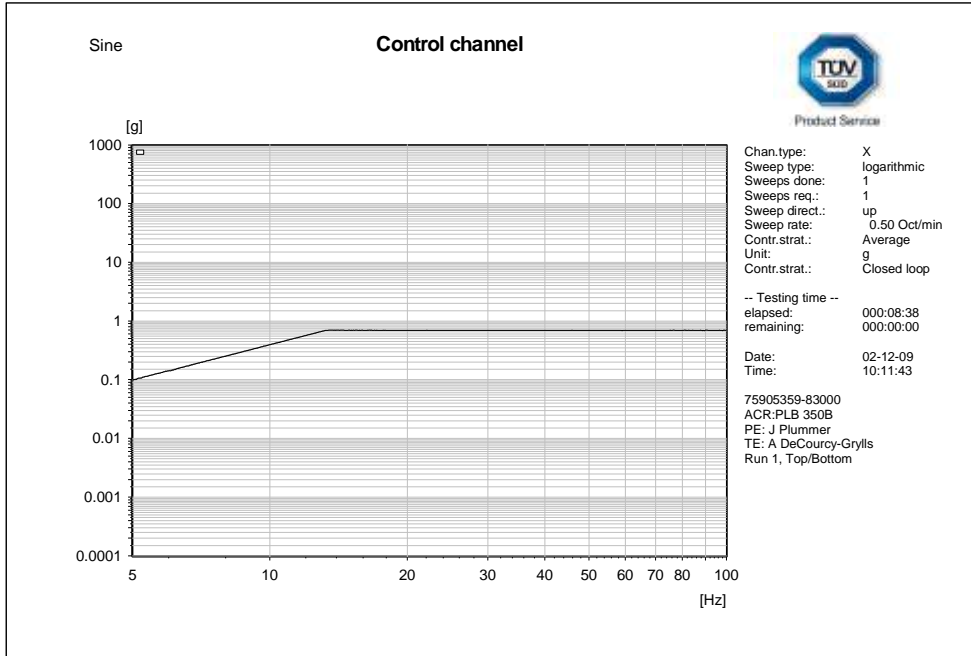
Post test no signs of mechanical degradation could be witnessed.

Activation Monitoring

During the test the EUT was monitored for signs of activation, none were found.

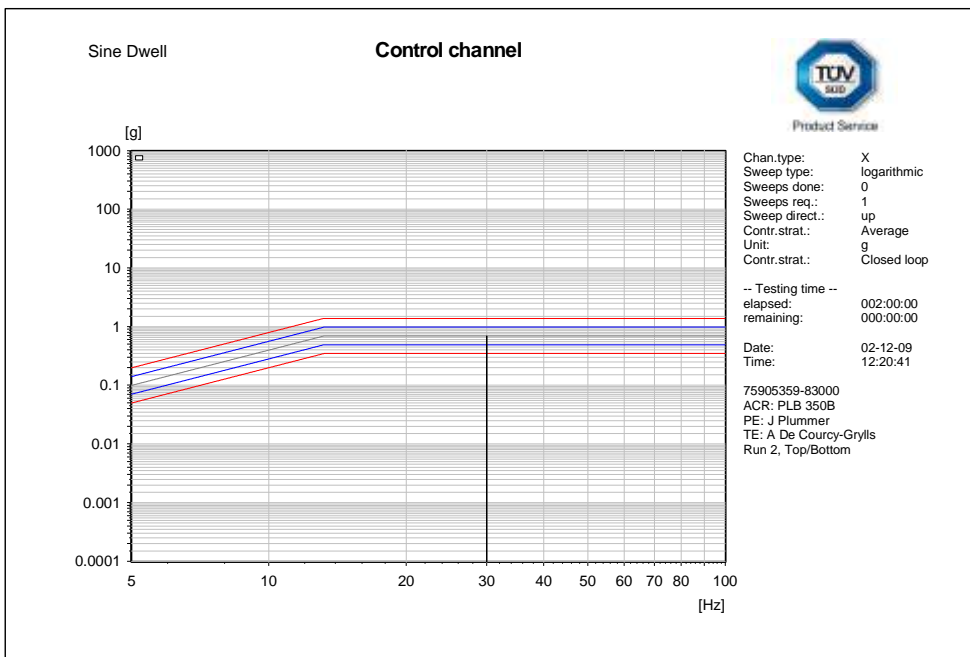
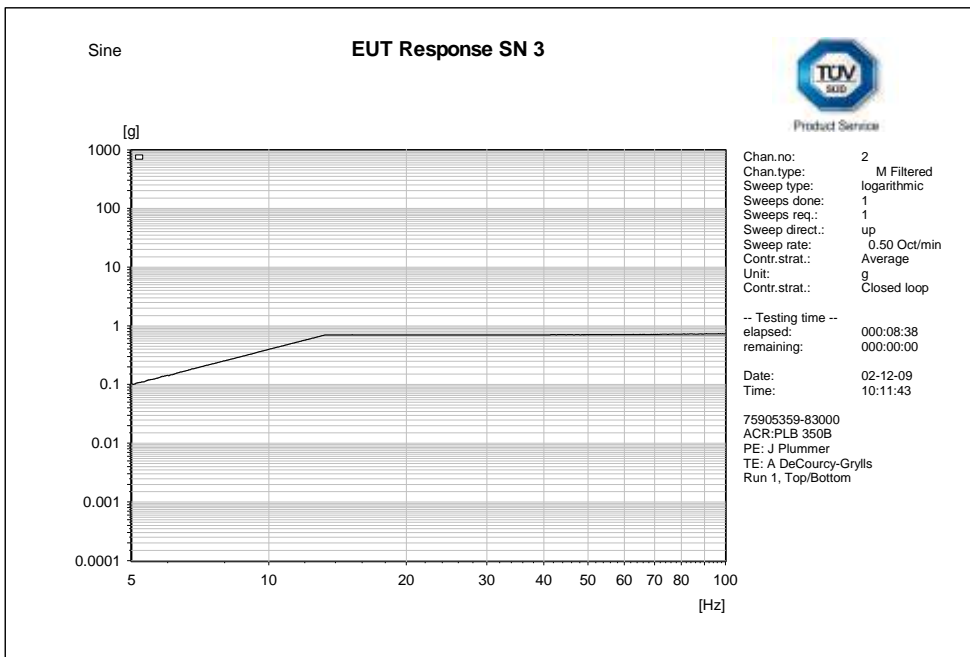


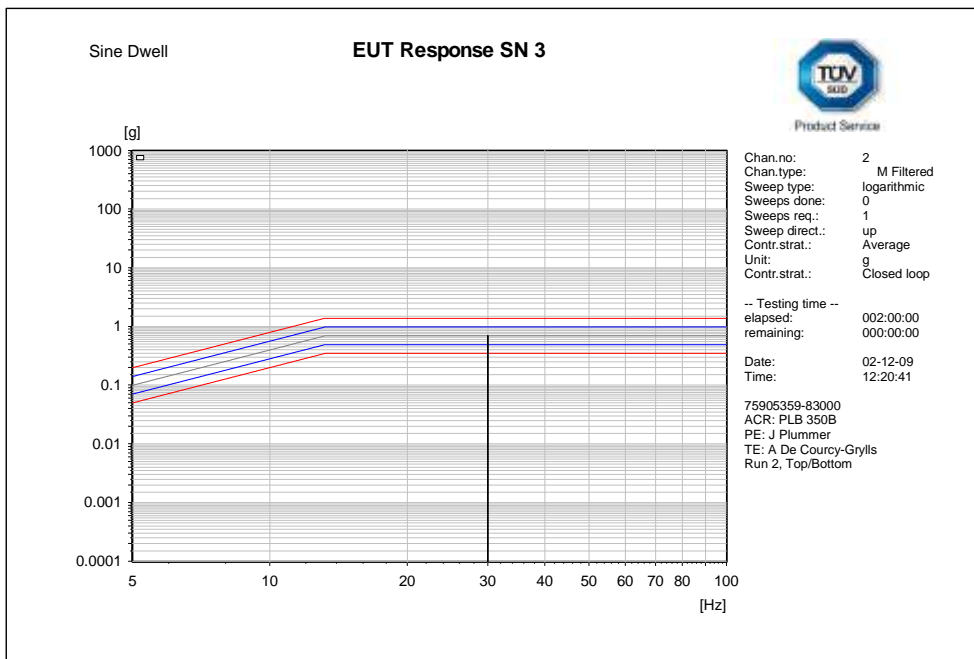
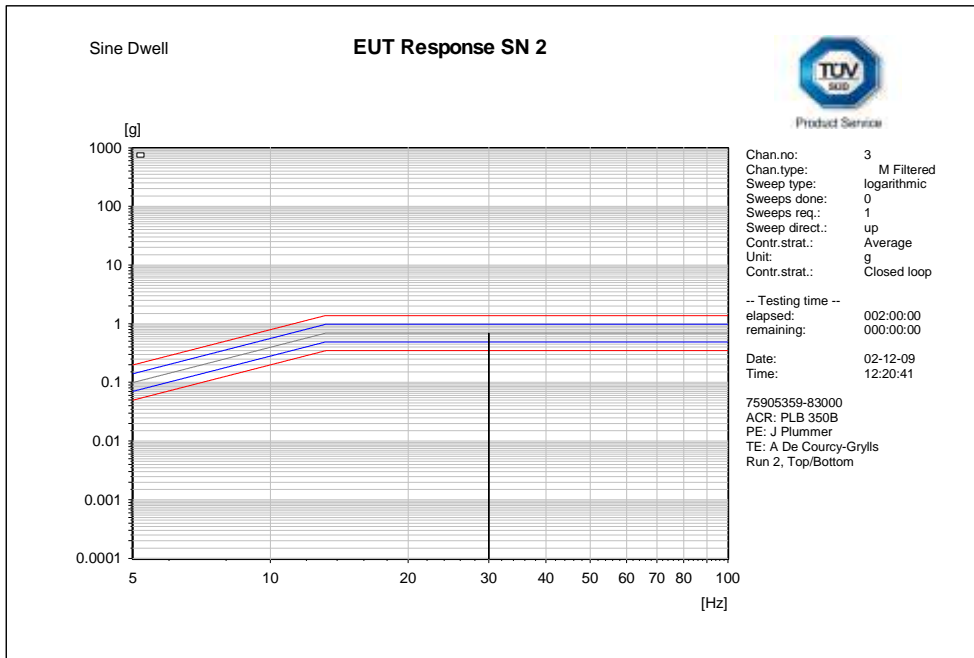
Vertical Axis





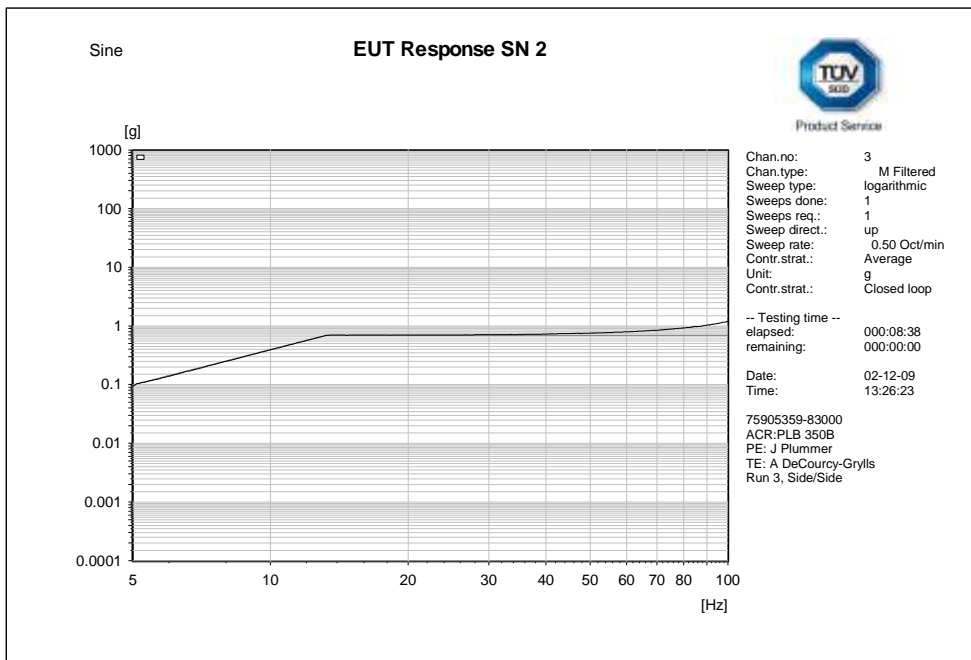
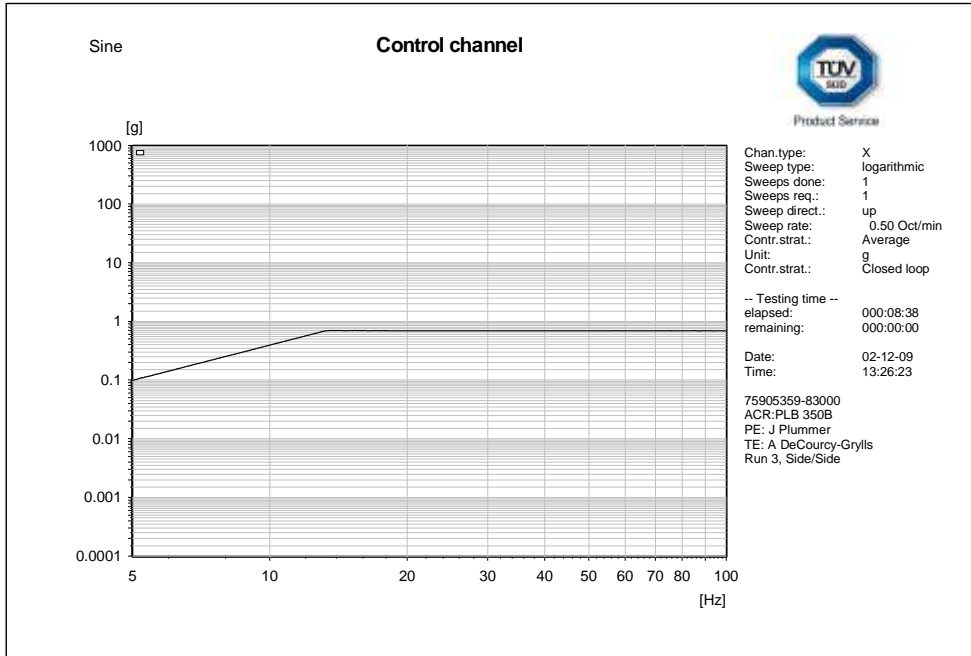
Product Service

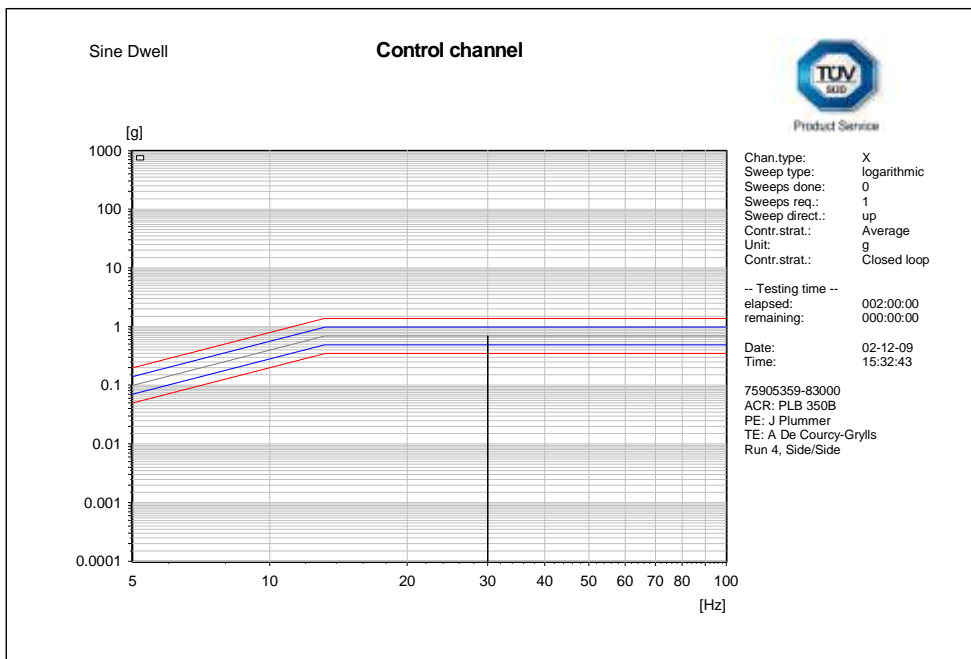
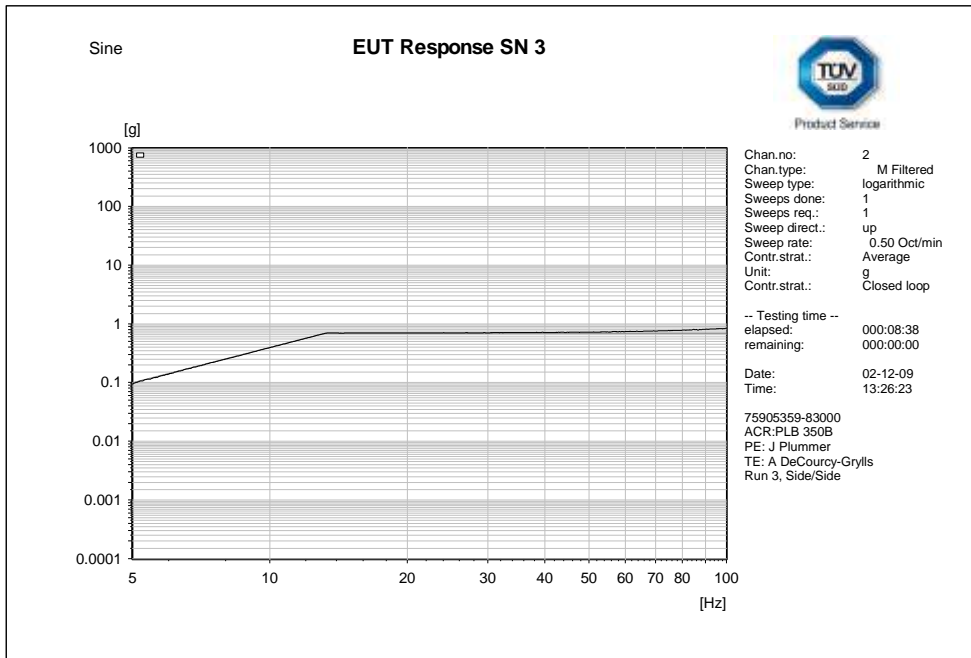




