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Report On

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit in accordance with FCC CFR 47 Part 80 and Industry Canada RSS-182

COMMERCIAL-IN-CONFIDENCE

Document 75912008 Report 07 Issue 2 May 2011

Product Service

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REPORT ON

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit in accordance with FCC CFR 47 Part 80 and Industry Canada RSS-182

Document 75912008 Report 07 Issue 2

May 2011

PREPARED FOR

SRT Marine Technology Ltd
Wireless House
Westfield Industrial Estate
Midsomer Norton
Bath
BA3 4BS

PREPARED BY

N Bennett
Senior Administrator

APPROVED BY

M Jenkins
Authorised Signatory

DATED 23 May 2011

This report has been up-issued to Issue 2 to correct typographical errors.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 80 and Industry Canada RSS-182. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

B Airs S Bennett

UKAS TESTING 0141

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Product Service

SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC and Industry Canada Testing of the SRT Marine Technology Ltd Cobalt: Class B AIS Unit to the requirements of FCC Part 80 and Industry Canada RSS-182.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	SRT Marine Technology Ltd
Model Number(s)	011-0014
Serial Number(s)	10
Number of Samples Tested	One
Test Specification/Issue/Date	FCC CFR 47 Part 80: 2009 Industry Canada RSS-182: 2003
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	R001715 02 December 2010
Start of Test	14 January 2011
Finish of Test	24 February 2011
Name of Engineer(s)	B Airs S Bennett

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 80 and Industry Canada RSS-182 is shown below.

Configuration 1 - As supplied							
Section	Clause		Test Description	Mode	Mod State	Result	Base Standard
	FCC	IC					
2.1	80.209 (a)	3.9, 4.2 and 6.1	Frequency Stability Under Voltage Variations	Tx	1	Pass	
2.2	80.209 (a)	3.9, 6.1 and 6.2	Transmitter Frequency Tolerances	Tx	1	Pass	
2.3	80.205 (a)	3.4 (d)(e) and 3.9	Occupied Bandwidth	Tx	1	Pass	
2.4	80.211 (f)(1)(2)	6.3.1 and 6.6	Emission Limitations (Emission Mask)	Tx	1	Pass	
2.5	80.211 (f)(3)	4.4 and 6.3	Emission Limitations (Conducted Transmitter Mask)	Tx	1	Pass	
2.6	80.213	-	Modulation Characteristics	Tx	1	Pass	
2.7	80.215	3.7, 3.9, 4.3 and 6.2	Transmitter Power	Tx	1	Pass	
2.8	80.217 (b)	-	Suppression of Interference Aboard Ships	Rx	1	Pass	
2.9	80.215 (e)(g)(1)(2)(3)	3.7	Transmitter Carrier Power Reduction	Tx	1	Pass	
2.10	80.213 (a)(2)	3.4 (b)	Transmitter Frequency Deviation	Tx	1	Pass	

1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	COBALT; Class B AIS Transceiver OEM Module to IEC62287-1
MANUFACTURER	SRT Marine Technology Ltd
TYPE	Marine Radio Equipment
PART NUMBER	011-0014
SERIAL NUMBER	10, 11, 12
HARDWARE VERSION	Revision 2
SOFTWARE VERSION	1271, 1285
TRANSMITTER OPERATING RANGE	VHF = 156.025-162.025MHz
RECEIVER OPERATING RANGE	VHF = 156.025-162.025MHz, GPS = 1575.42MHz
COUNTRY OF ORIGIN	United Kingdom
INTERMEDIATE FREQUENCIES	19.655MHz, 455KHz, 29.255MHz,
ITU DESIGNATION OF EMISSION	6K00G7E
HIGHEST INTERNALLY GENERATED FREQUENCY	213.68MHz
OUTPUT POWER (W or dBm)	2 W, 33dBm
FCC ID	N/A
INDUSTRY CANADA ID	N/A
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Marine AIS CSTDMA Class B Transceiver OEM Module to IEC62287-1
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	Switch mode power supply
MANUFACTURER	SRT Marine Technology Ltd
TYPE	Switch mode power supply
PART NUMBER	N/A as internal
VOLTAGE	12 to 24V DC, -10% to +30% (10.8 to 31.2V DC
COUNTRY OF ORIGIN	United Kingdom

Signature  Nathan Emery

Date **15th February 2011**

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a SRT Marine Technology Ltd Cobalt: Class B AIS Unit. A full technical description can be found in the manufacturer's documentation.

1.4.2 Test Configuration

Configuration 1: As supplied

The EUT was configured in accordance with FCC CFR 47 Part 80 and Industry Canada RSS-182.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from a 12V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable
1	Rx1 Tuning Range Extended (C261 Fitted)	Nathan Emery	06 January 2011

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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
SRT Marine Technology Ltd
Cobalt: Class B AIS Unit

2.1 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.1.1 Specification Reference

FCC Part 80, Clause 80.209 (a)
Industry Canada RSS-182, Clause 3.9, 6.1 and 6.2

2.1.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.1.3 Date of Test and Modification State

17 January 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.0°C
Relative Humidity	32.0%

2.1.6 Test Procedure

The EUT was connected to a spectrum analyser via a 30 dB attenuator with an external high stability frequency reference connected.

The EUT was transmitted unmodulated and the trace set to max hold with a 100 Hz resolution bandwidth.

The marker was then used to measure the peak response and the result recorded in the table on the following page.

2.1.7 Test Results

12 V DC Supply

Test Conditions		Frequency Error (Hz)			
		156.025 MHz		162.025 MHz	
		TX1	TX2	TX1	TX2
T_{nom}(+23.0°C)	V_{min}(10.80V)	-71	-48	-81	-83
	V_{min}(10.20V)	-81	-48	-81	-90
	V_{nom}(12.00V)	-81	-55	-81	-83
	V_{max}(13.20V)	-93	-55	-74	-58
	V_{max}(13.80V)	-81	-81	-77	-71
Maximum Frequency Error (Hz)		-93	-81	-81	-90
Measurement uncertainty (Hz)		±11			

1 – V_{min} and V_{max} is V_{nom} ± 10% for RSS-182
2 – V_{min} and V_{max} is V_{nom} ± 15% for FCC Part 80

Limit Clause

The frequency error shall not exceed 10ppm. (±1.56025 kHz / ±1.62025 kHz)

2.2 TRANSMITTER FREQUENCY TOLERANCE

2.2.1 Specification Reference

FCC Part 80, Clause 80.209 (a)
Industry Canada RSS-182, Clause 3.9, 6.1 and 6.2

2.2.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.2.3 Date of Test and Modification State

18 January 2011 - Modification State 1

2.2.4 Test Equipment Used

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

2.2.5 Environmental Conditions

Ambient Temperature	23.0°C
Relative Humidity	32.0%

2.2.6 Test Procedure

The EUT was connected to a spectrum analyser via a 30 dB attenuator with an external high stability frequency reference connected. The EUT was transmitted unmodulated and the trace set to max hold with a 100 Hz resolution bandwidth. The marker was then used to measure the peak response and the result recorded in the table on the following page.

2.2.7 Test Results

12V DC Supply

Temperature Interval (°C)	Frequency Error (kHz)					
	156.025 MHz					
	10.8 V		12.0 V		13.2 V	
	TX1	TX2	TX1	TX2	TX1	TX2
-20	-0.036	-0.034	-0.045	-0.034	-0.031	-0.036
-15	+0.038	-0.071	+0.041	-0.072	+0.014	-0.071
-10	+0.086	-0.118	+0.082	-0.115	+0.087	-0.105
0	+0.096	-0.143	+0.097	-0.143	+0.096	-0.145
+10	+0.077	-0.108	+0.069	-0.105	+0.062	-0.108
+20	-0.071	-0.048	-0.081	-0.055	-0.083	-0.0.55
+30	-0.016	-0.031	-0.038	-0.029	-0.046	-0.032
+40	-0.066	-0.043	-0.066	-0.035	-0.063	-0.043
+50	-0.069	-0.079	-0.063	-0.069	-0.049	-0.061
+55	-0.034	-0.164	-0.024	-0.163	+0.005	-0.149
Maximum freq. error (kHz)	+0.096	+0.143	+0.097	+0.163	+0.096	+0.149
Measurement uncertainty (Hz)	±11					