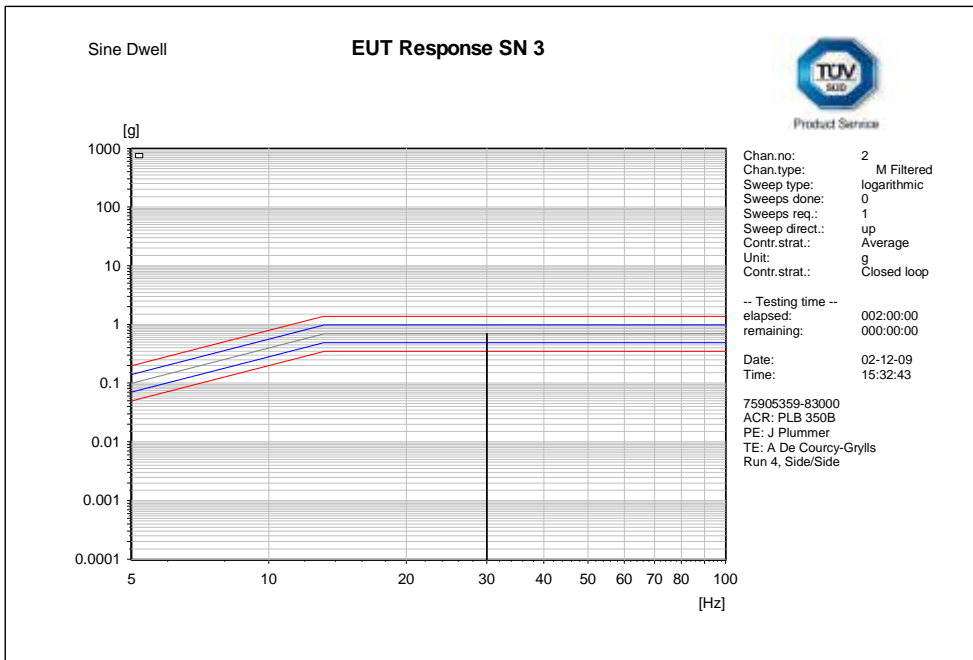
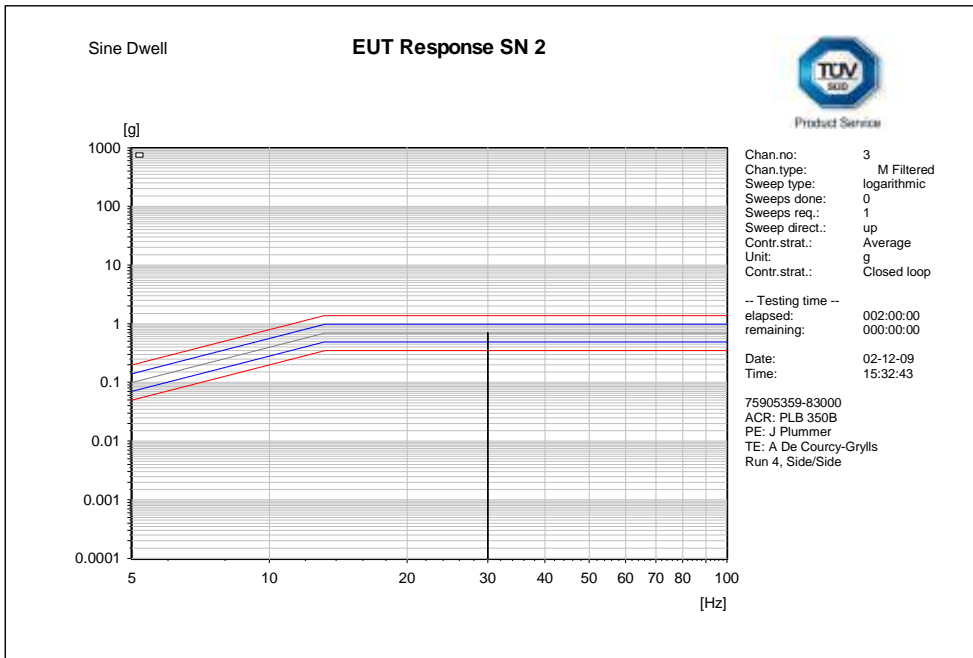


Lateral Axis





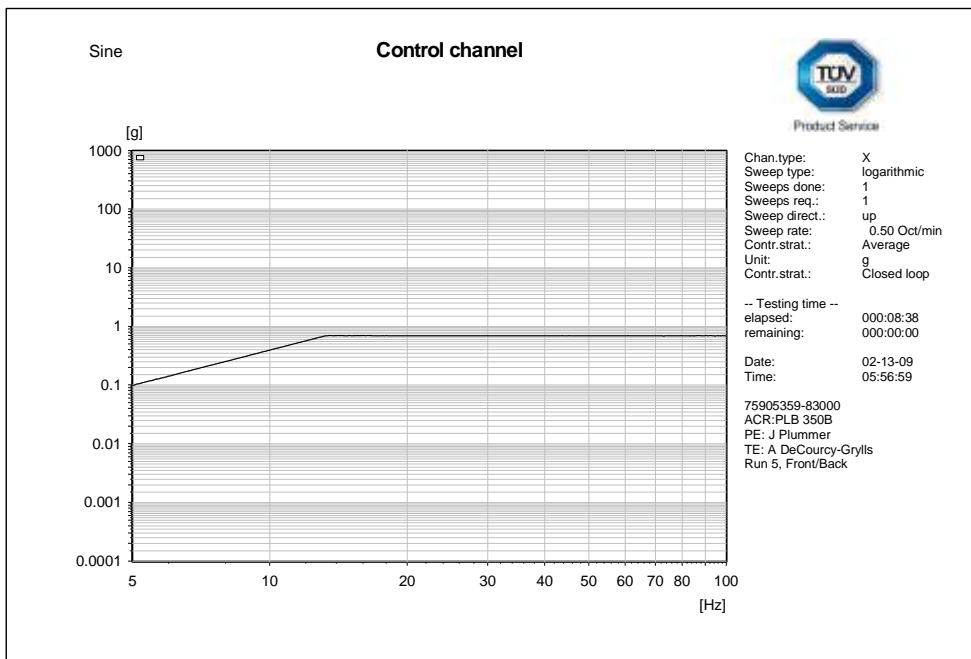




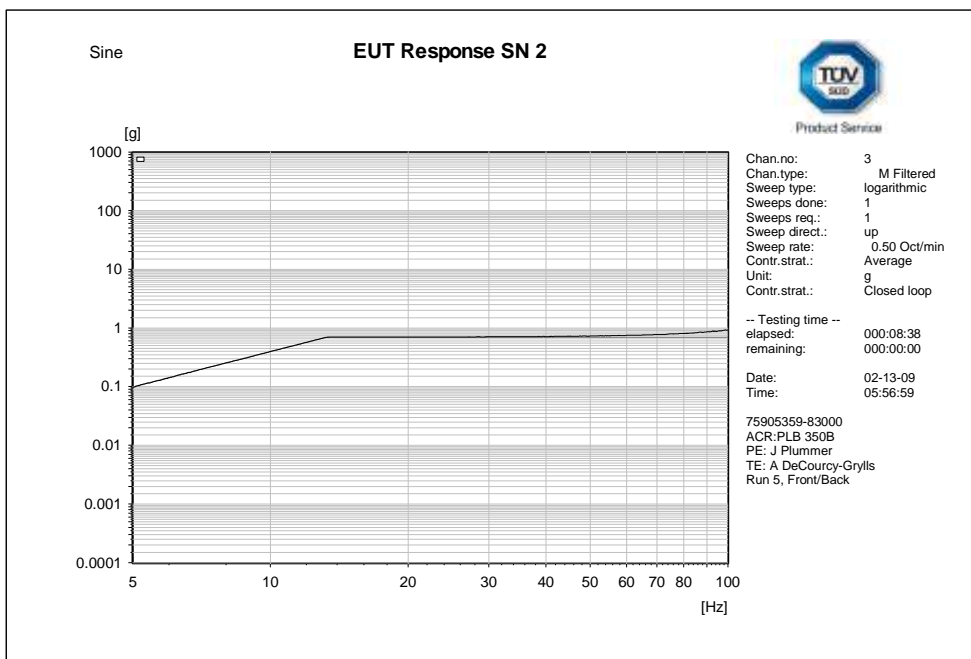


Product Service

Longitudinal Axis



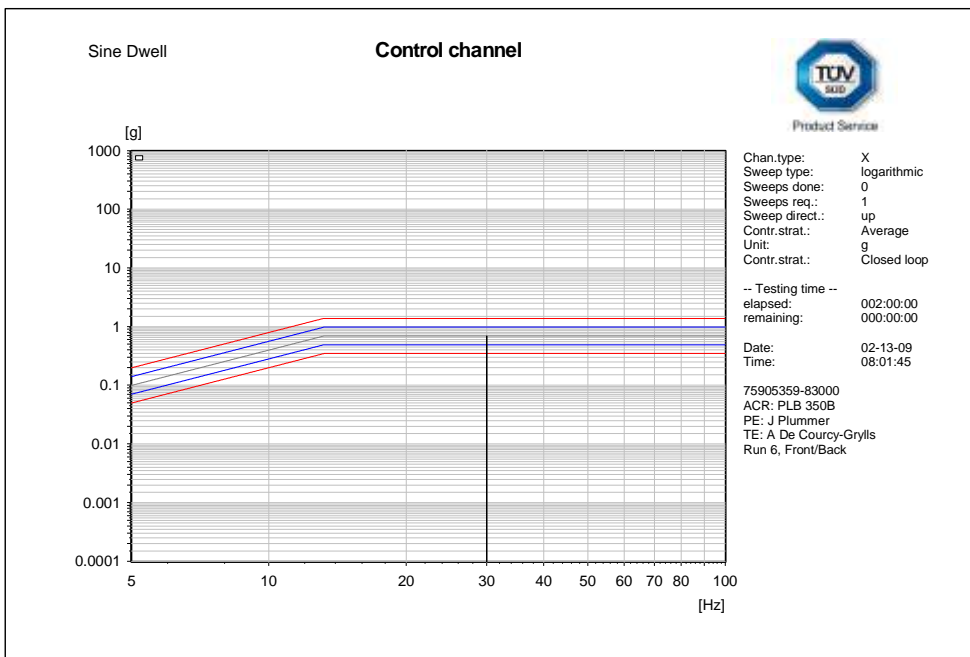
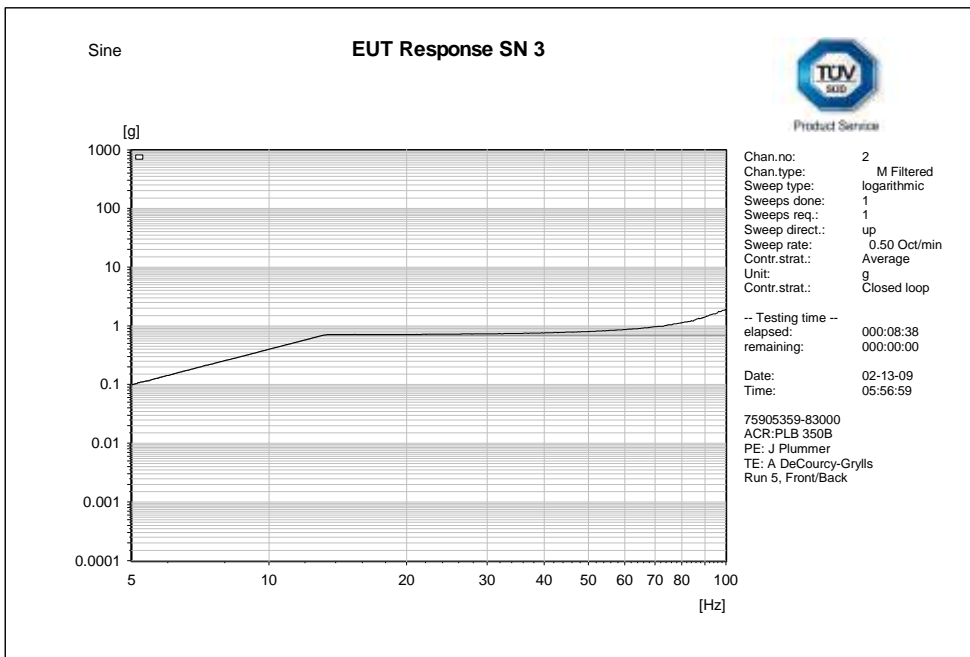
C:\VcpNT\Daten\m+p\ACRIRS 012.rsn

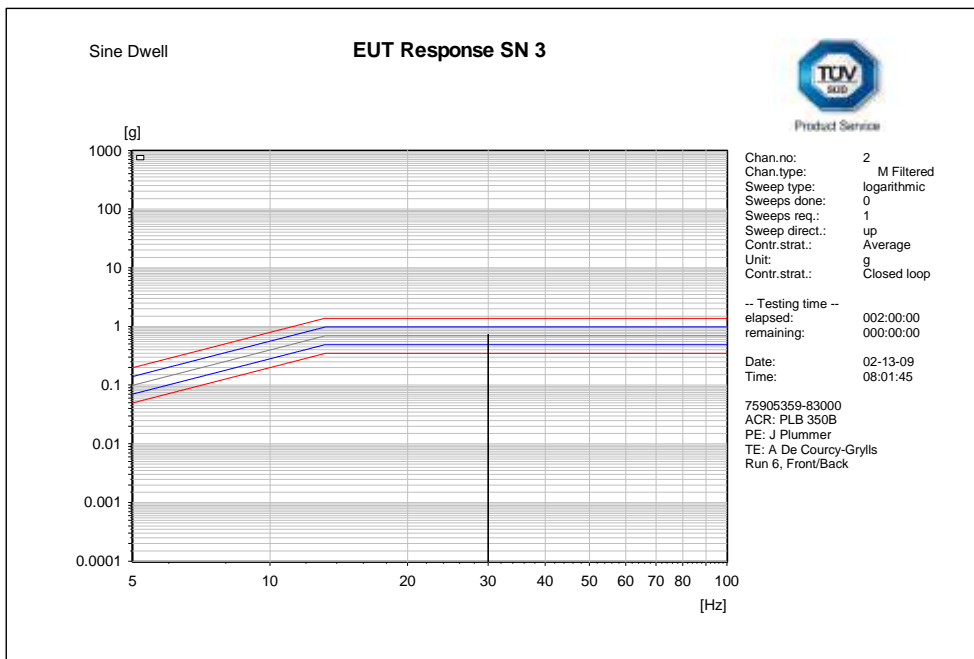
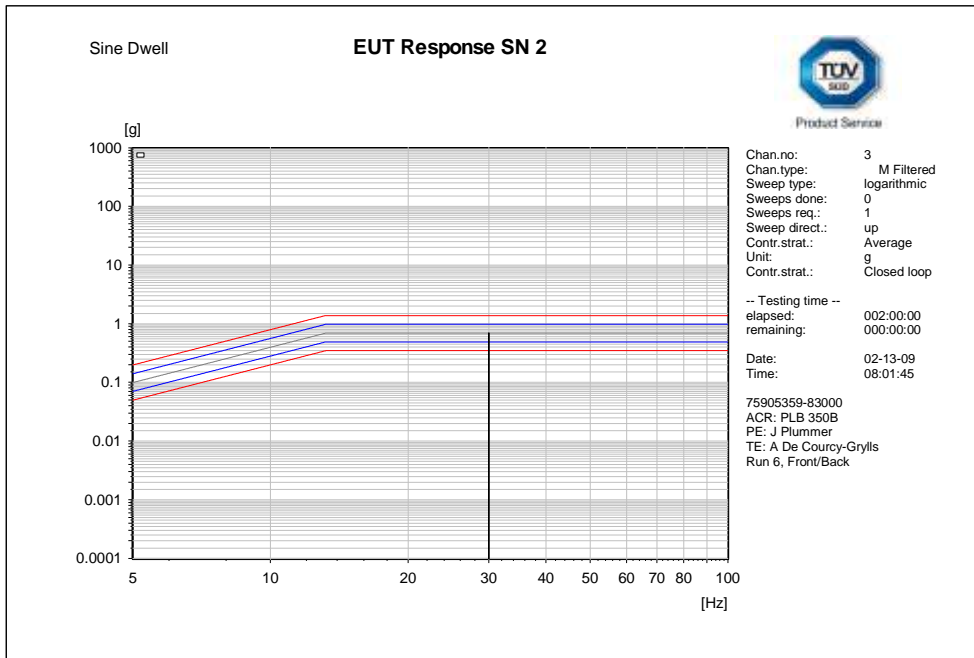


C:\VcpNT\Daten\m+p\ACRIRS 012.rsn



Product Service





## 2.7 BUMP TEST (RUGGEDNESS)

### 2.7.1 Specification Reference

RTCM 11010.2:2008, Clause A.7

### 2.7.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.7.3 Date of Test and Modification State

12 February to 13 February 2009 - Modification State 0

### 2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.7.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle.

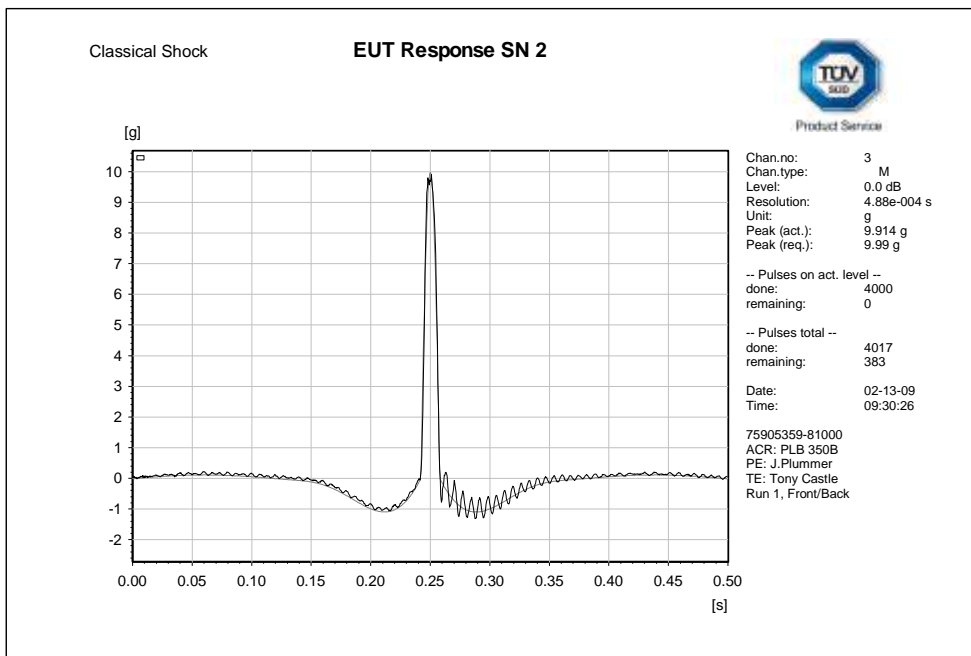
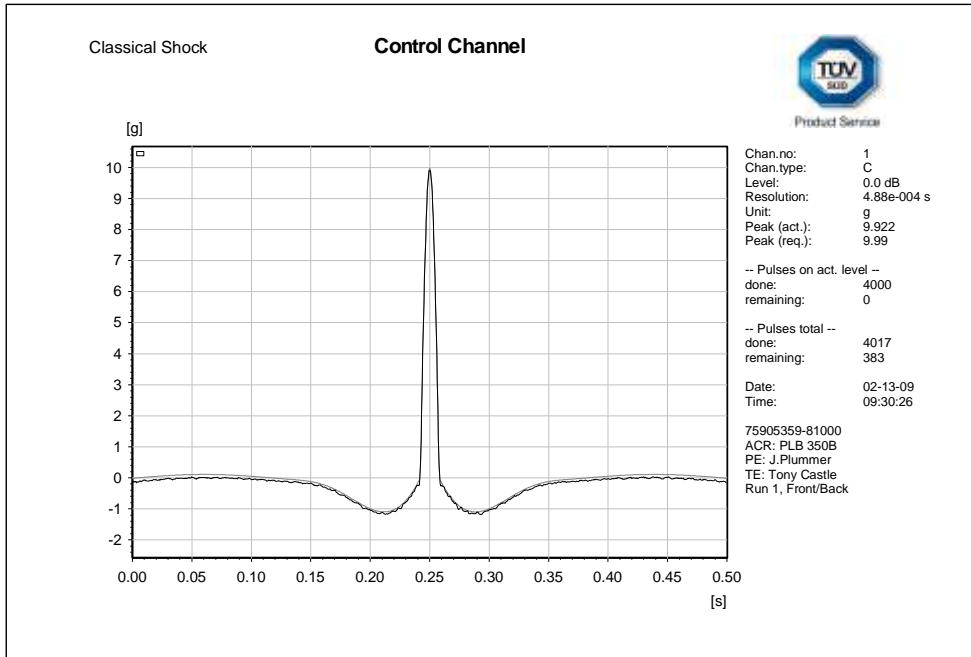


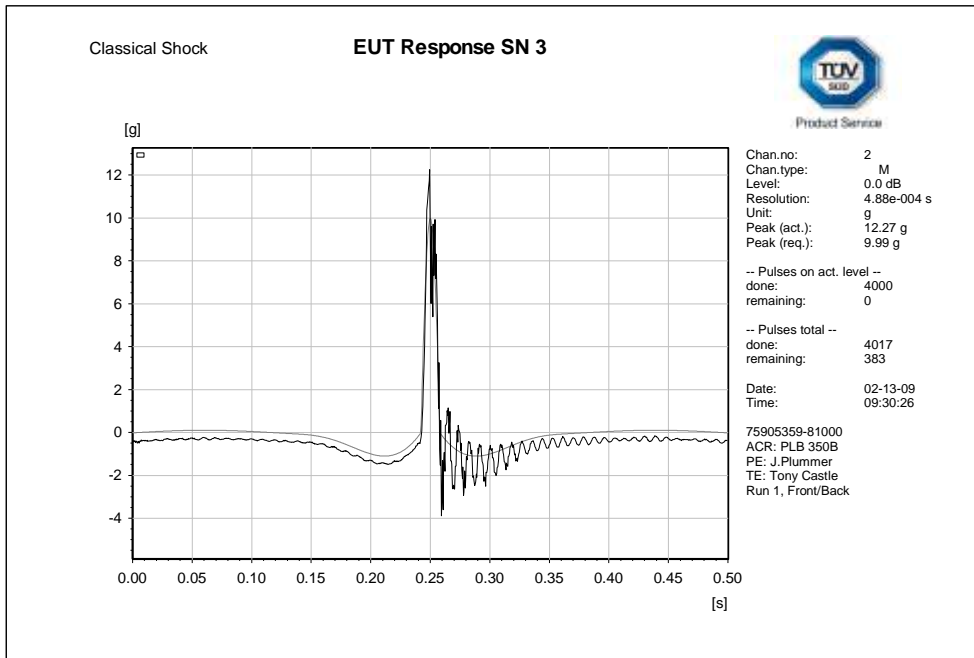
Test Set-up



2.7.6 Test Results

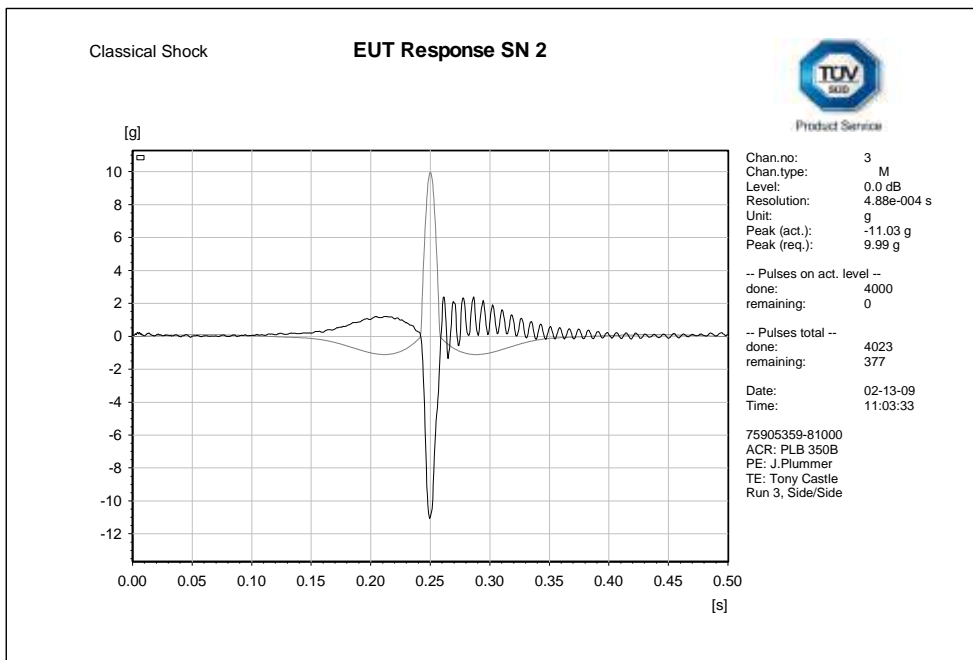
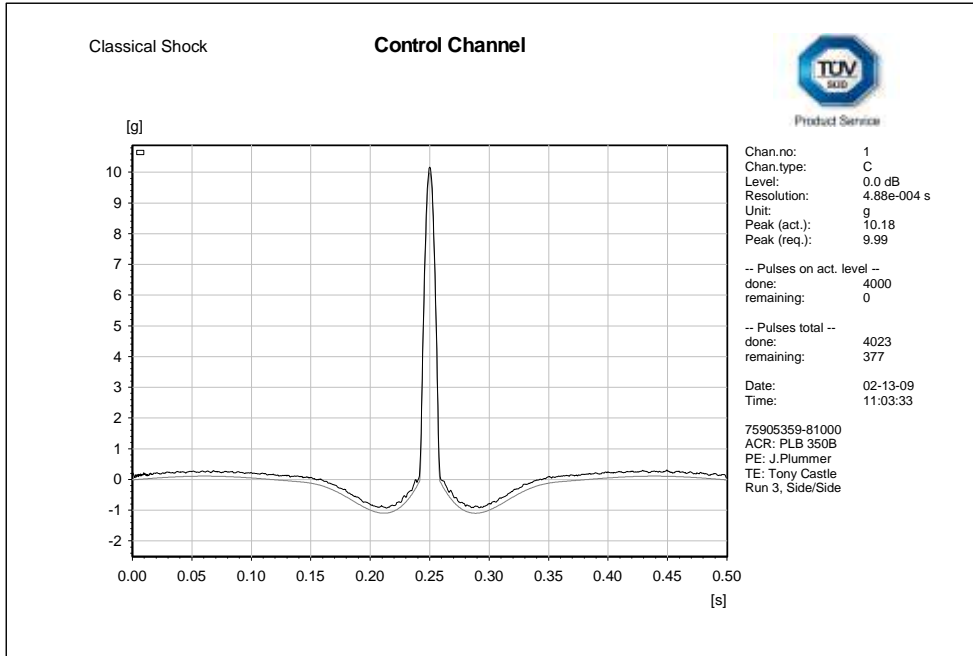
Vertical axis, 4000 Bumps



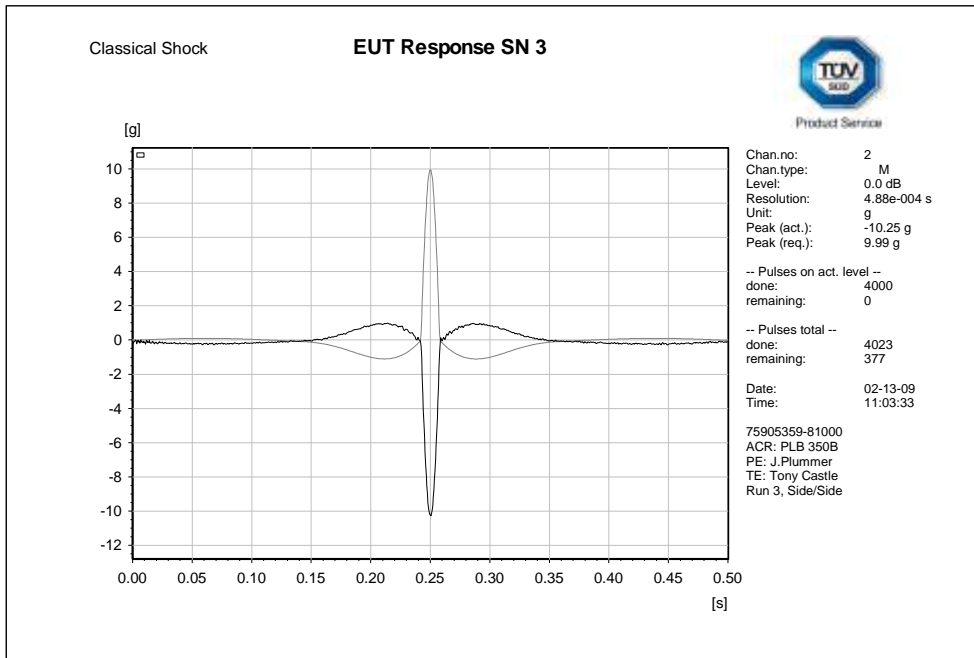




Lateral axis, 4000 Bumps



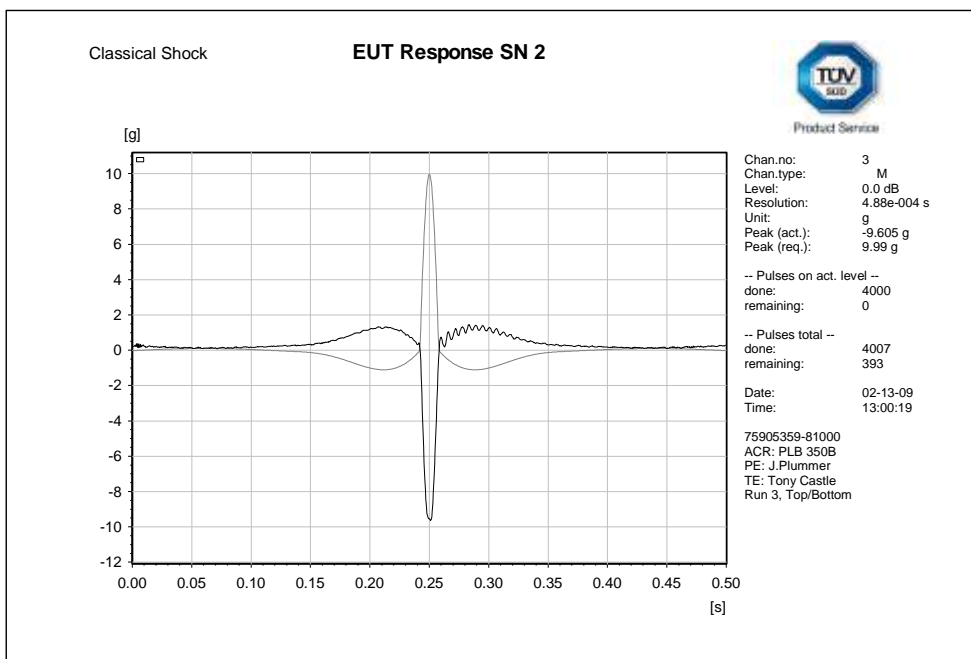
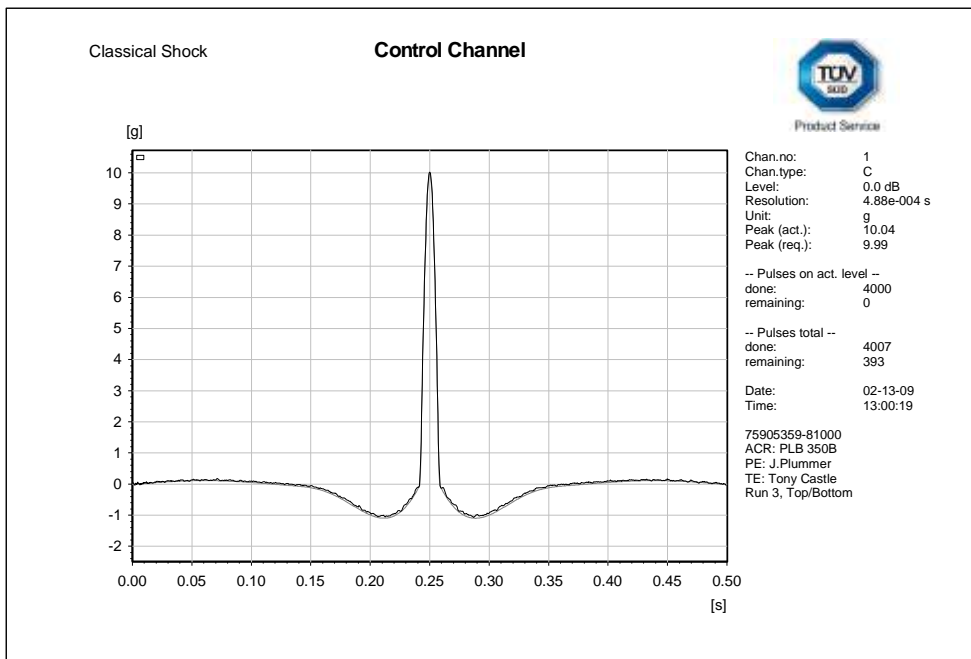


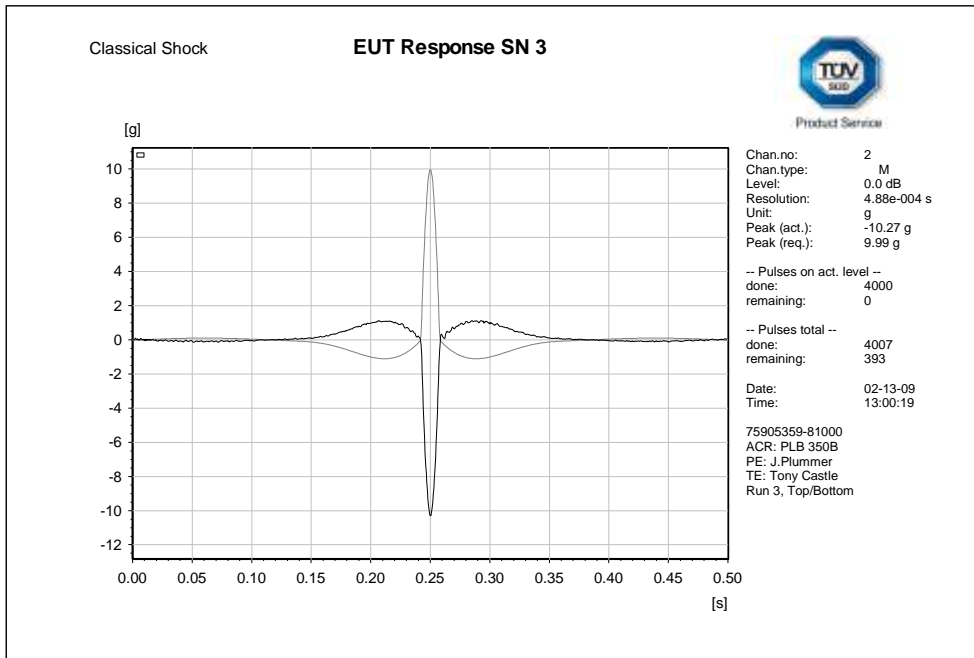




Product Service

Longitudinal axis, 4000 Bumps







Mechanical Inspection

Post-test no signs of mechanical degradation could be witnessed.

EUT Response

During the test the EUT did not release from its mounting nor did it activate during the test.

Summary of Performance Check Results

PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FF FE2F96EE2F80057FDFF9C5297783E0F66C	FF FE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.03691 MHz	406.03658 MHz
121 MHz Presence	✓	✓

PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FE2F4C9EA00004000D6F145F40	FF FE2F4C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FF FED04C9EA00004000D6F145F40	FF FED04C9EA00006000D6B58CF40
406 MHz Frequency	406.036627 MHz	406.036582 MHz
121 MHz Presence	✓	✓



**2.8 CORROSION TEST (SALT MIST)**

**2.8.1 Specification Reference**

RTCM 11010.2:2008, Clause A.8

**2.8.2 Test Waiver**

Corrosion test was waived in accordance with the following specification references:

IEC 60945: 2002, Clause 8.12.1 Waiver:

*“The corrosion test shall be waived where the manufacturer is able to produce evidence that the components, materials and finishes employed in the equipment would satisfy the test.”*

**2.8.3 Justification**

Customer supplied information (see Annex A) intends to show that the waiver is justified.

## 2.9 DROP TEST (ON HARD SURFACE)

### 2.9.1 Specification Reference

RTCM 11010.2:2008, Clause A.9

### 2.9.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.9.3 Date of Test and Modification State

16 February 2009 - Modification State 0

### 2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.9.5 Test Set-up and Operating Modes

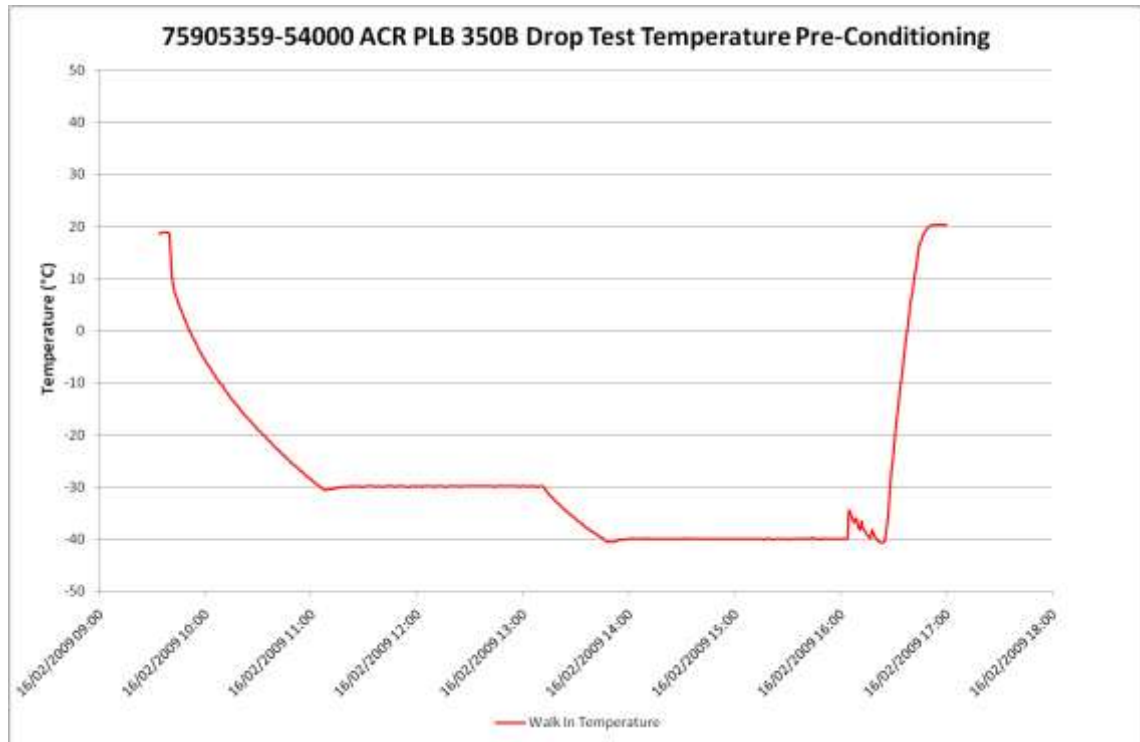
The test was performed with the EUT in the following mode(s): Idle



Test Set-up

## 2.9.6 Environmental Conditions

### EUT Conditioning Plot



## 2.9.7 Test Results

### Procedure

This test was combined with another test with the soak temperature of  $-40^{\circ}\text{C}$  instead of  $-30^{\circ}\text{C}$ . Due to the way that the materials are likely to behave (become more brittle) the procedure used was considered to be more stringent.

EUT placed in chamber and conditioned as per Environmental Conditions above. EUT removed and the Drop-test performed as follows:

For each sample: 6 drops, one to each face, from a height of 1.220 metres onto the test surface

### Test Observations

The EUT was monitored and did not activate automatically during the test. The EUT was subjected to a mechanical inspection post-test and no signs of deterioration were noted.