Temperature Interval (°C)	Frequency Error (kHz)					
	162.025 MHz					
	10.8 V		12.0 V		13.2 V	
	TX1	TX2	TX1	TX2	TX1	TX2
-20	+0.016	-0.042	+0.021	-0.042	+0.016	-0.045
-15	+0.067	-0.074	+0.069	-0.073	+0.072	-0.068
-10	+0.095	-0.118	+0.096	-0.121	+0.095	-0.119
0	+0.095	-0.140	+0.095	-0.142	+0.092	-0.142
+10	+0.047	-0.097	+0.047	-0.097	+0.045	-0.101
+20	-0.081	-0.083	-0.081	-0.083	+0.074	-0.058
+30	-0.061	-0.029	-0.062	-0.032	-0.065	-0.031
+40	-0.064	-0.034	-0.066	-0.032	-0.064	-0.034
+50	-0.024	-0.101	-0.016	-0.098	-0.011	-0.091
+55	+0.031	-0.179	+0.038	-0.169	+0.048	-0.149
Maximum freq. error (Hz)	+0.095	+0.179	+0.096	+0.169	+0.095	+0.149
Measurement uncertainty (Hz)	±11					

Limit Clause

The frequency error shall not exceed 10ppm. (±1.56025 kHz / ±1.62025 kHz)

2.3 OCCUPIED BANDWIDTH

2.3.1 Specification Reference

FCC Part 80, Clause 80.205 (a)
Industry Canada RSS-182, Clause 3.4 (d)(e) and 3.9

2.3.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.3.3 Date of Test and Modification State

18 January 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.2°C
Relative Humidity	29.6%

2.3.6 Test Procedure

The EUT was connected to a spectrum analyser via a cable and attenuators. The EUT was configured to transmit three different packet data loads at maximum power.

The trace was set to max hold until a sufficient number of sweeps was observed. The 99% occupied bandwidth function was selected on the spectrum analyser and the result and the trace were recorded.

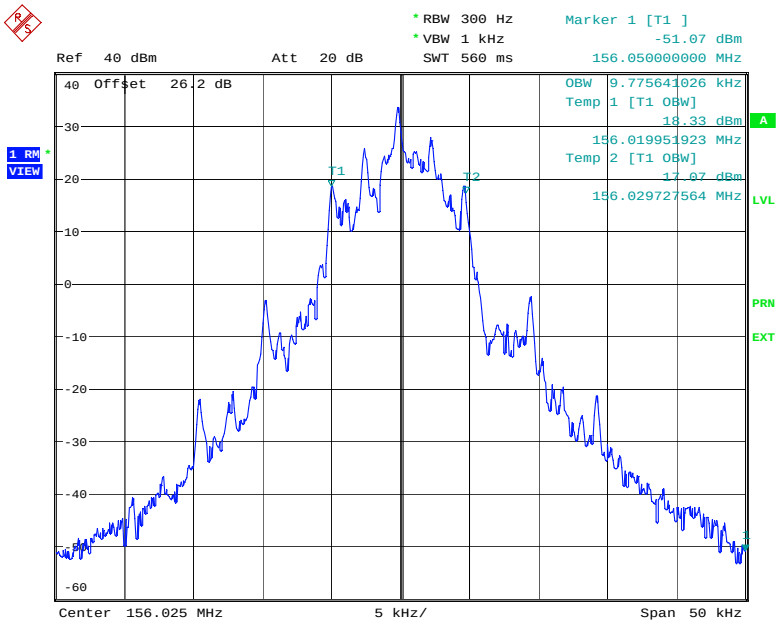
2.3.7 Test Results

Frequency	Modulation	TX No	Result (kHz)	Authorised Bandwidth (kHz)
156.025 MHz	101010	TX1	9.7756	20
		TX2	9.7756	20
	00001111	TX1	9.5353	20
		TX2	9.4551	20
	PRBS	TX1	9.5353	20
		TX2	9.4551	20
162.025 MHz	101010	TX1	9.7756	20
		TX2	9.8558	20
	00001111	TX1	9.5353	20
		TX2	9.5353	20
	PRBS	TX1	9.6153	20
		TX2	9.4551	20

156.025 MHz

101010

Tx1



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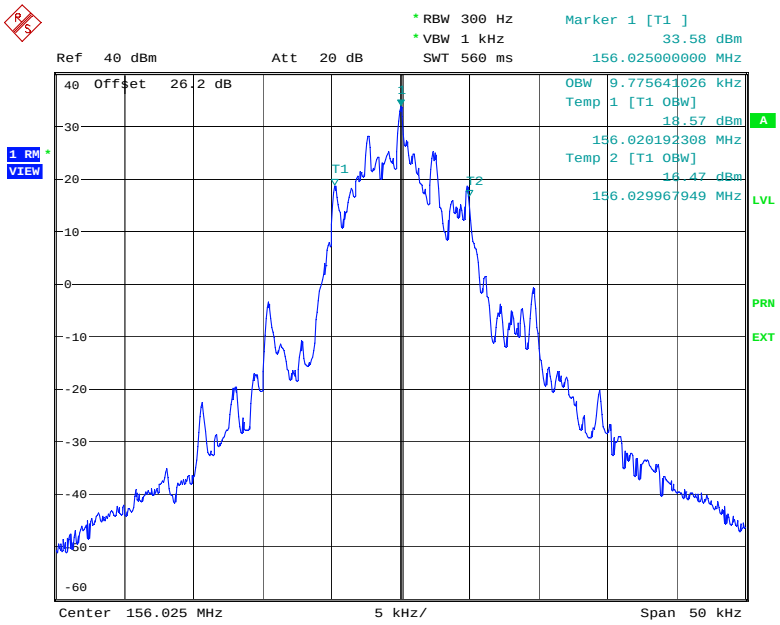

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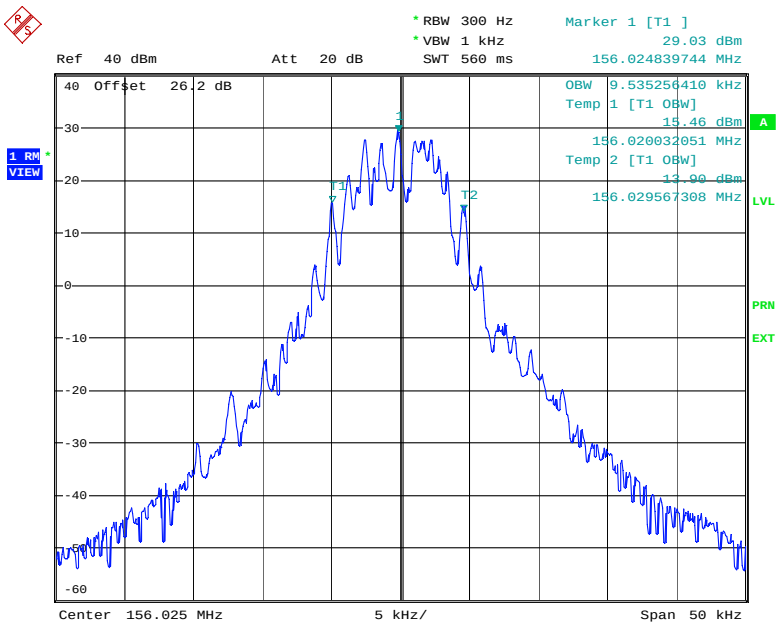

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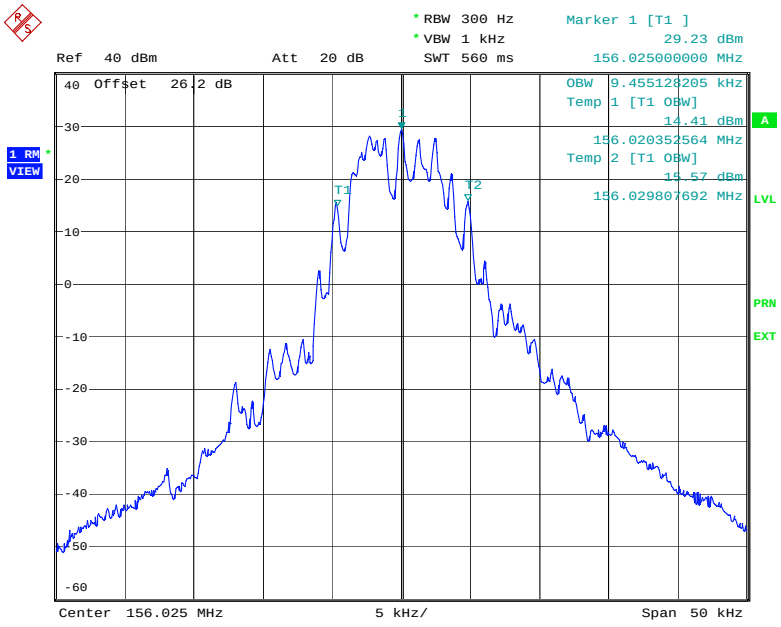