Summary of Performance Check Results

PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED096EE2F80057FDFF9C52977	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.03691 MHz	406.036503 MHz
121 MHz Presence	✓	✓

PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FFFED04C9EA00004000D6F145F40	FFFED04C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FFFED04C9EA00004000D6F145F40	FFFE2F4C9EA00006000D6B58CF40
406 MHz Frequency	406.036623 MHz	406.036578 MHz
121 MHz Presence	✓	✓



## 2.10 THERMAL SHOCK TEST

### 2.10.1 Specification Reference

RTCM 11010.2:2008, Clause A.10

### 2.10.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.10.3 Date of Test and Modification State

16 February 2009 - Modification State 0

### 2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.10.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle

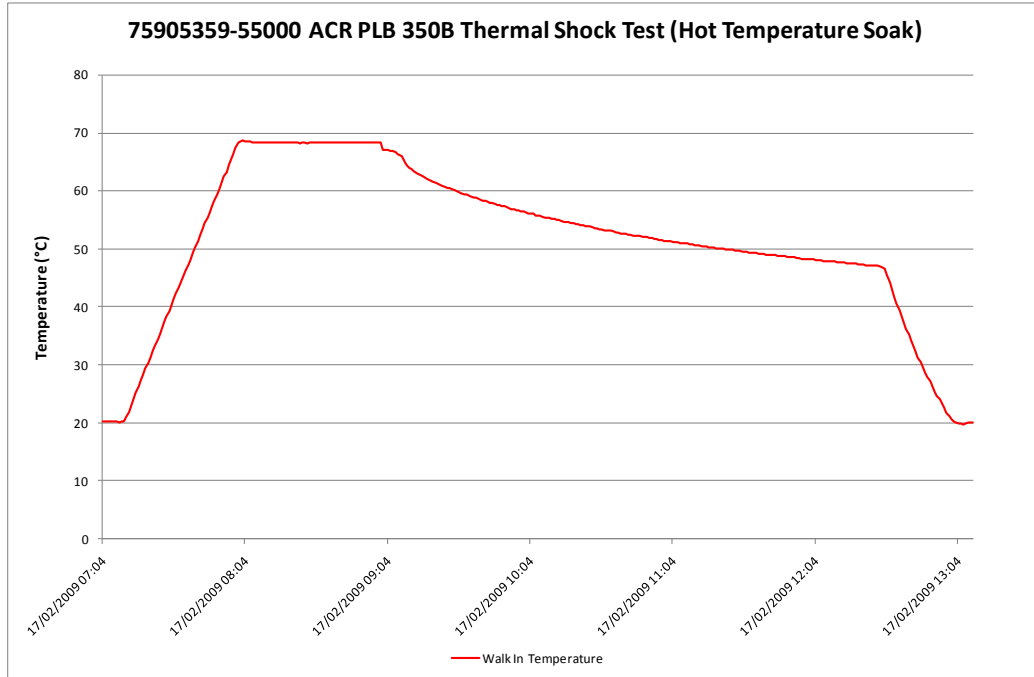


Test Set-up

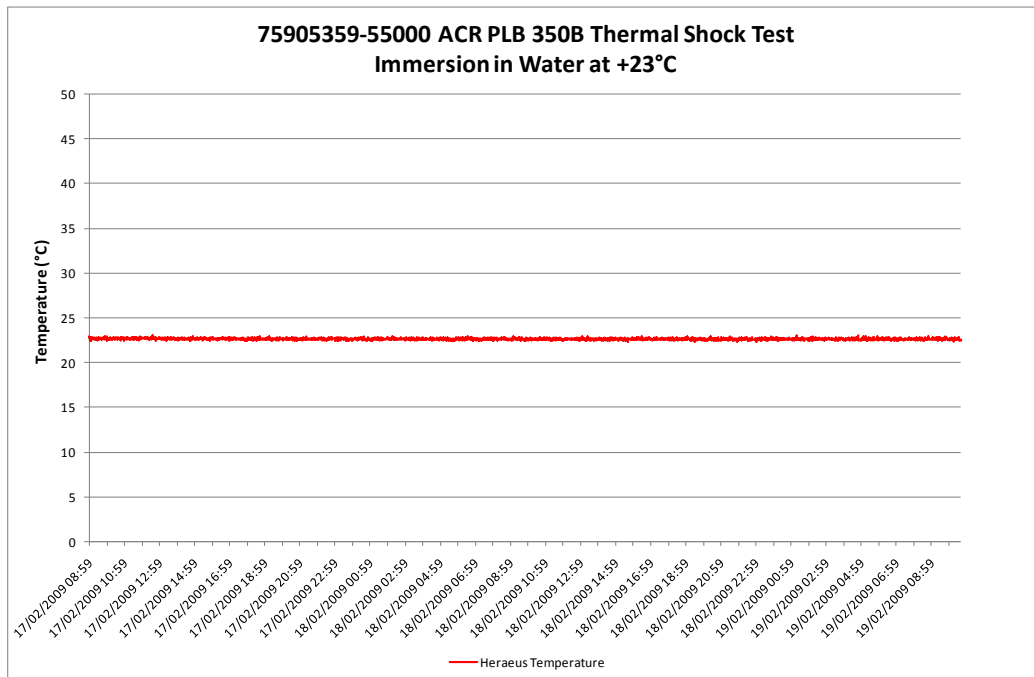


### 2.10.6 Environmental Conditions

#### Preconditioning Temperature Plot



#### Water Temperature Plot





**2.10.7 Test Results**

The EUT was placed in the pre-conditioning climatic chamber at a temperature of +70°C for 1 hour.

The EUT was located into the Hearaeus climatic chamber which contained the water vessel (conditioned for approximately 12 hours) at +23°C.

The unit was prevented from floating to the surface with the use of a metal stand which held it 100mm below the surface of the water (measured to the highest point of the EUT) as pictured in Test Setup above.

The EUT was subjected to 48 hours of immersion.

Summary of Performance Check Results

PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FF FE2F96EE2F80057FDFF9C5297783E0F66C	FF FE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036894 MHz	406.036509 MHz
121 MHz Presence	✓	✓

PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FE2F4C9EA00004000D6F145F40	FF FE2F4C9EA00006000D6B58CF40
Normal Mode:		
Normal Message	FF FED04C9EA00004000D6F145F40	FF FED04C9EA00006000D6B58CF40
406 MHz Frequency	406.036614 MHz	406.036578 MHz
121 MHz Presence	✓	✓

## 2.11 IMMERSION TEST

### 2.11.1 Specification Reference

RTCM 11010.2:2008, Clause A.11 (Immersion only)

### 2.11.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.11.3 Date of Test and Modification State

15 April 2009 - Modification State 0

### 2.11.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.11.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle



Test Set-up



**2.11.6 Test Results**

The EUT was placed in a pressure vessel with the highest point just below the water surface, see test setup above. The pressure was increased to +1.000 bar relative to atmospheric pressure and maintained for 5 minutes.

The EUT was weighed before and after the test to indicate if any ingress occurred.

EUT Sample	S/N #22	S/N #5	S/N #20	S/N #18
Weight Before (Kg)	0.264	0.255	0.245	0.236
Weight After (Kg)	0.264	0.255	0.245	0.236

The weight after the test was the same as before the test, indicating no measurable ingress occurred.

Inspection

Subsequent to the test the EUT case was dismantled inspected internally and no sign of ingress was found.

Summary of Performance Check Results

PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036862 MHz	406.036462 MHz
121 MHz Presence	✓	✓



PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036604 MHz	406.036512 MHz
121 MHz Presence	✓	✓

## 2.12 TEMPORARY IMMERSION TEST

### 2.12.1 Specification Reference

RTCM 11010.2:2008, Clause A.11 (Temporary Immersion only)

### 2.12.2 Equipment Under Test

PLB-350A (Floatation), Serial Number #20  
PLB-350B (Floatation), Serial Number #22  
PLB-350A (Slim), Serial Number #18  
PLB-350B (Slim), Serial Number #5

### 2.12.3 Date of Test and Modification State

15 April 2009 - Modification State 0

### 2.12.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.12.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle



Test Set-up



**2.12.6 Test Results**

The EUT was completely submerged in a bucket of water to a depth 10 mm from the uppermost surface of the EUT. The bucket was then positioned in an overpressure vessel and a gauge corresponding to 1 m was applied for a period of 1 hour.

The EUT was weighed before and after the test to indicate if any ingress occurred.

EUT Sample	S/N #22	S/N #5	S/N #20	S/N #18
Weight Before (Kg)	0.264	0.255	0.245	0.236
Weight After (Kg)	0.264	0.255	0.245	0.236

The weight after the test was the same as before the test, indicating no measurable ingress occurred.

Inspection

Subsequent to the test the EUT case was dismantled inspected internally and no sign of ingress was found.

Summary of Performance Check Results

PLB-350B

Parameter	Result for S/N #22	Result for S/N #5
Self-test Mode:		
Self-test Message	FFFED096EE2F80057FDFF9C52977	FFFED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036858 MHz	406.036463 MHz
121 MHz Presence	✓	✓





PLB-350A

Parameter	Result for S/N #20	Result for S/N #18
Self-test Mode:		
Self-test Message	FF FED096EE2F80057FDFF9C52977	FF FED096EE2F80037FDFFCA6E1B7
Normal Mode:		
Normal Message	FFFE2F96EE2F80057FDFF9C5297783E0F66C	FFFE2F96EE2F80037FDFFCA6E1B783E0F66C
406 MHz Frequency	406.036603 MHz	406.036514 MHz
121 MHz Presence	✓	✓



**2.13 SPURIOUS EMISSIONS TEST**

**2.13.1 Specification Reference**

RTCM 11010.2:2008, Clause A.12

**2.13.2 Equipment Under Test**

PLB-350B (Slim), Serial Number #2  
PLB-350A (Floatation), Serial Number #7

**2.13.3 Date of Test and Modification State**

03 & 04 February and 22 & 23 June 2009 - Modification State 0

**2.13.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

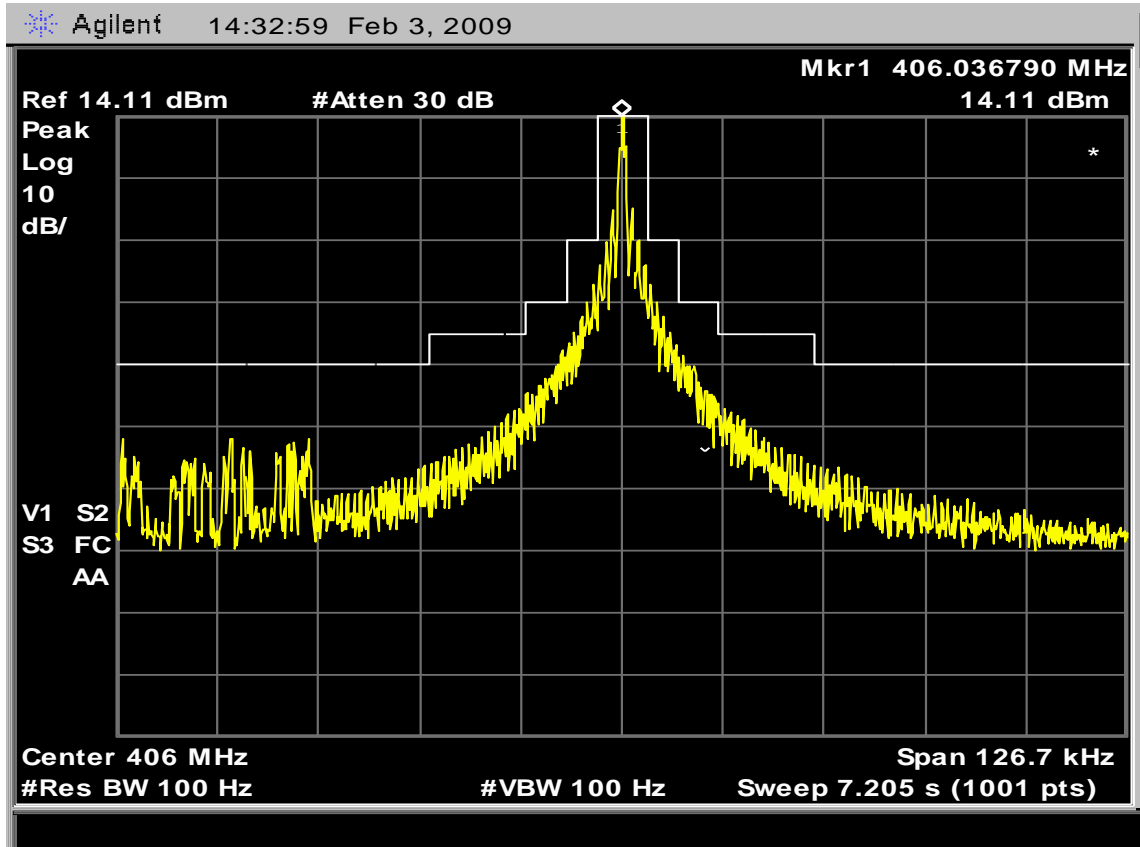
**2.13.5 Operating Modes**

The test was performed with the EUT in the following mode(s): Normal

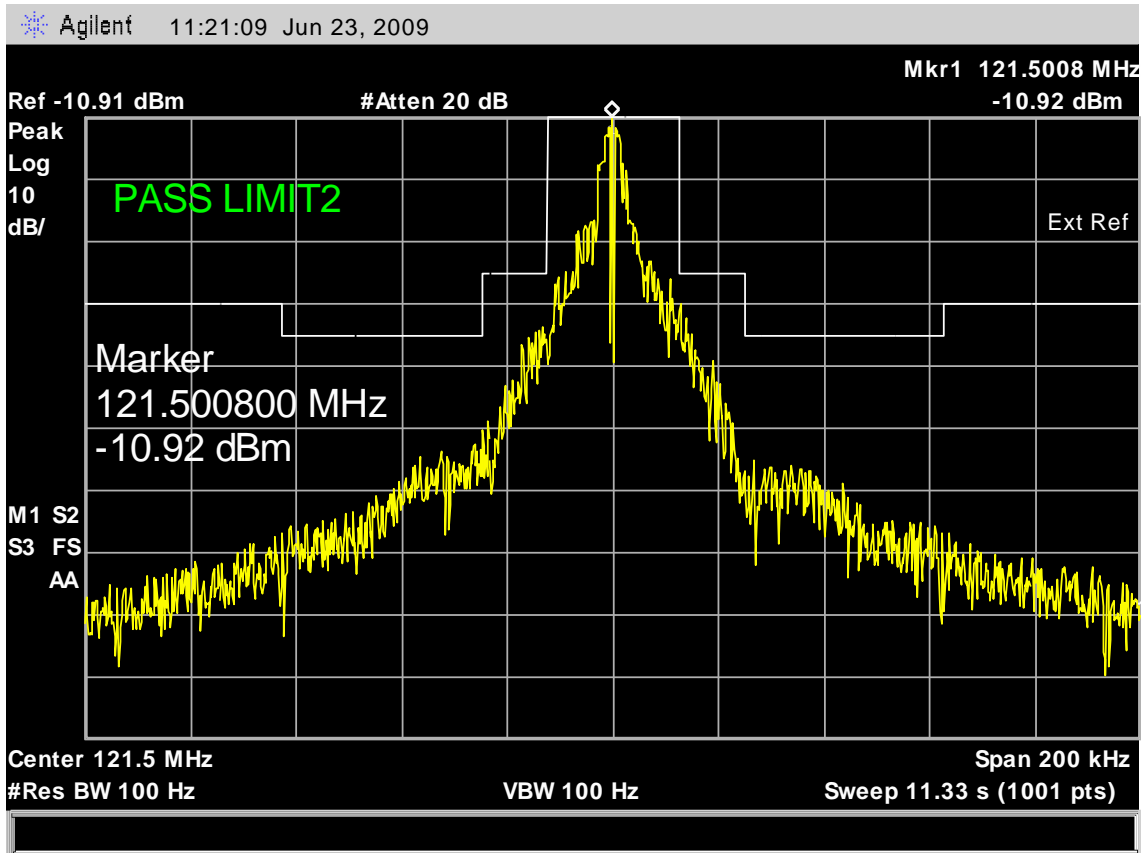


2.13.6 Test Results (Close In Emissions)

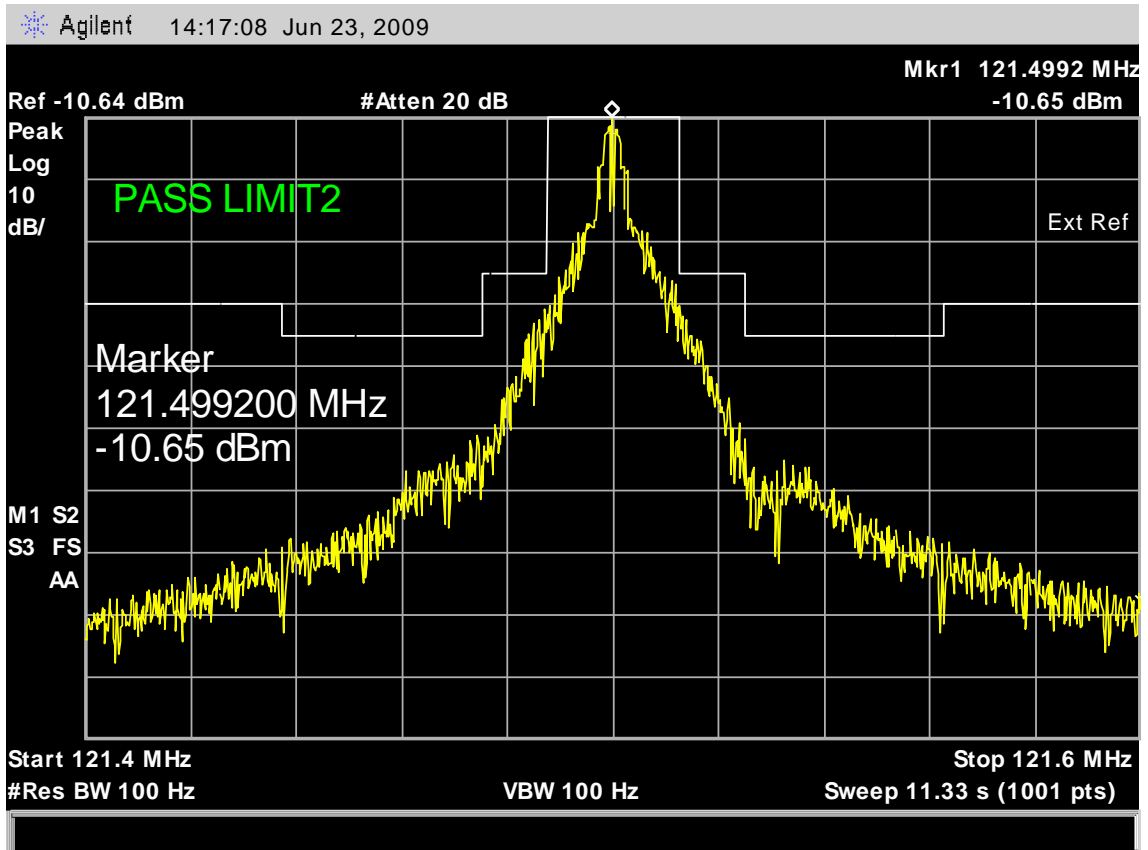
PLB-350B (Slim), Serial Number: #2 (TUV Reference 75905359\_015)