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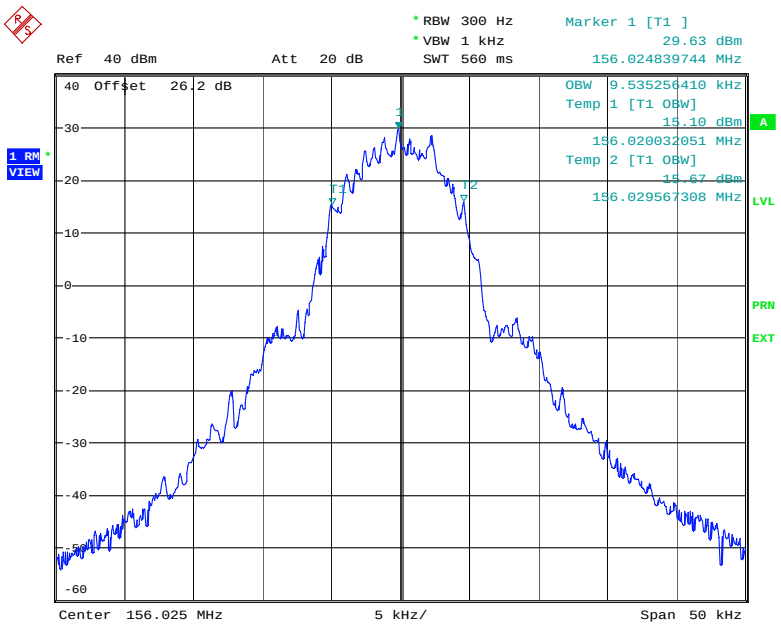
PRBS

Tx1



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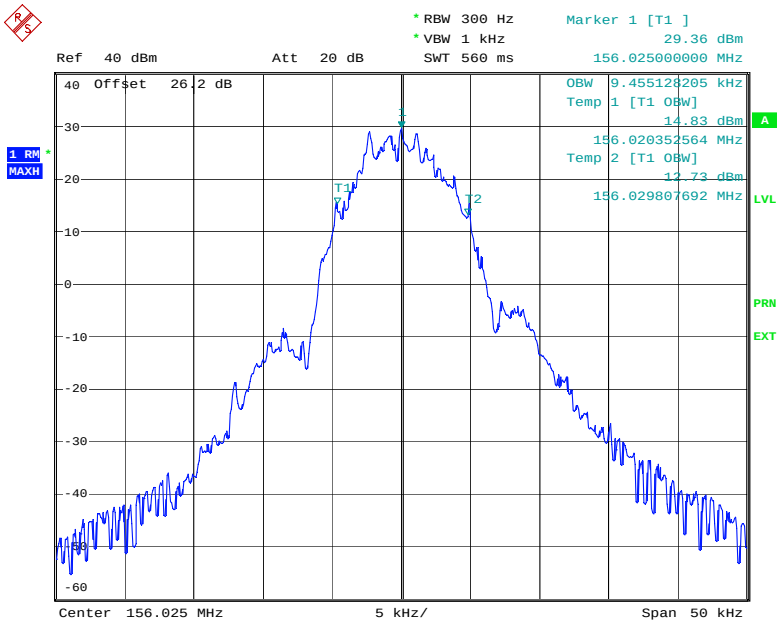

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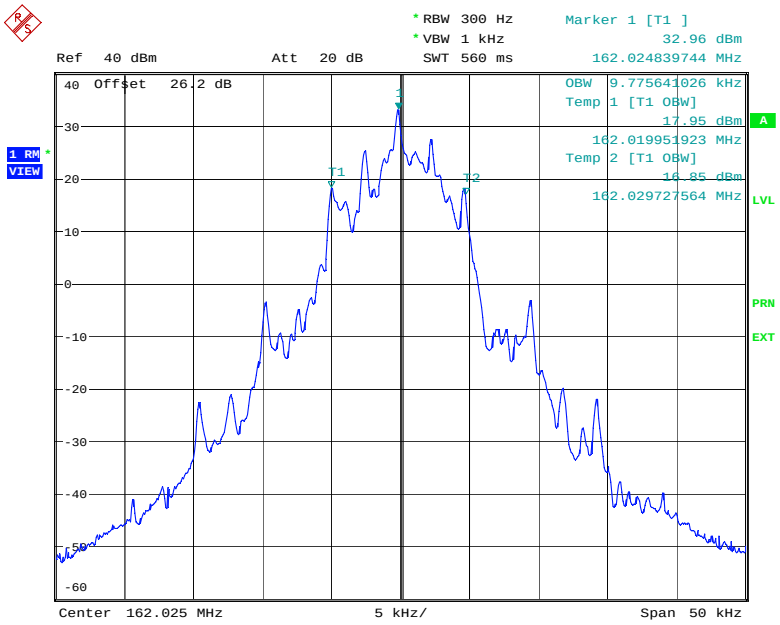
162.025 MHz

101010

Tx1



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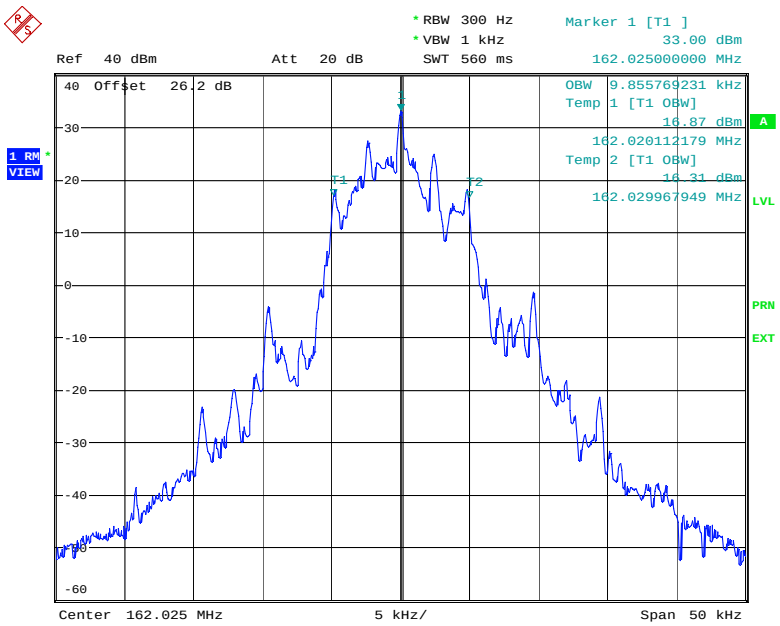

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00001111

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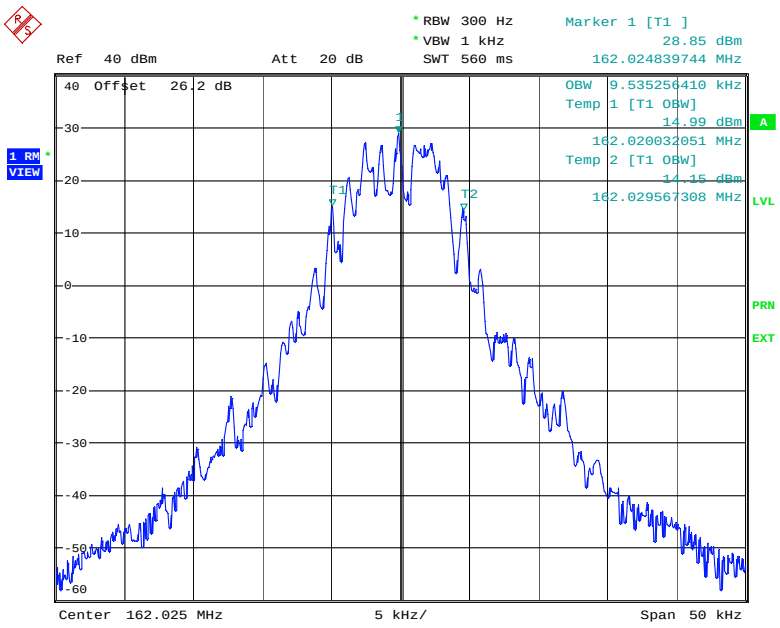

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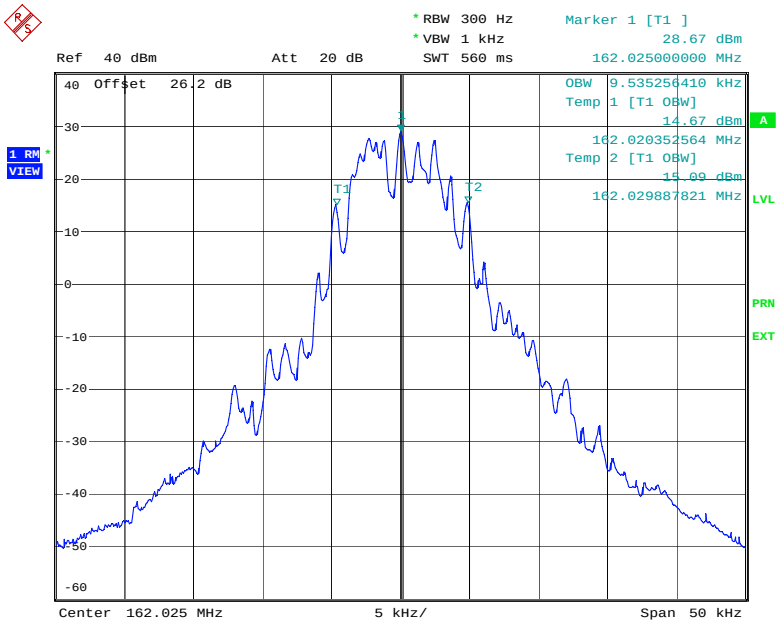

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PRBS

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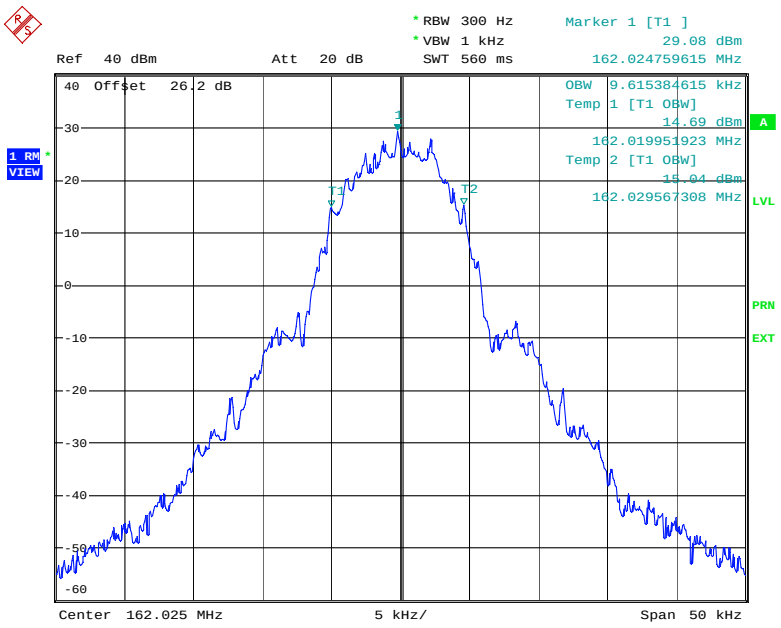

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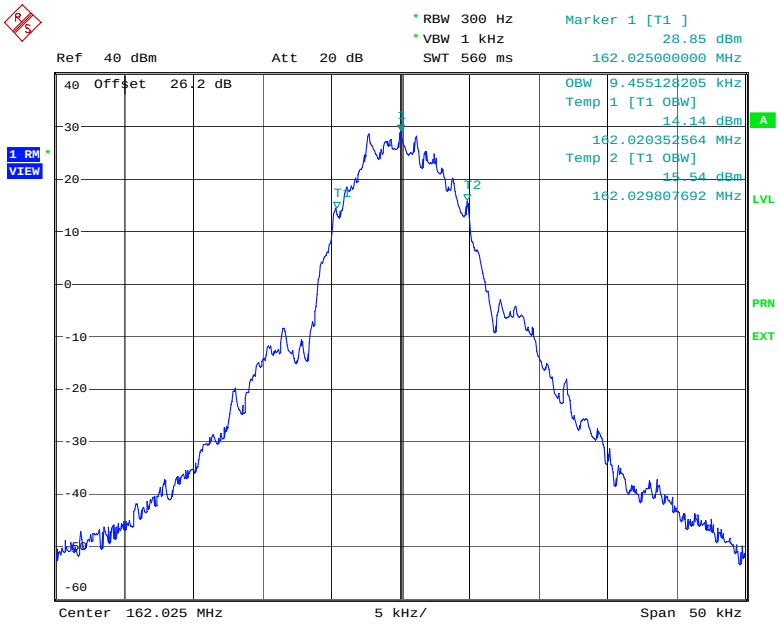

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Limit Clause

(d) The nominal authorised channel bandwidth for voice is 20 kHz

(e) For data modulation, an authorised bandwidth of 16 kHz is permitted.

2.4 EMISSION LIMITATIONS (EMISSION MASK)

2.4.1 Specification Reference

FCC Part 80, Clause 80.211 (f)(1)(2)
Industry Canada RSS-182, Clause 6.3.1 and 6.6

2.4.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.4.3 Date of Test and Modification State

18 and 21 February 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.4°C
Relative Humidity	28.5%

2.4.6 Test Procedure

The EUT was connected to a spectrum analyser via a 30 dB attenuator. The resolution bandwidth and video bandwidth were set to 300 Hz and 1 kHz respectively. The EUT was configured to transmit three different packet data loads. These were 11110000, 10101010 and PRBS. The reference level was set to the power measured in 80.215 (FCC) and 6.2 (RSS-182). The traces were recorded and are shown below.

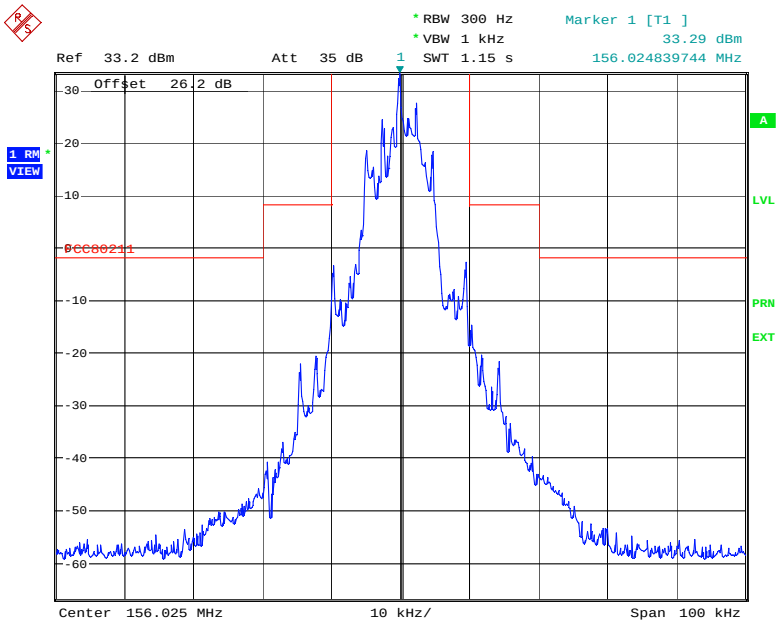
2.4.7 Test Results

12V DC Supply

156.025 MHz

101010

TX1



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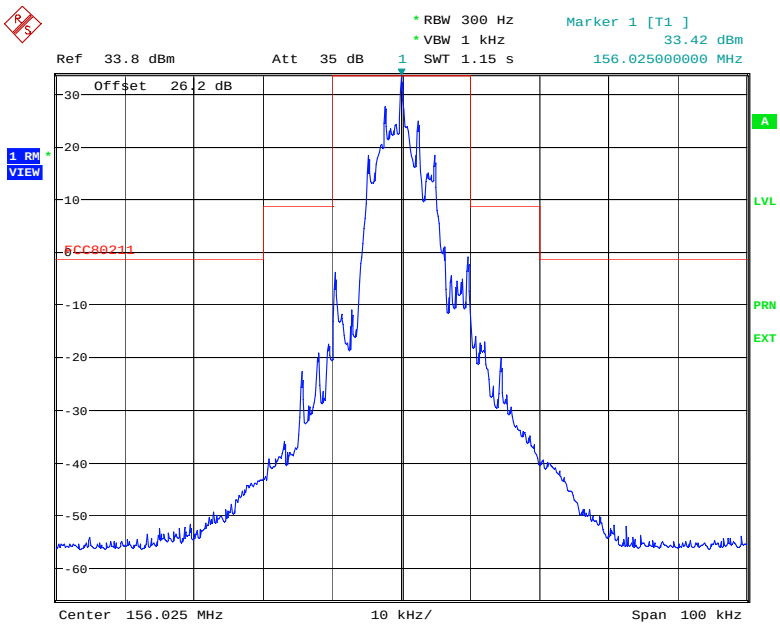