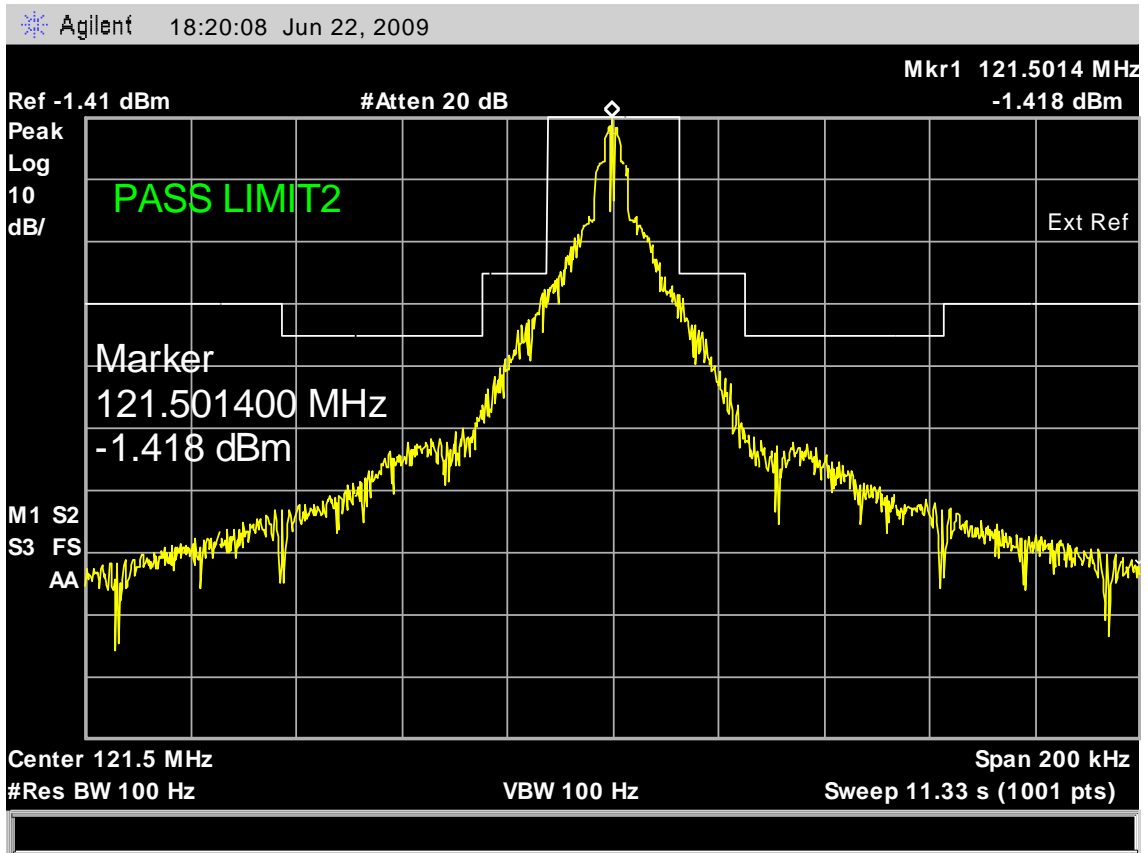
406 MHz Combined Plot over Ambient Temperature, +55°C and -20°C



121 MHz Plot at Ambient Temperature



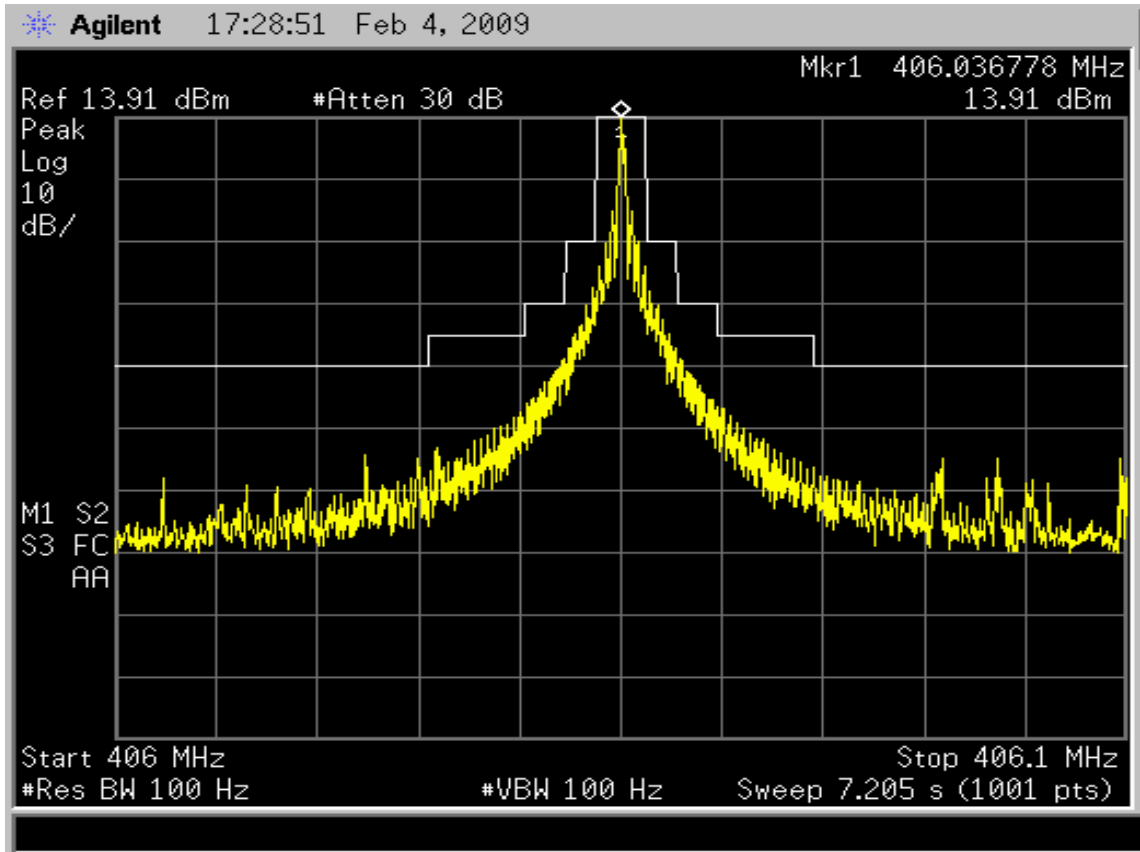
121 MHz Plot at Maximum Temperature (+55°C)



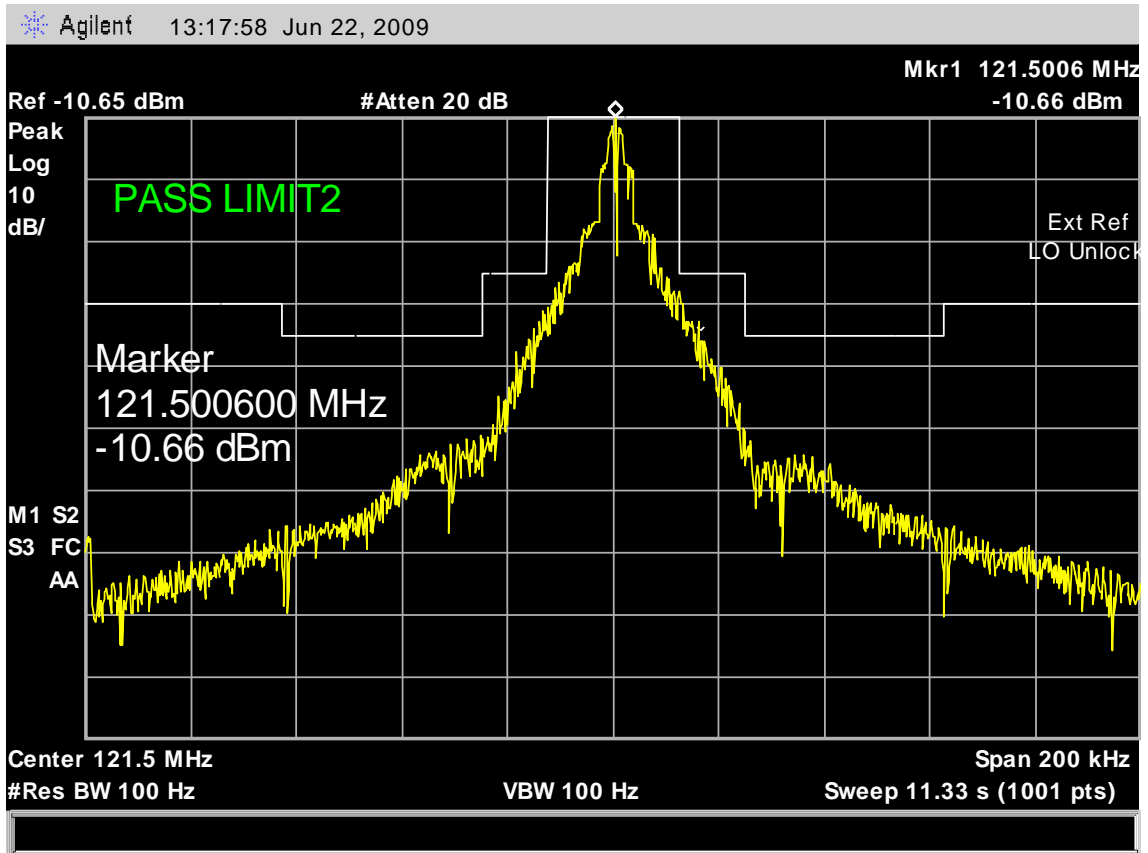
121 MHz Plot at Minimum Temperature (-20°C)



PLB-350A (Floatation), Serial Number: #7 (TUV Reference 75905359\_005)

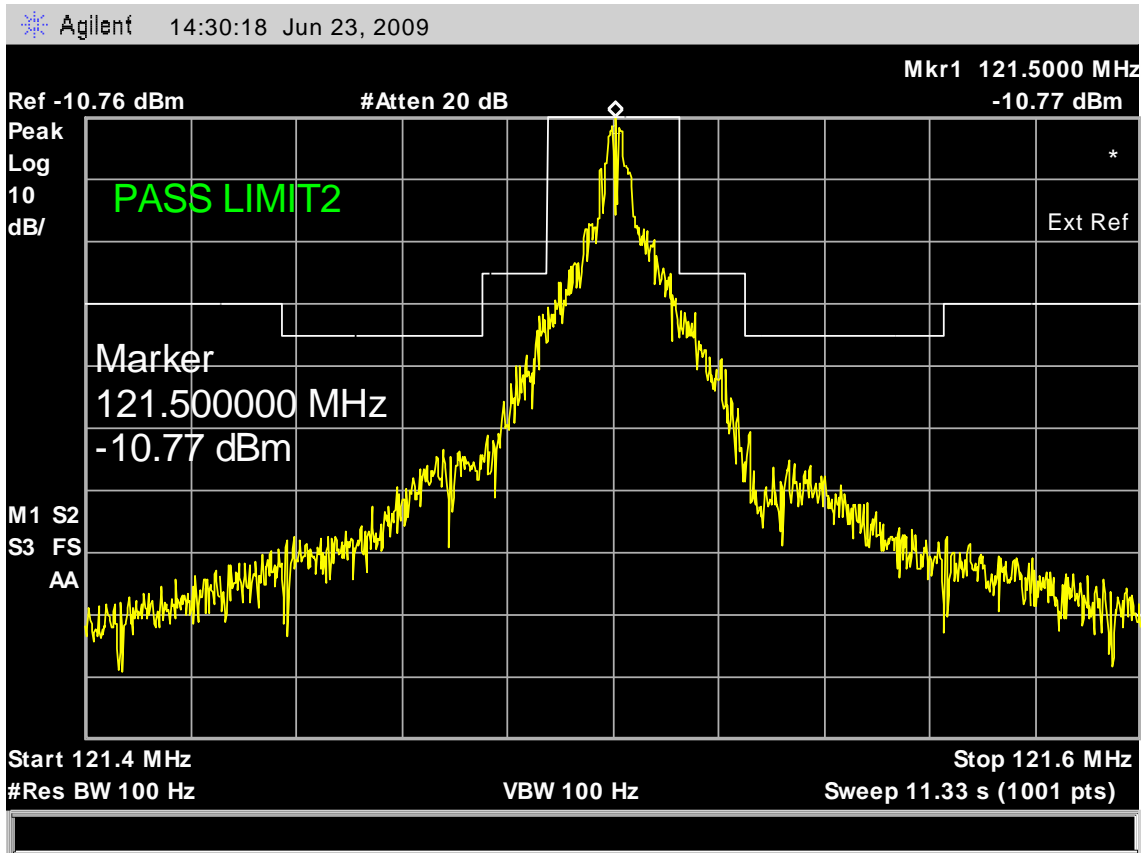


406 MHz Combined Plot over Ambient Temperature, +55°C and -20°C

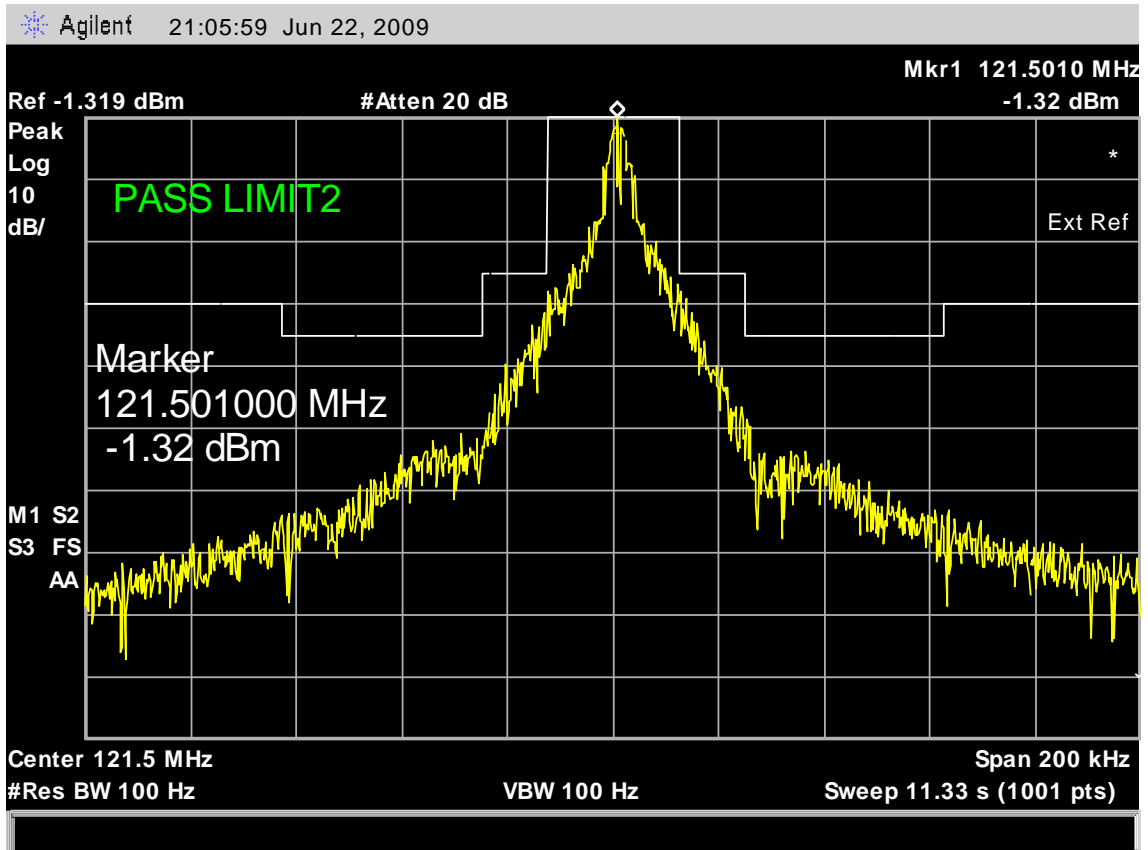


121 MHz Plot at Ambient Temperature





121 MHz Plot at Maximum Temperature (+55°C)



121 MHz Plot at Minimum Temperature (-20°C)



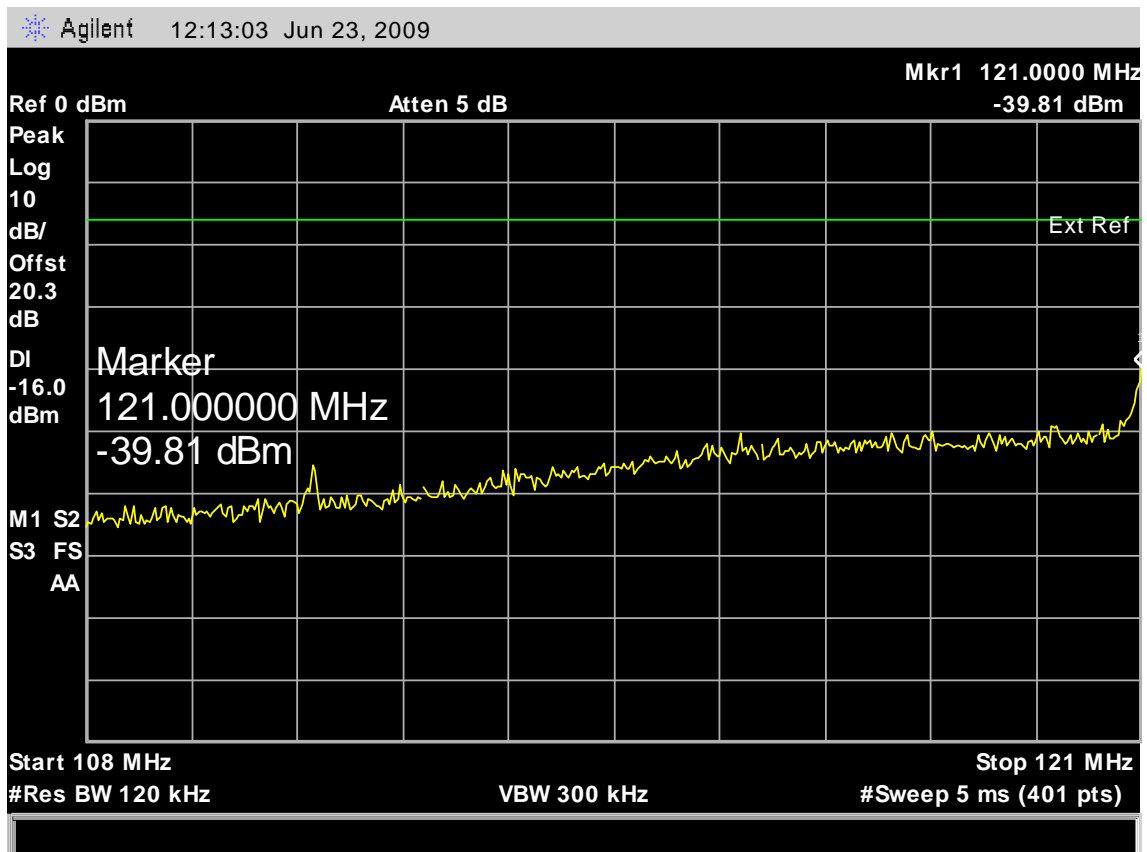
**2.13.7 Test Results (Out of Band)**

108 MHz to 121 MHz, 122 MHz to 137 MHz, 156 MHz to 162 MHz and 1525 MHz to 1610 MHz bands were checked, as per Specification Reference above.

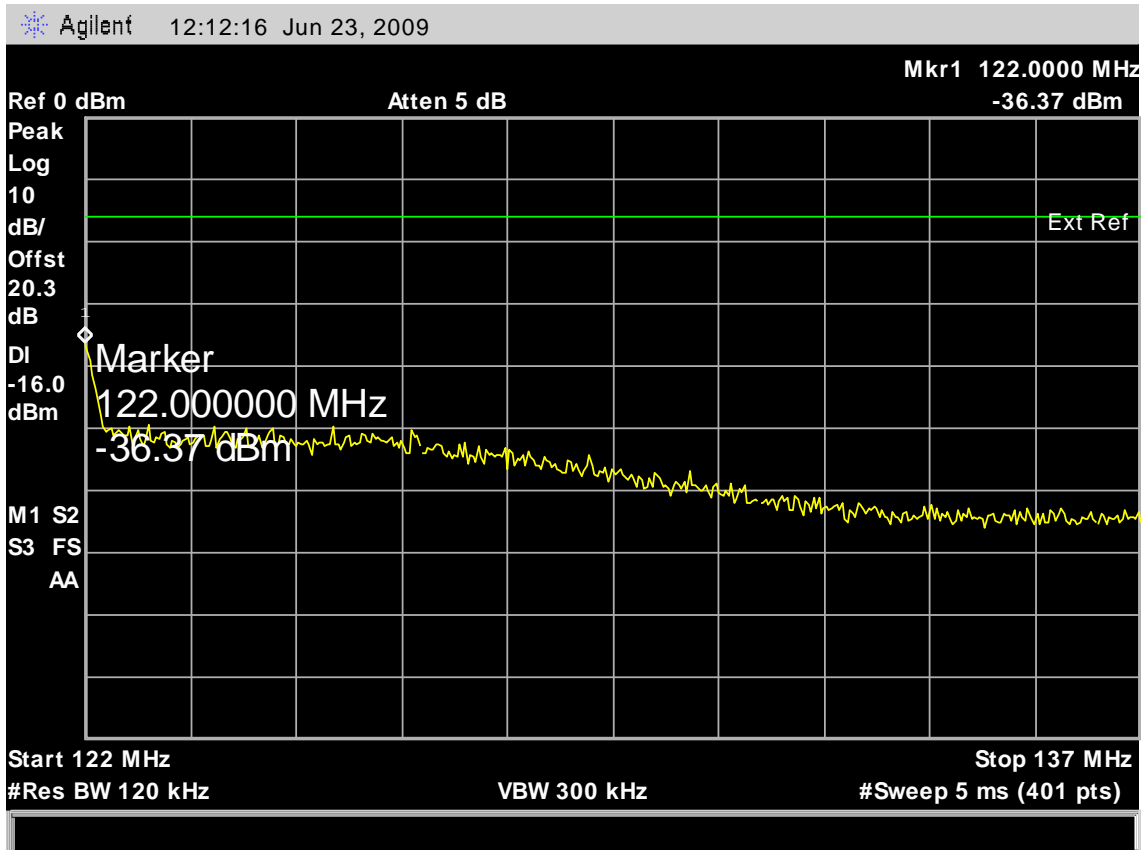
The EUT was equipped with two 50Ω outputs, one for the 121 MHz transmitter and one for the 406 MHz transmitter. Spurious Emissions were measured at each port.