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00001111

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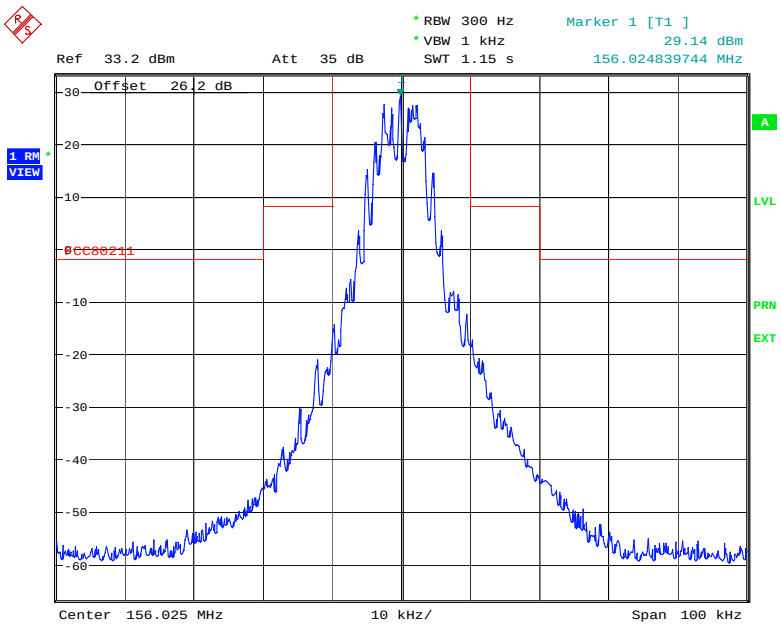

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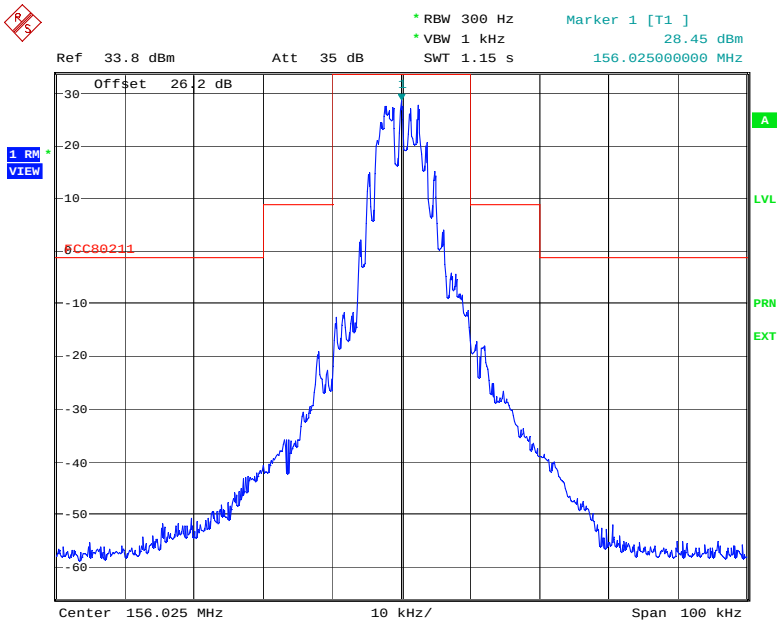

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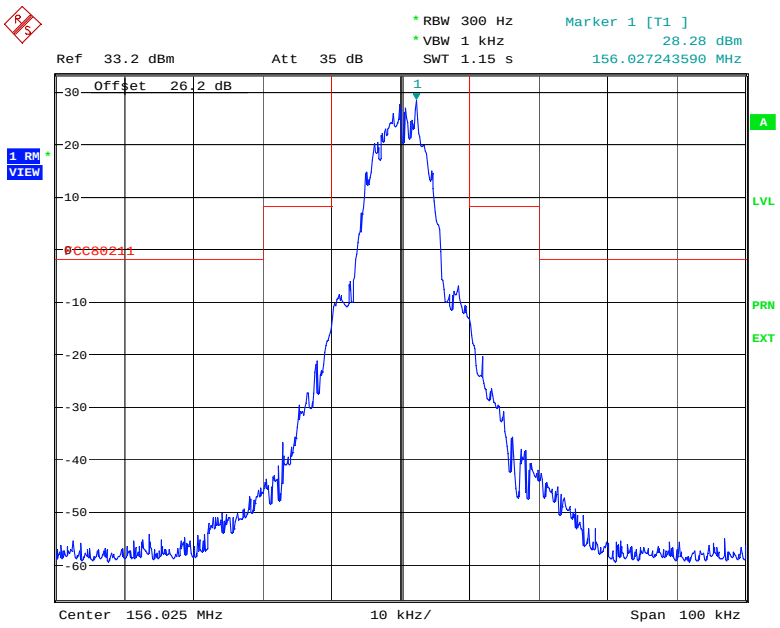
PRBS

TX1



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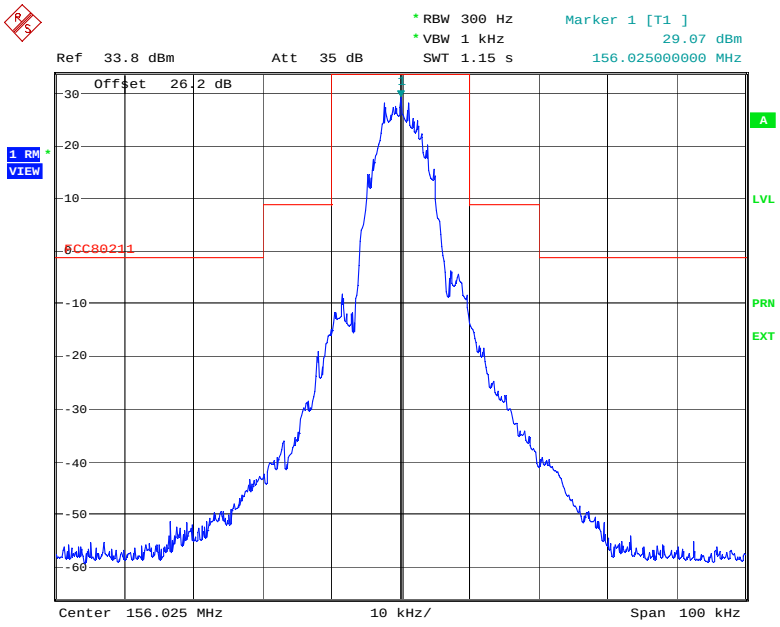

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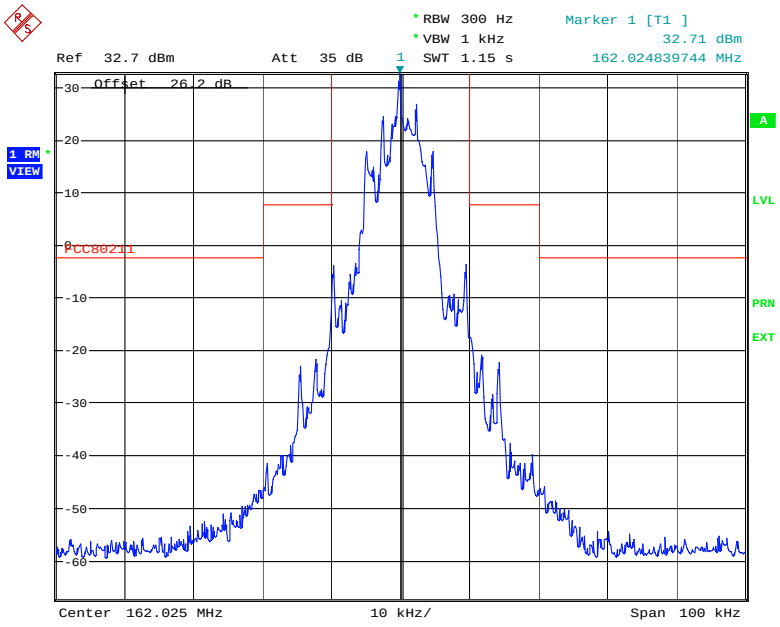
162.025 MHz

101010

TX1



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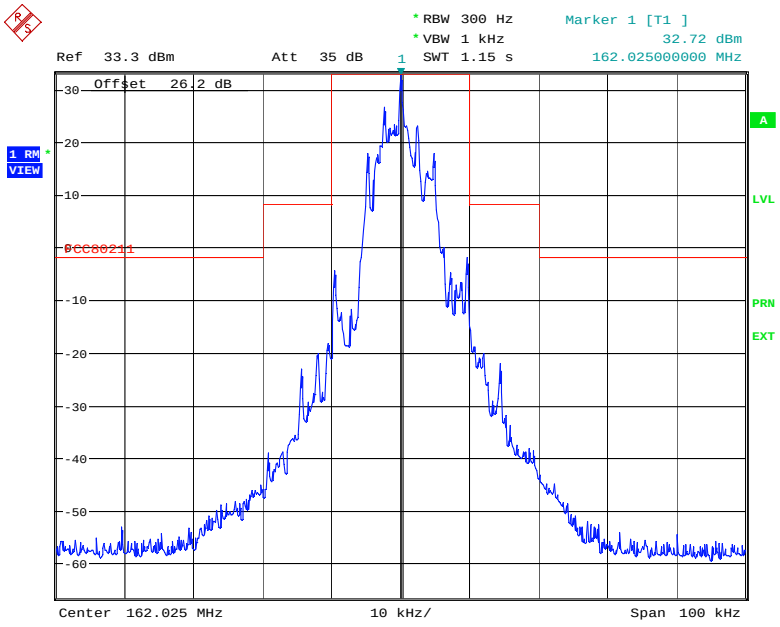

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00001111

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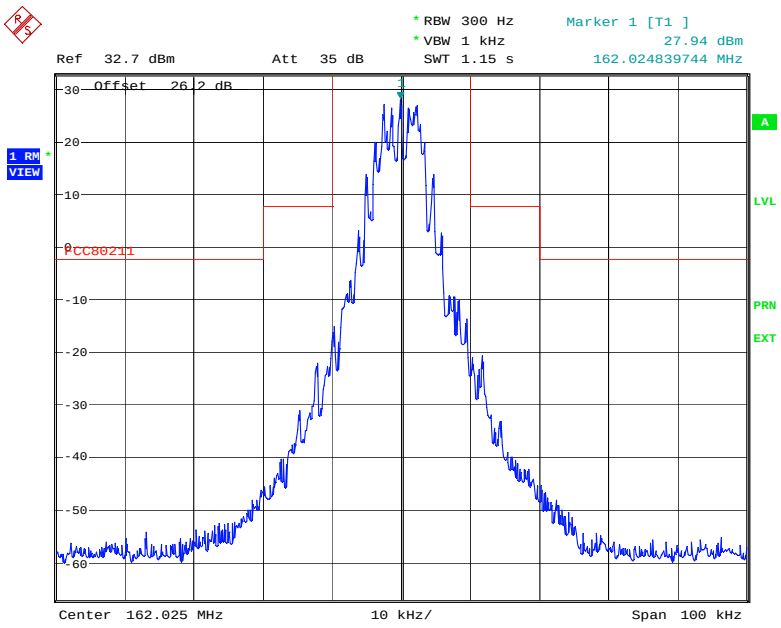

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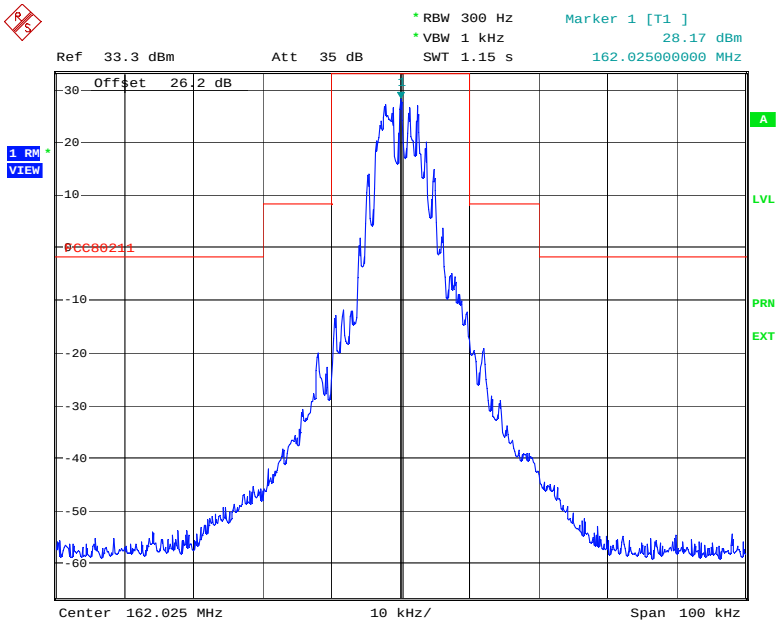

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PRBS

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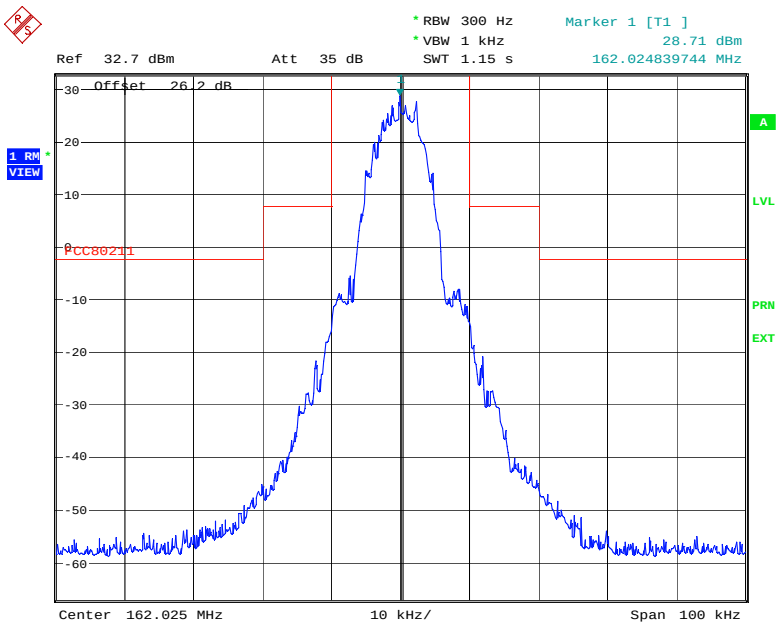

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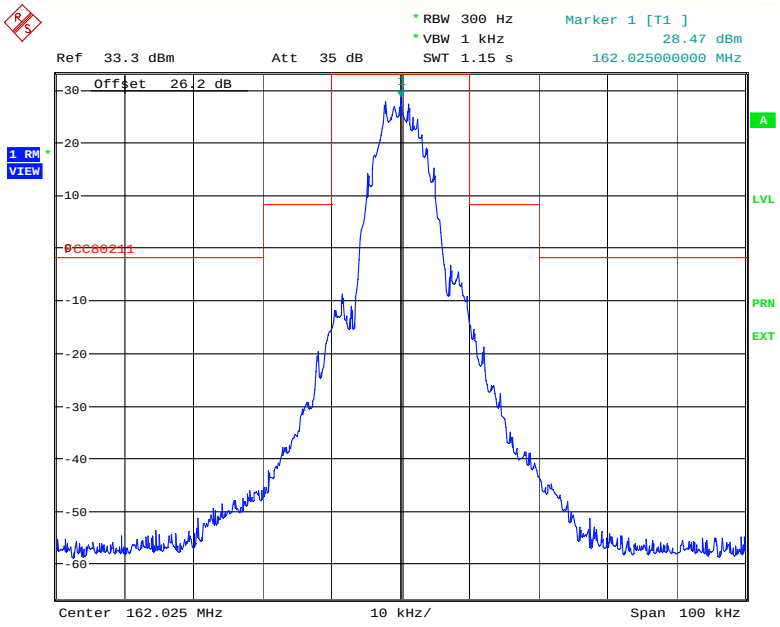

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Limit Clause

On any frequency removed from the assigned frequency by more than 50 % up to and including 100 % of the authorized bandwidth: At least 25 dB

On any frequency removed from the assigned frequency by more than 100 % up to and including 250 % of the authorized bandwidth: At least 35 dB

2.5 EMISSION LIMITATIONS (CONDUCTED TRANSMITTER SPURIOUS)

2.5.1 Specification Reference

FCC Part 80, Clause 80.211 (f)(3)
Industry Canada RSS-182, Clause 4.4 and 6.3

2.5.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.5.3 Date of Test and Modification State

21 February 2011 - Modification State 1

2.5.4 Test Equipment Used

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

2.5.5 Environmental Conditions

Ambient Temperature	22.8°C
Relative Humidity	31.7%

2.5.6 Test Procedure

Using a spectrum analyser, the emissions were measured between the range 9 kHz to 2 GHz. The path loss between the EUT and the spectrum analyser was measured and the highest value of attenuation across the range was entered as a reference level offset. The resolution bandwidth and video bandwidth were set to 30 kHz and 100 kHz respectively. Due to the burst nature of the signal, the spectrum analyser was set to measure only during the burst (gated trigger).