Note: Limit of 25 μW converted to -16.0 dBm for the purposes of using the logarithmic scale on the test instrument. This limit was displayed on the plot as the green horizontal line.

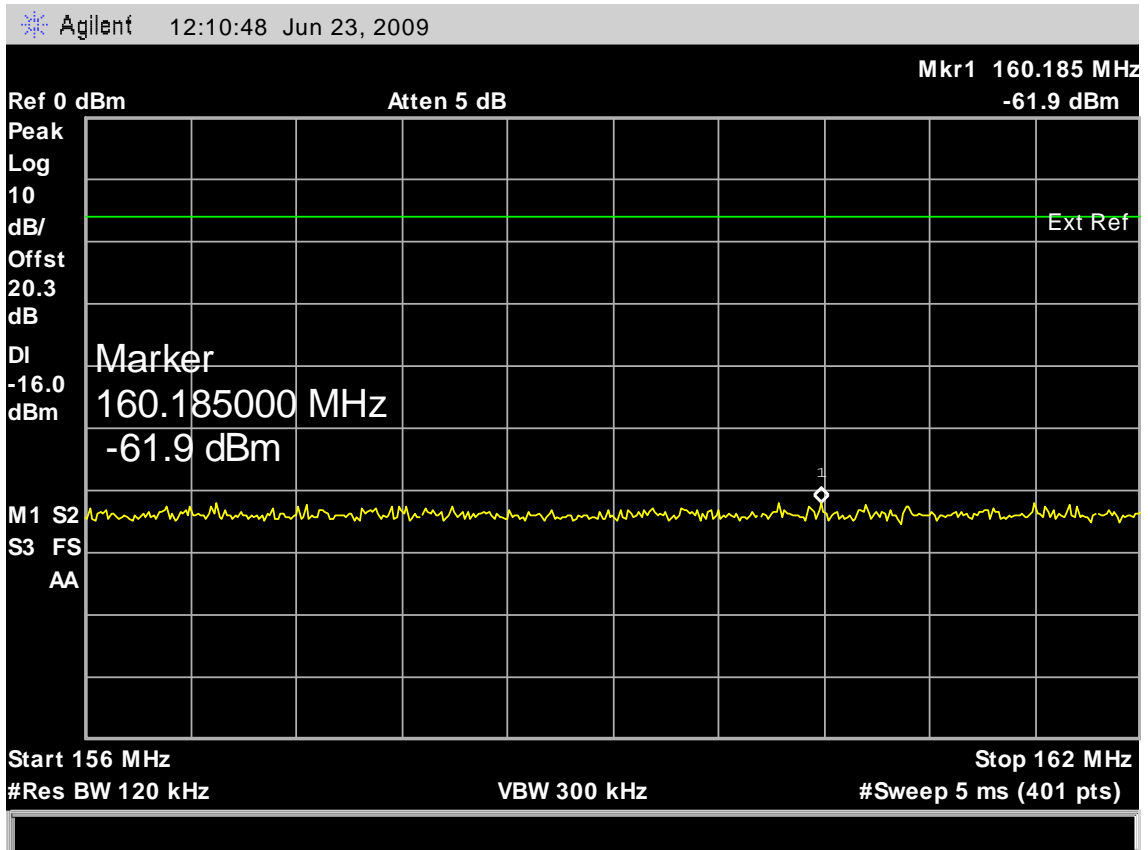
PLB-350B (Slim), Serial Number: #2 (TUV Reference 75905359 015) 121 MHz Output Port



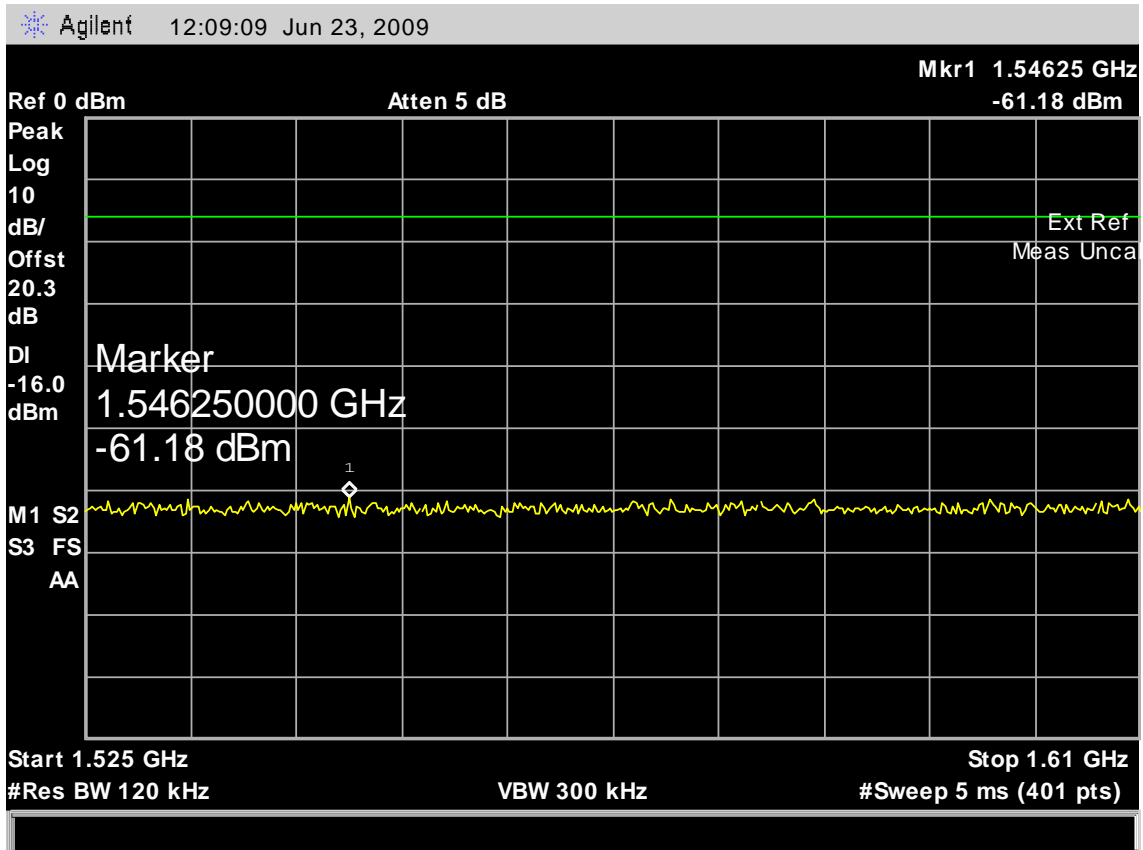
(108 MHz to 121 MHz)



(122 MHz to 137 MHz)



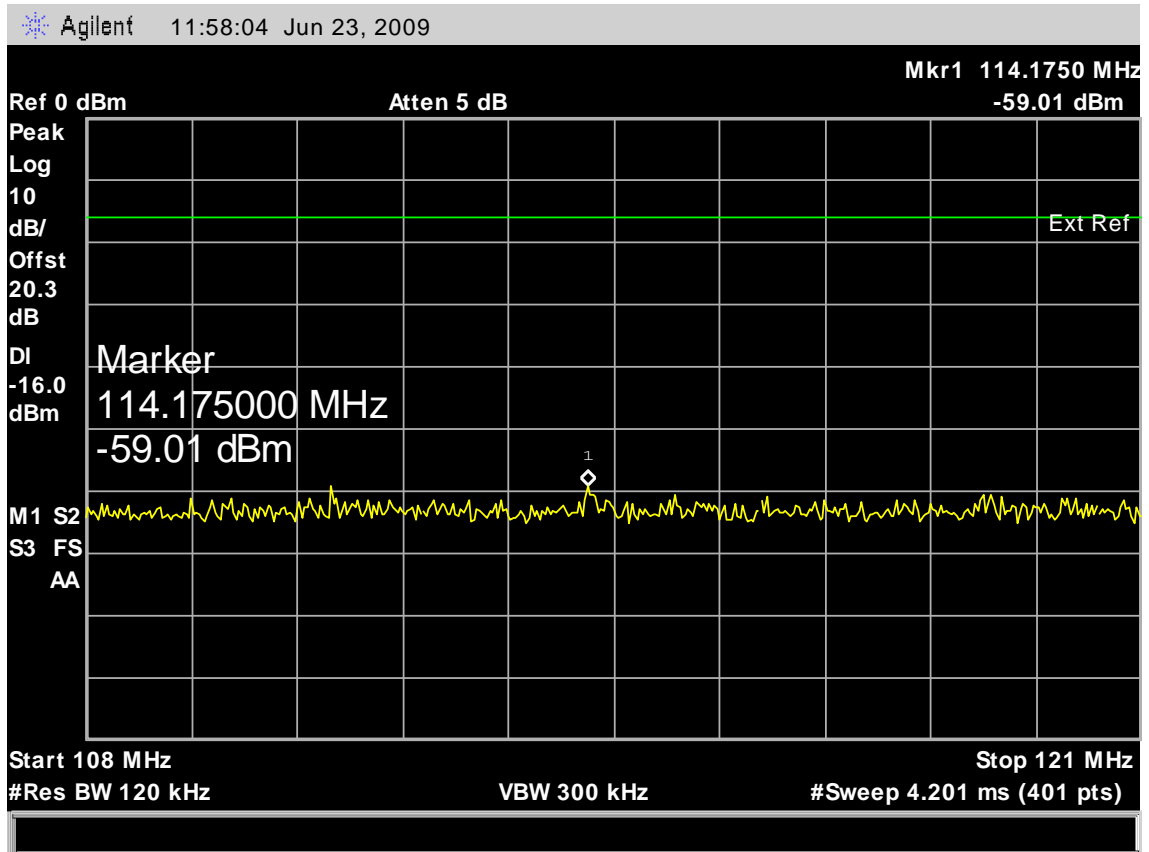
(156 MHz to 162 MHz)



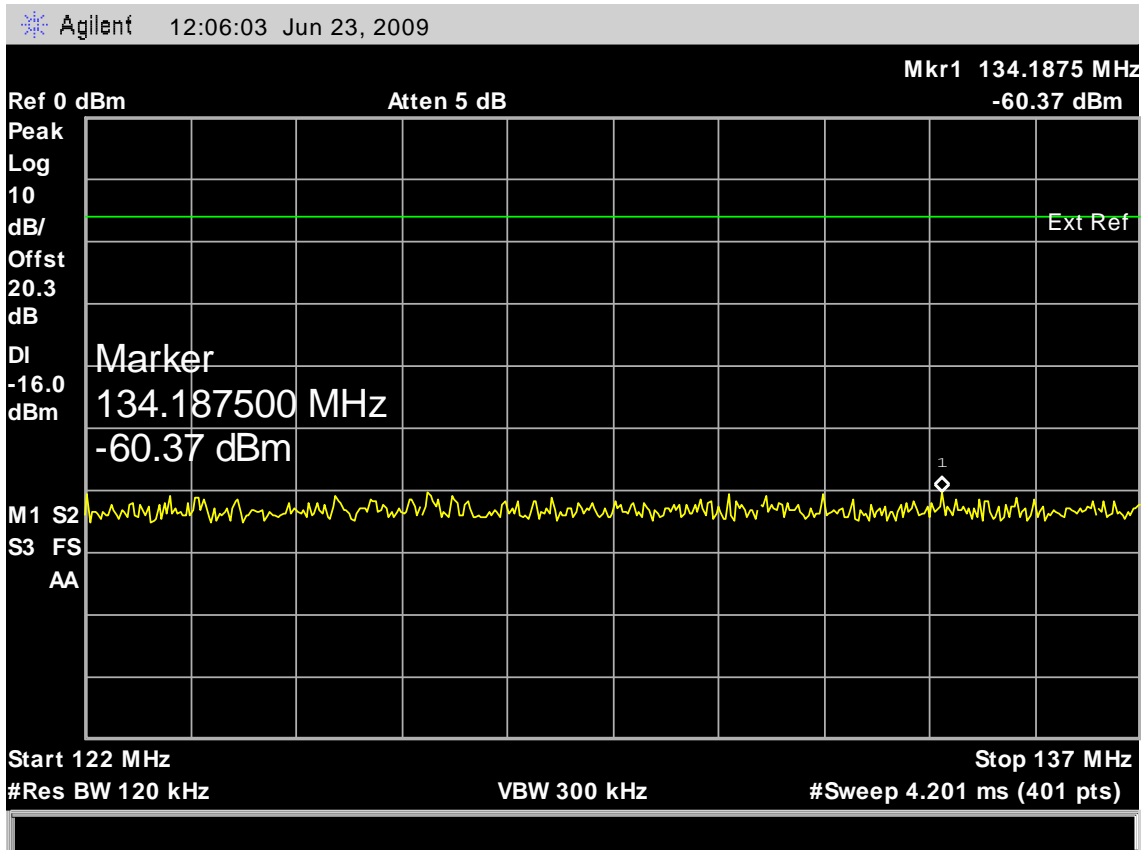
(1525 MHz to 1610 MHz)



PLB-350B (Slim), Serial Number: #2 (TUV Reference 75905359\_015) 406 MHz Output Port

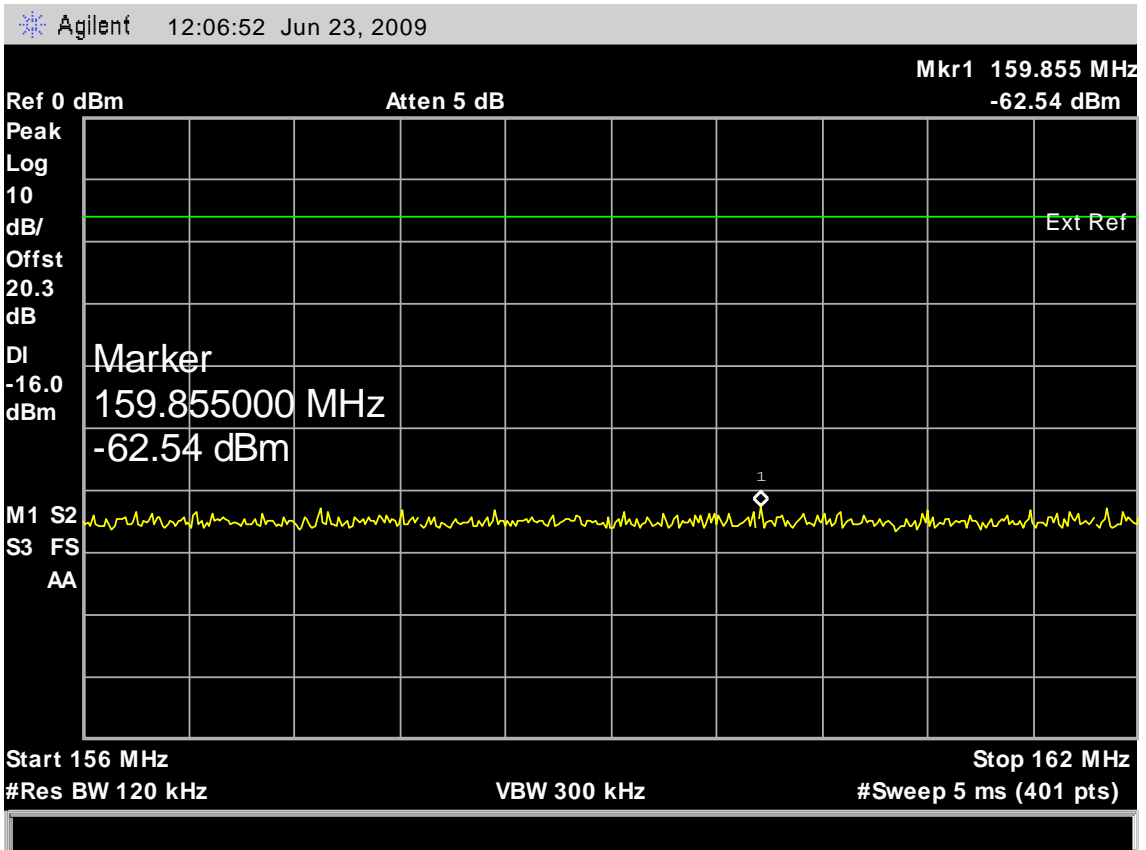


(108 MHz to 121 MHz)

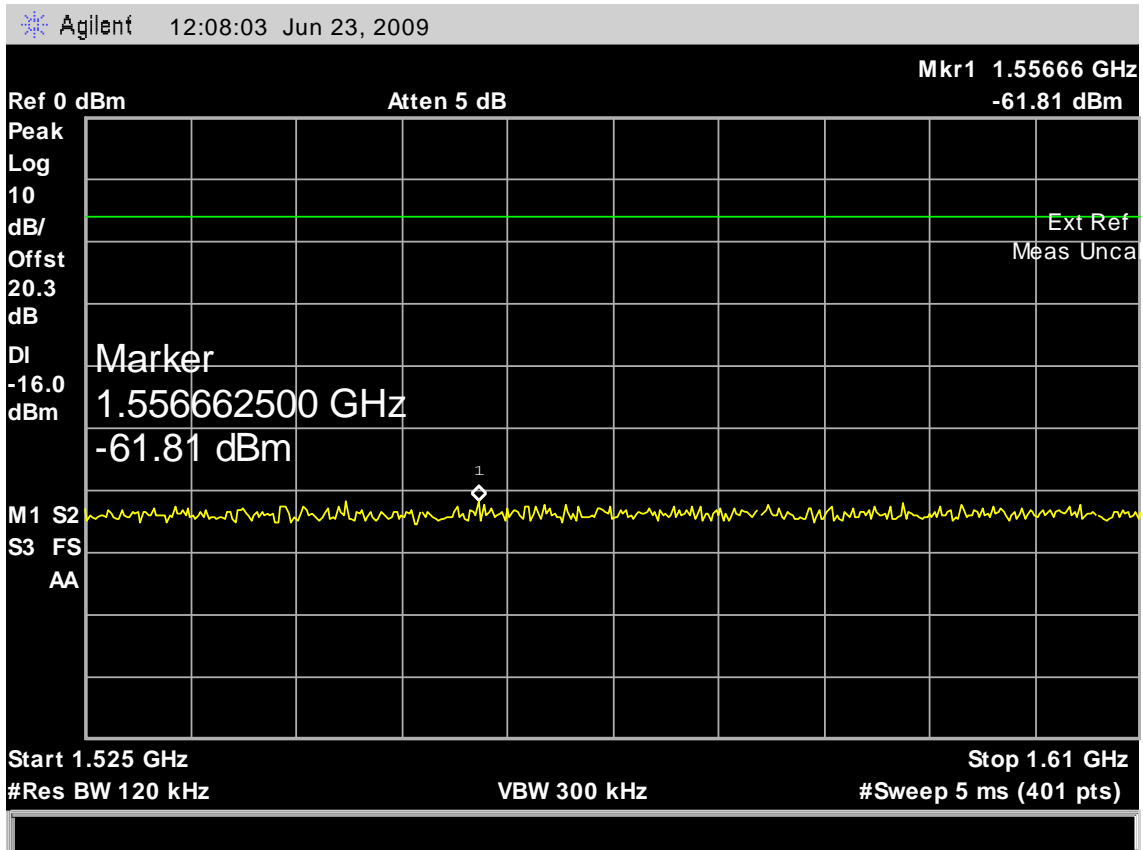


(122 MHz to 137 MHz)