The trace was set to max hold and a peak detector was used to give the worst case result. The traces were recorded as shown on the following page.

2.5.7 Test Results

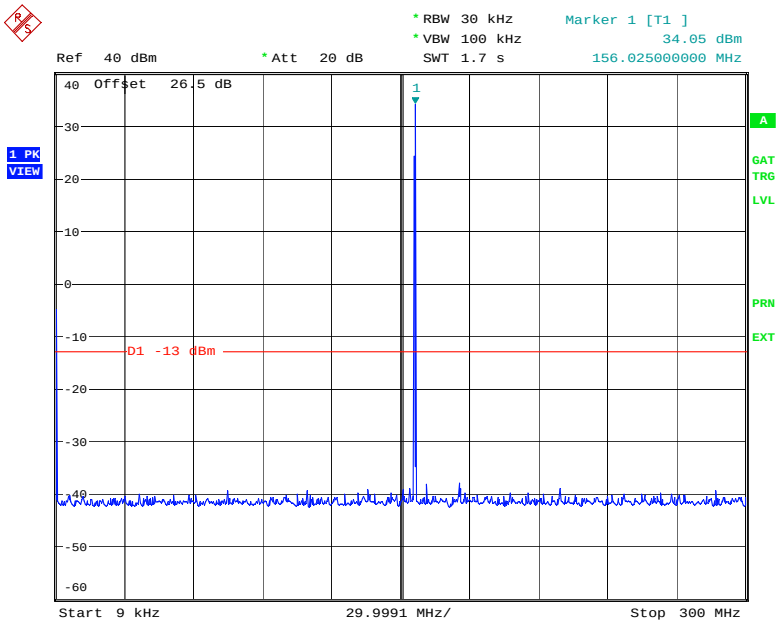
12 V DC Supply

Maximum Power 2W

156.025 MHz

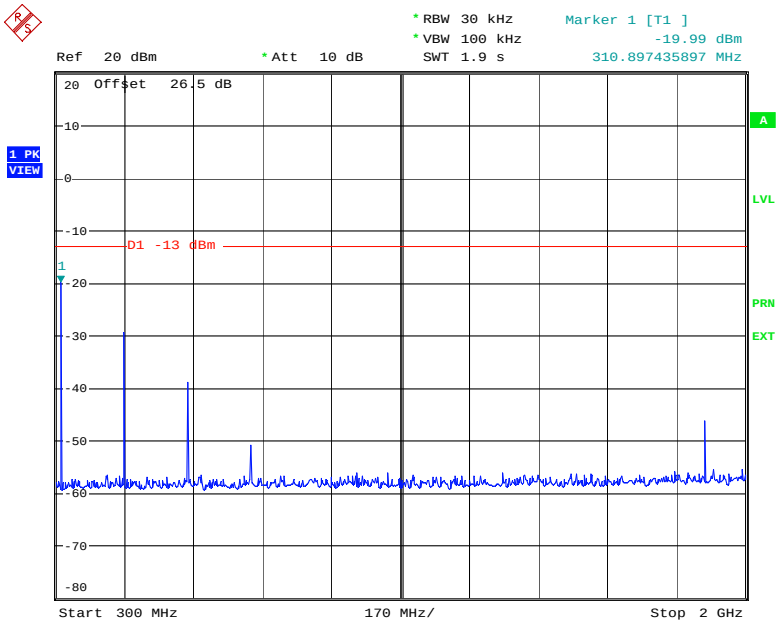
Tx1

9 kHz to 300 MHz



Date: 21.FEB.2011 12:06:33

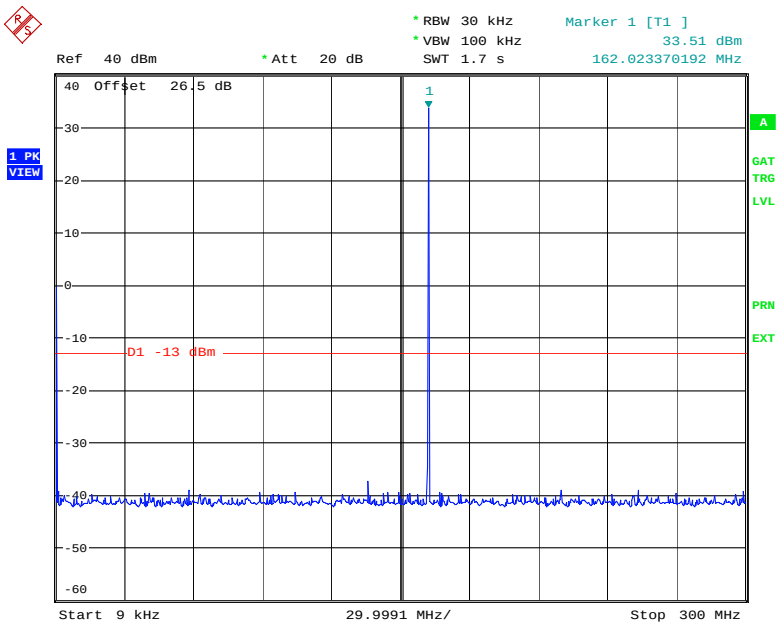
300 MHz to 2 GHz



Date: 21.FEB.2011 13:01:52

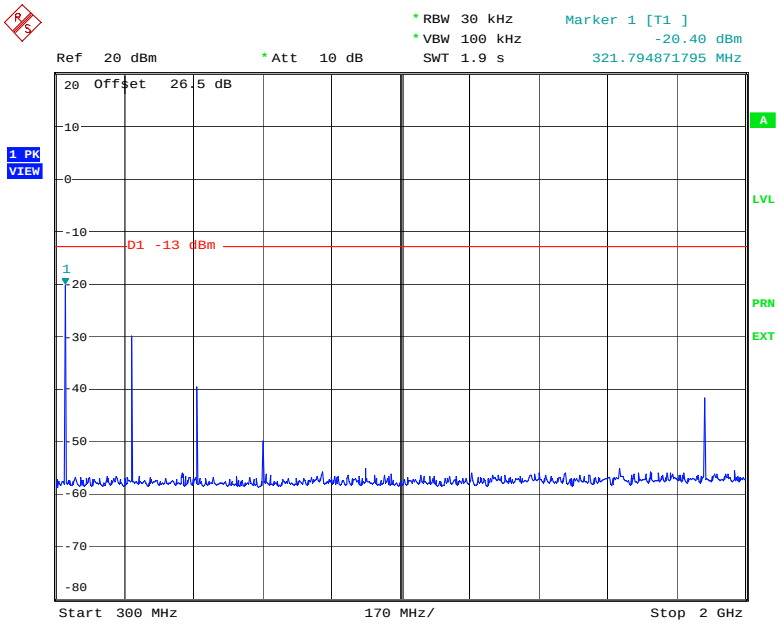
Tx2

9 kHz to 300 MHz



Date: 21.FEB.2011 12:25:31

300 MHz to 2 GHz

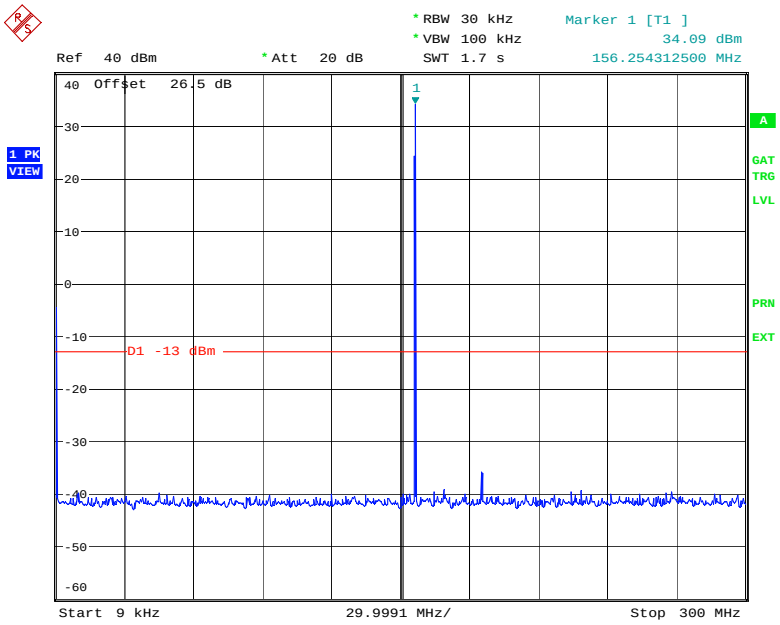


Date: 21.FEB.2011 13:04:18

160.025 MHz

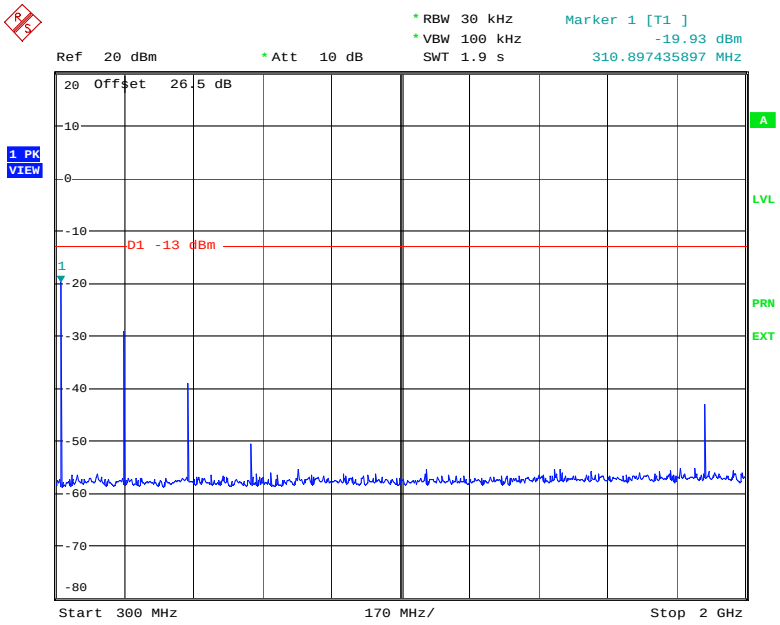
Tx1

9 kHz to 300 MHz



Date: 21.FEB.2011 12:35:47

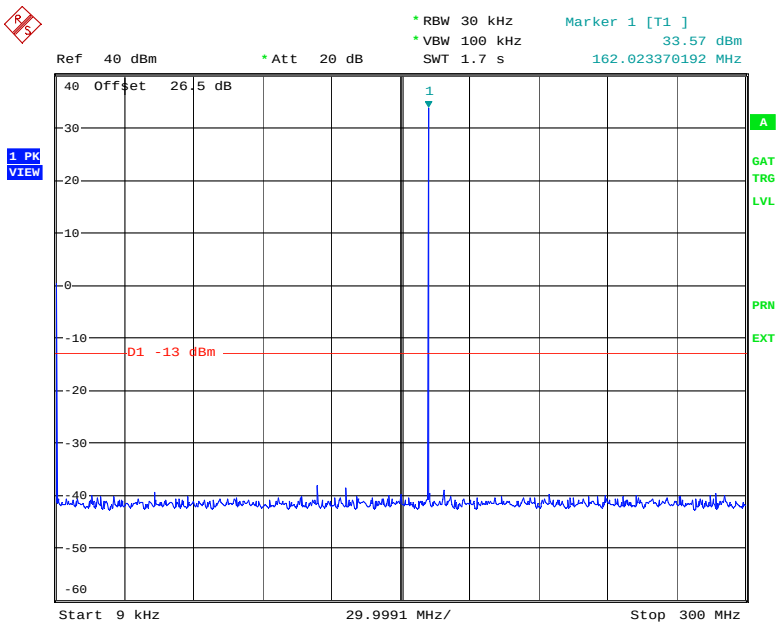
300 MHz to 2 GHz



Date: 21.FEB.2011 13:07:16