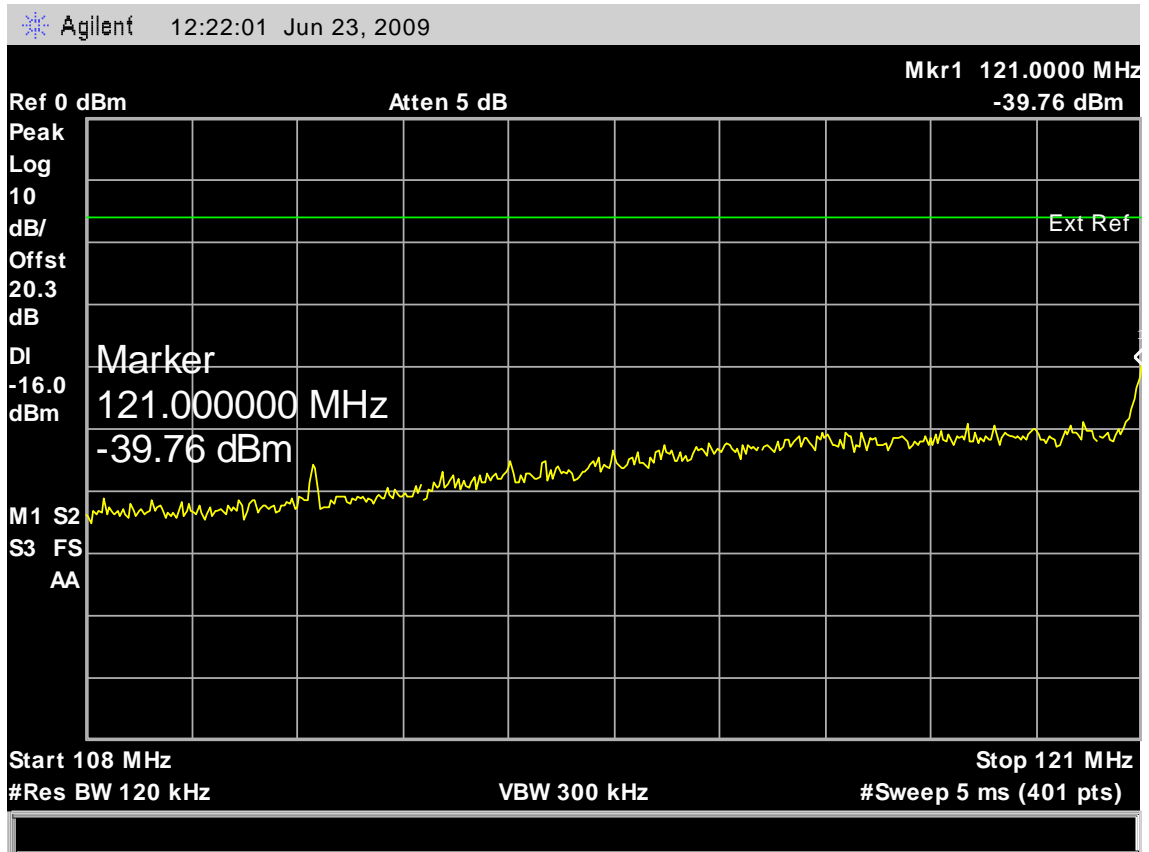
(156 MHz to 162 MHz)



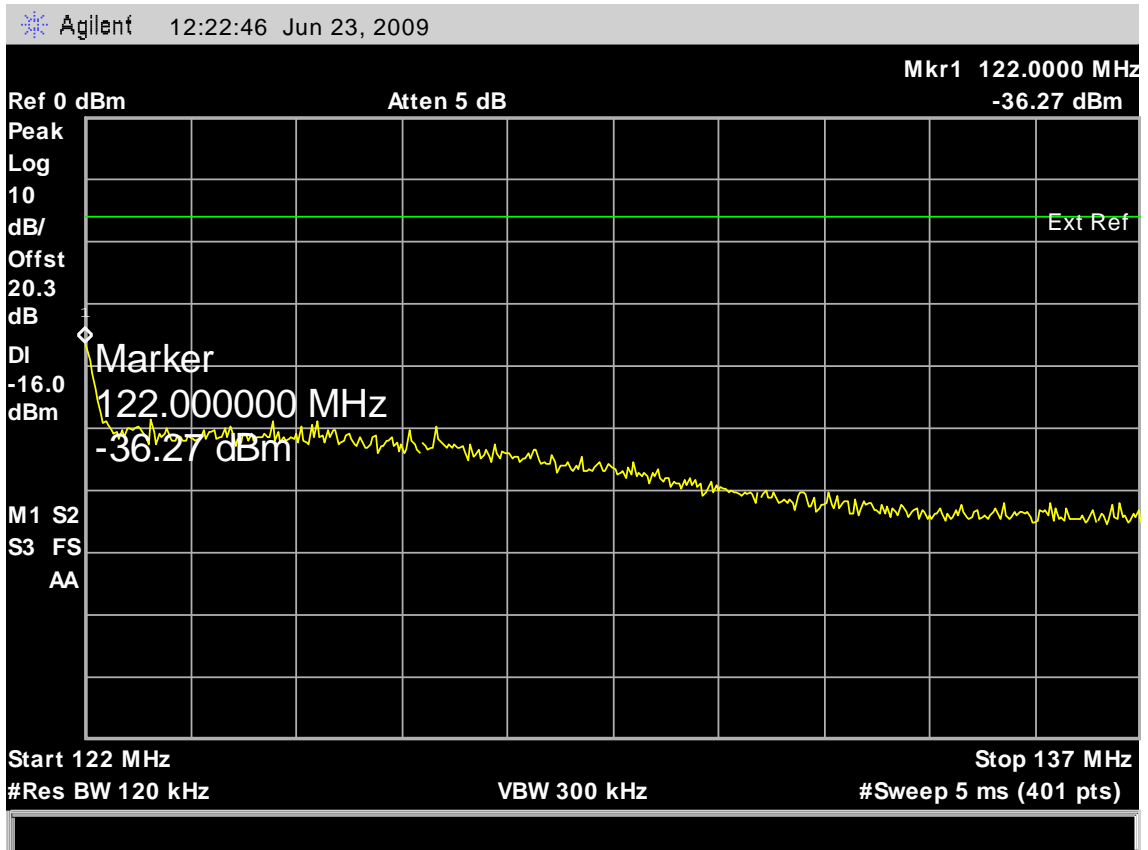
(1525 MHz to 1610 MHz)



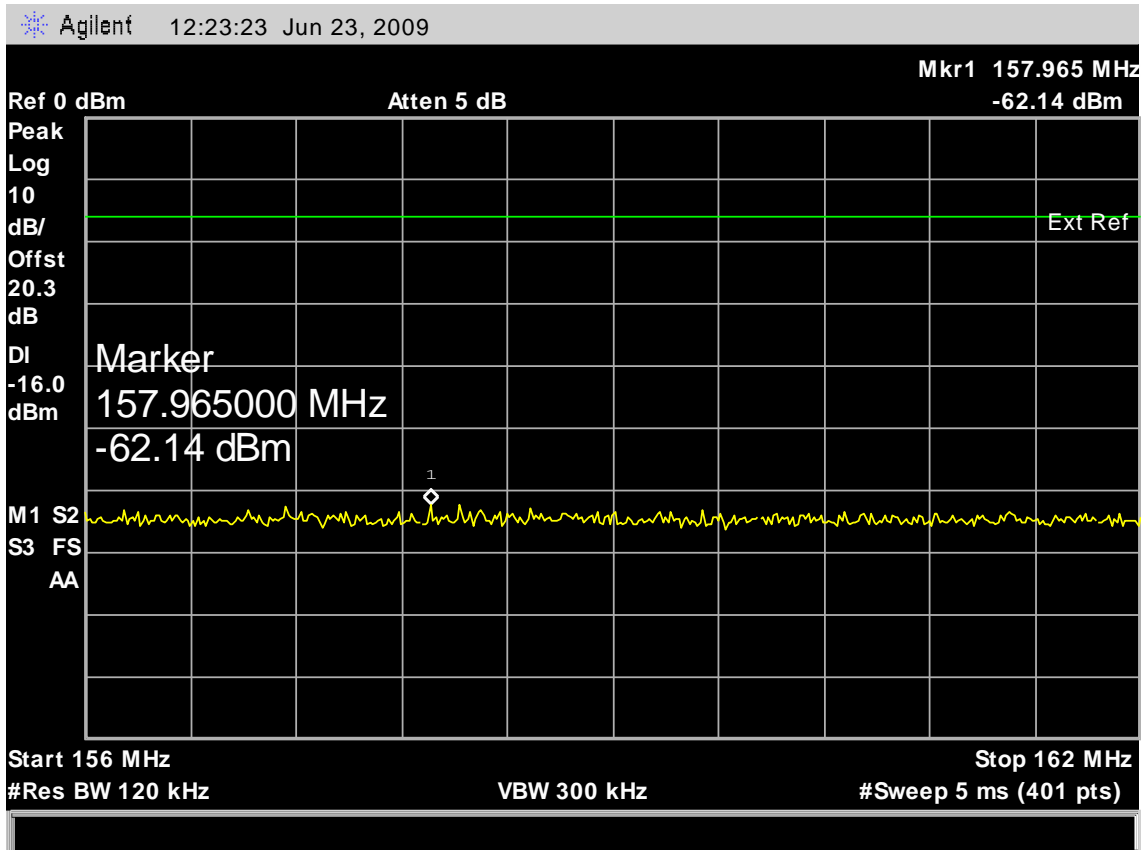
PLB-350A (Floatation), Serial Number: #7 (TUV Reference 75905359\_005) 121 MHz Output Port



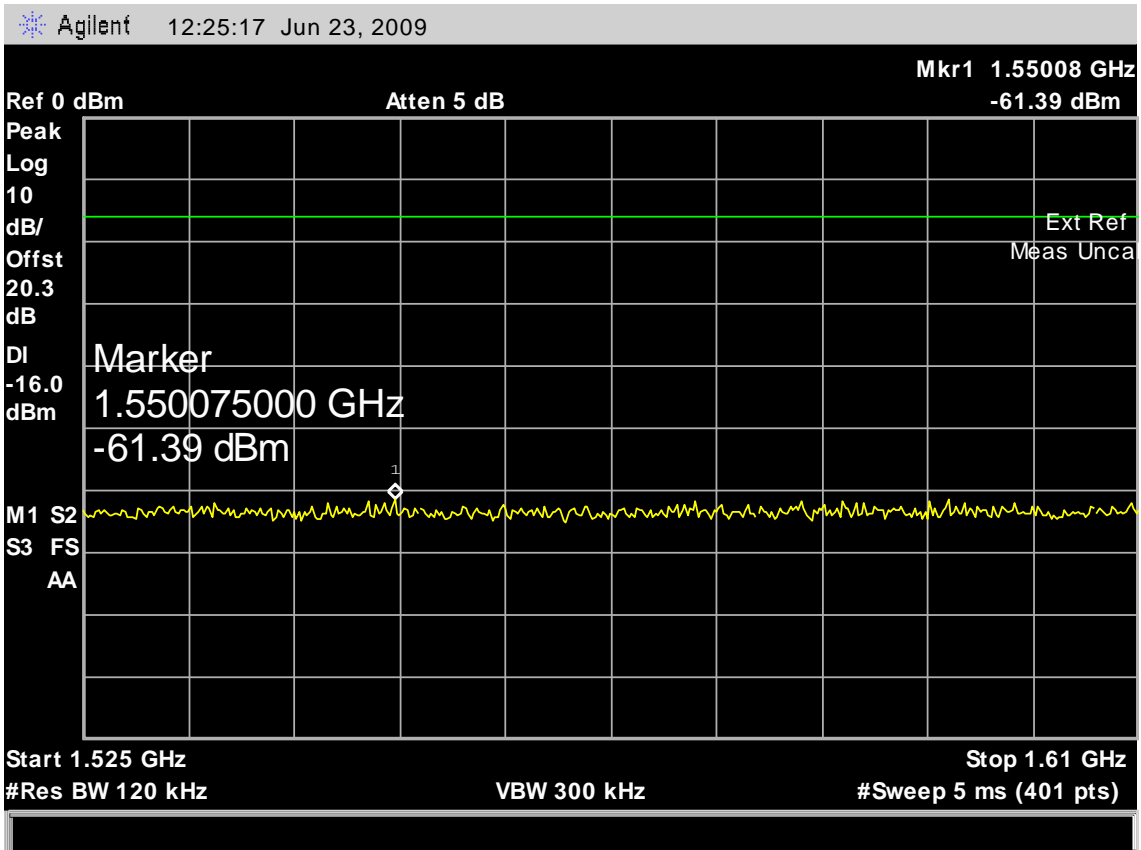
(108 MHz to 121 MHz)



(122 MHz to 137 MHz)



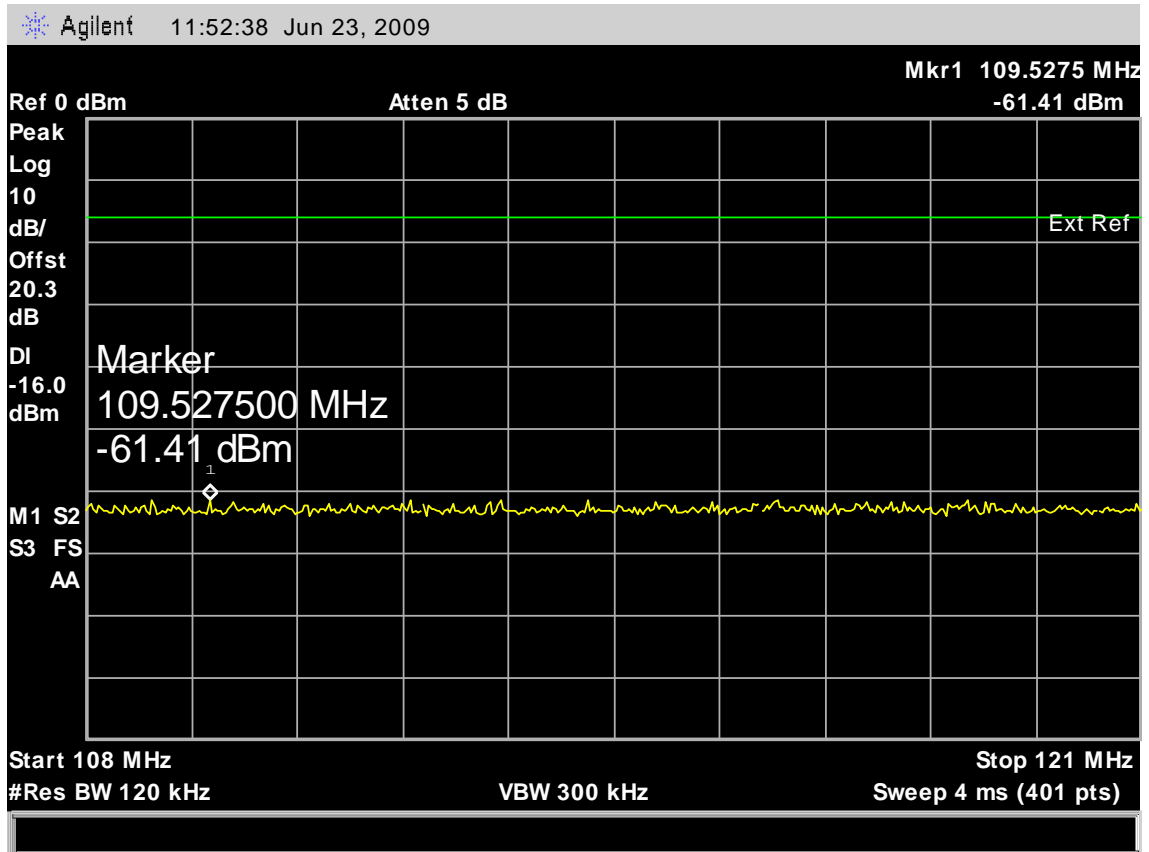
(156 MHz to 162 MHz)



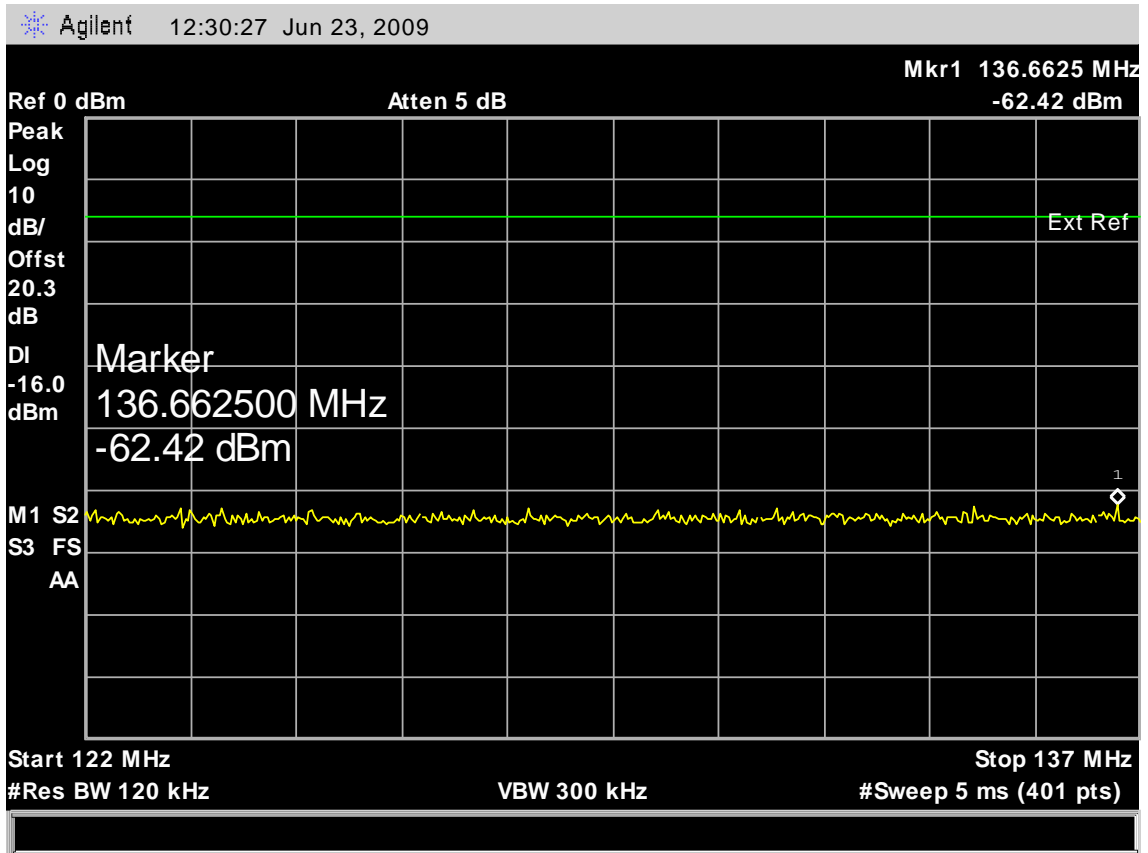
(1525 MHz to 1610 MHz)



PLB-350A (Floatation), Serial Number: #7 (TUV Reference 75905359\_005) 406 MHz Output Port

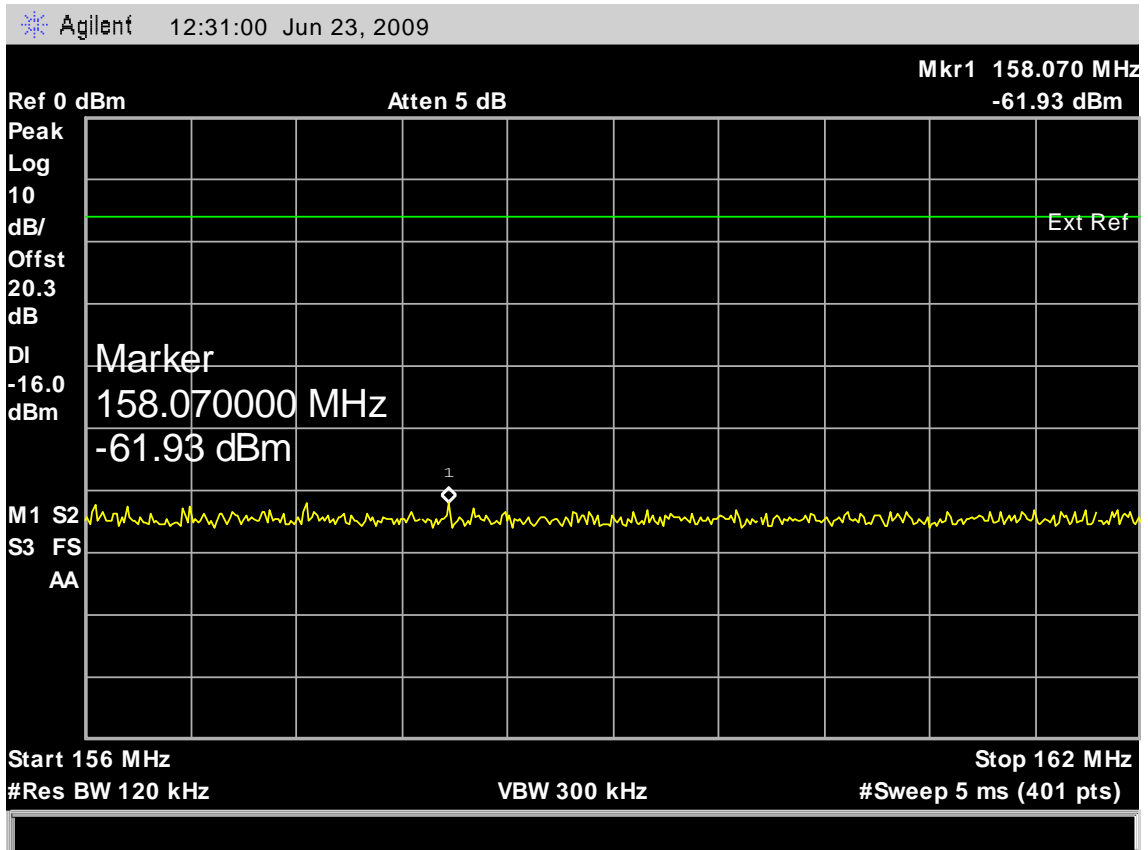


(108 MHz to 121 MHz)

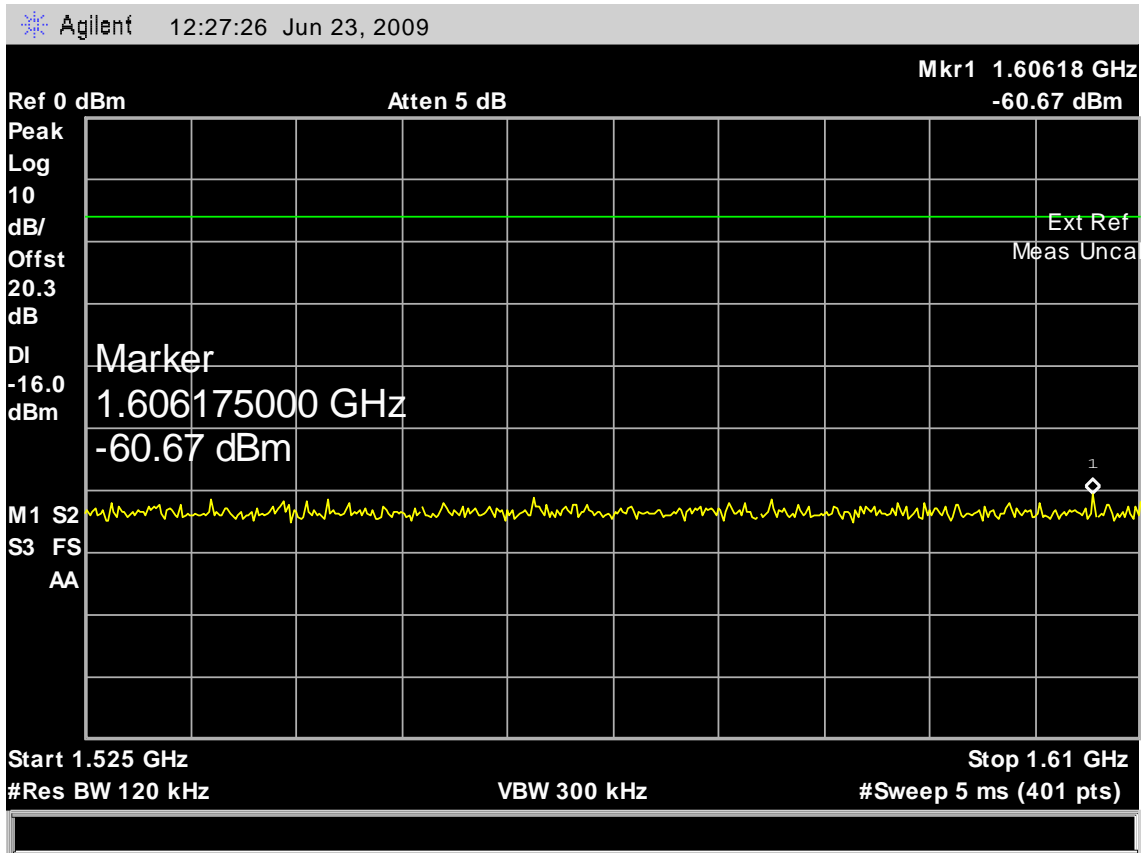


(122 MHz to 137 MHz)





(156 MHz to 162 MHz)



(1525 MHz to 1610 MHz)



**2.14 OPERATIONAL LIFE TEST**

**2.14.1 Specification Reference**

RTCM 11010.2:2008, Clause A.13.1

**2.14.2 Equipment Under Test**

PLB-350B (Floatation), Serial Number #2

**2.14.3 Date of Test and Modification State**

15 February 2009 - Modification State 0

**2.14.4 Test Equipment Used**

The major items of test equipment used for the above tests are identified in Section 3.1.

**2.14.5 Operating Modes**

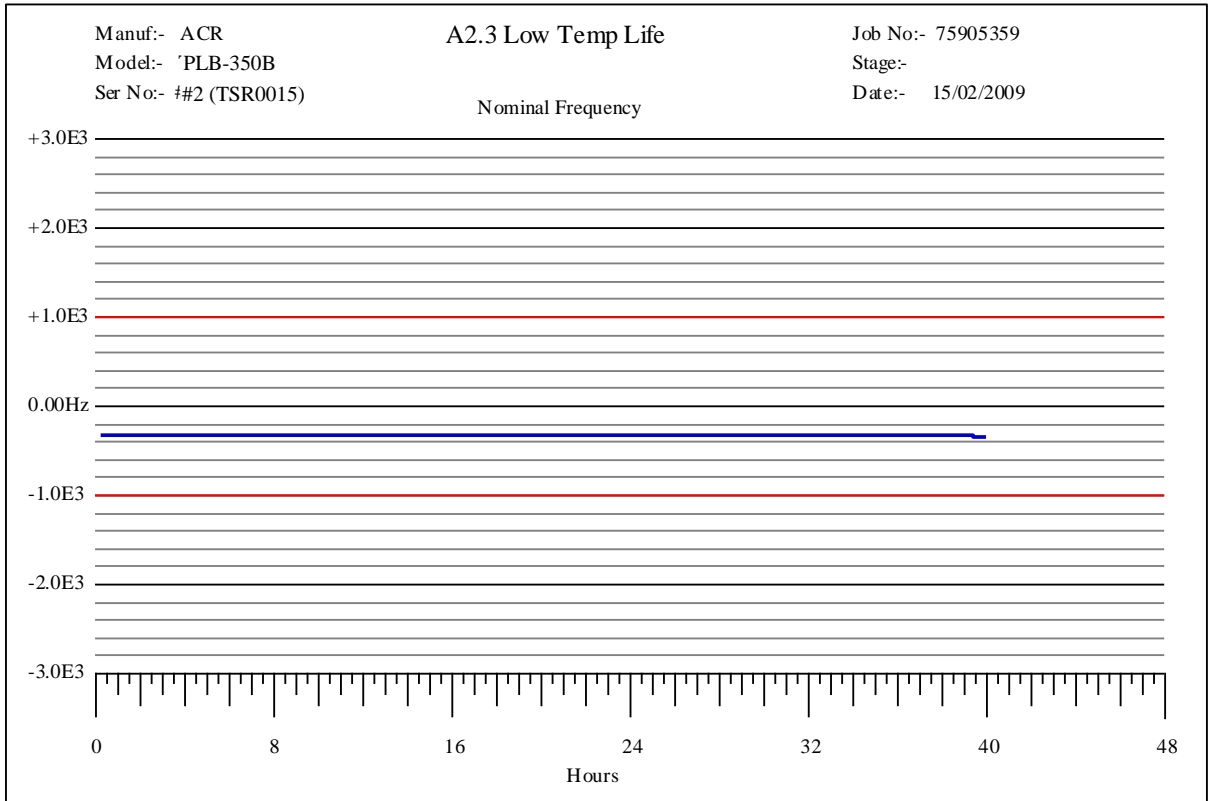
The test was performed with the EUT in the following mode(s): Normal



**2.14.6 Test Results**

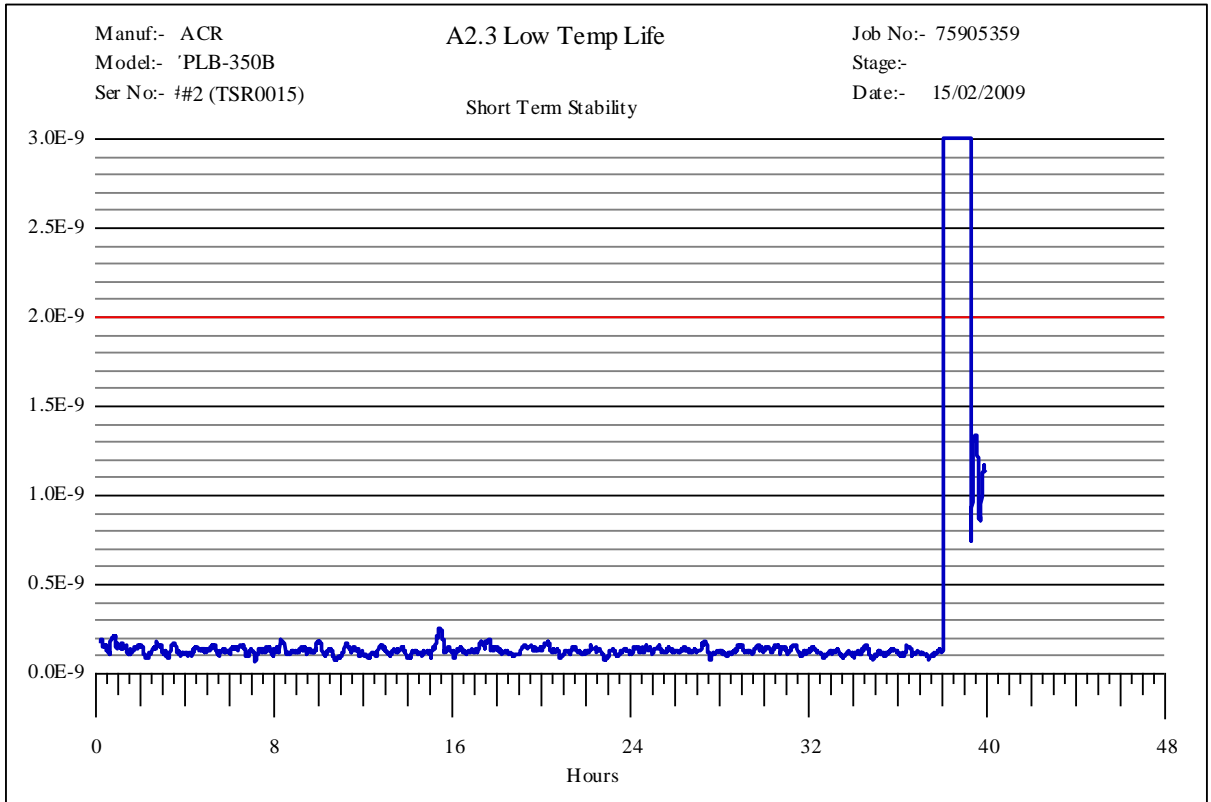
Operational life test performed with GPS variant only as this represents the highest current drain.

Nominal Frequency



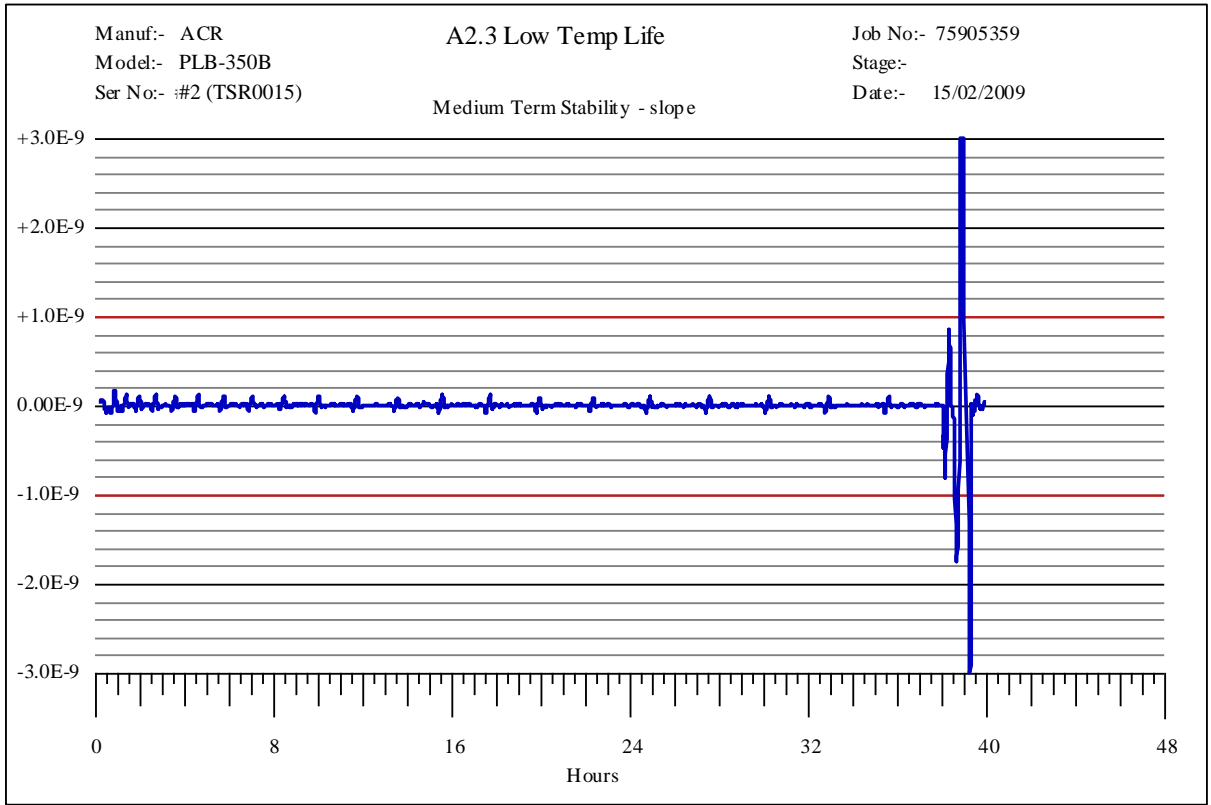


Short Term Stability



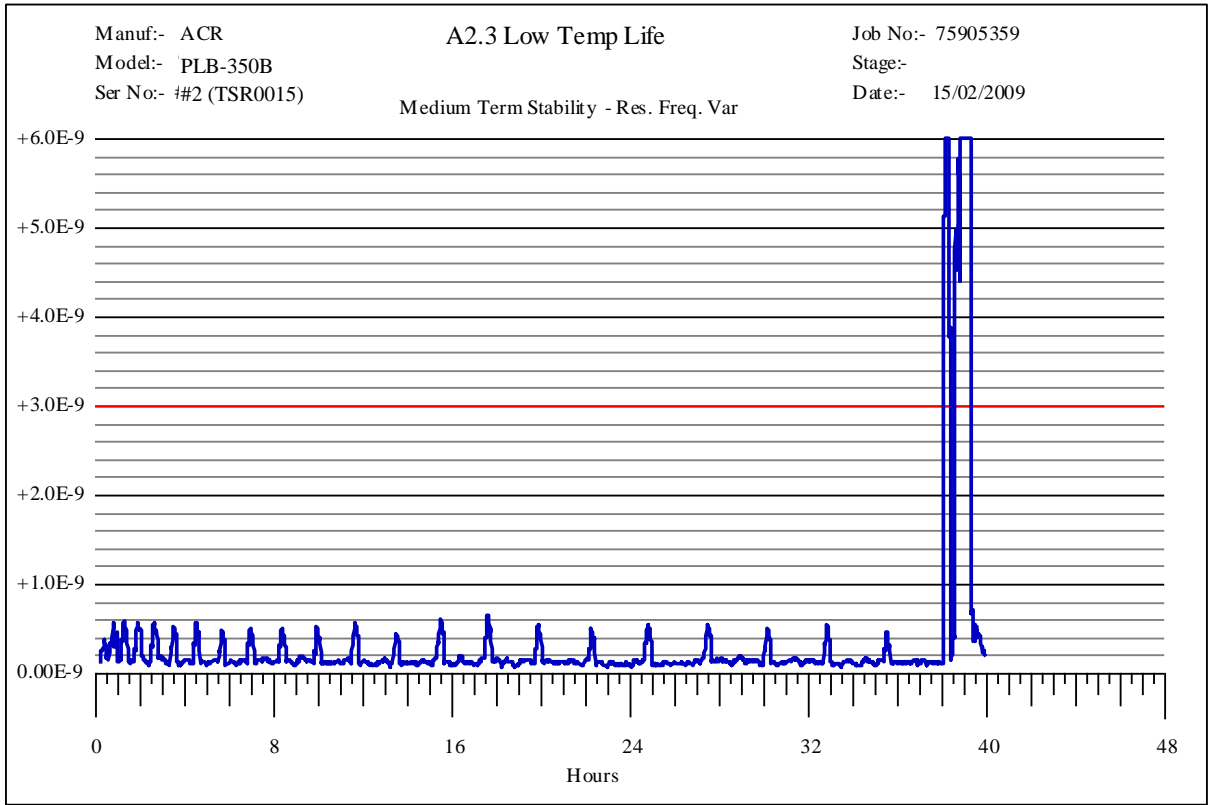


Medium Term Stability, Mean Slope





Medium Term Stability, Residual Frequency Variation





Output Power