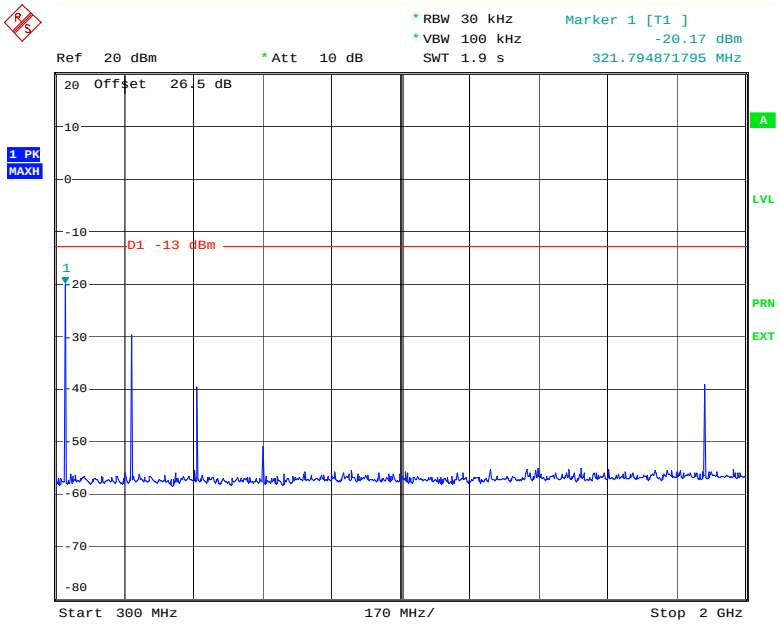
Tx2

9 kHz to 300 MHz



Date: 21.FEB.2011 12:44:39

300 MHz to 2 GHz



Date: 21.FEB.2011 13:12:49

Limit Clause

>250 % of authorised bandwidth 43+10 Log P **OR** -13 dBm

2.6 MODULATION CHARACTERISTICS

2.6.1 Specification Reference

FCC Part 80, Clause 80.213

2.6.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.6.3 Date of Test and Modification State

24 February 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.5°C
Relative Humidity	37.3%

2.6.6 Test Procedure

The EUT was configured to transmit three different packet data loads. These were 11110000, 10101010 and PRBS. The traces were recorded as shown below.

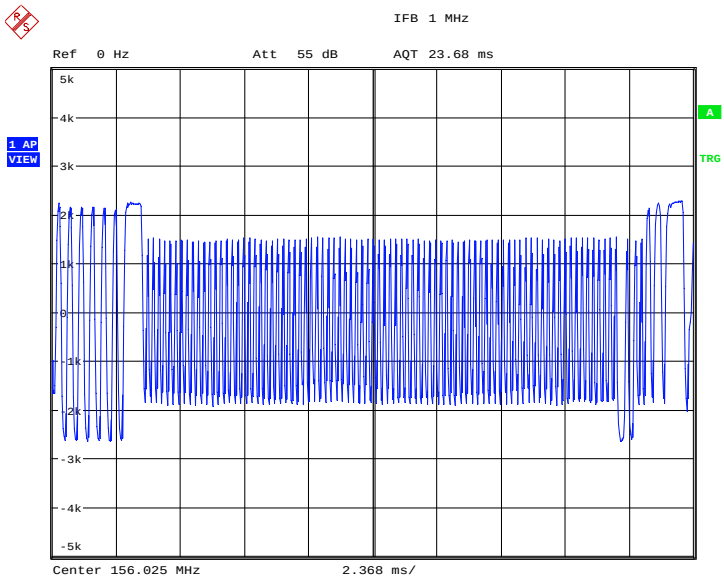
2.6.7 Test Results

12 V DC Supply

156.025 MHz

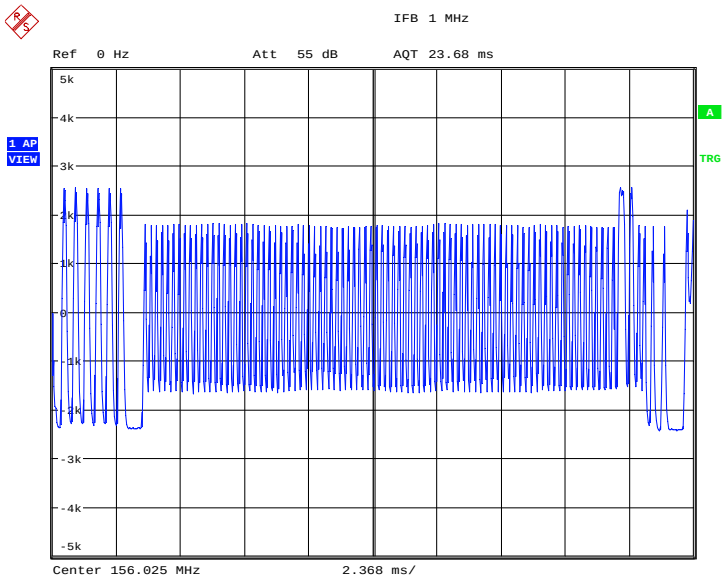
101010

TX1



Date: 24.FEB.2011 11:29:34

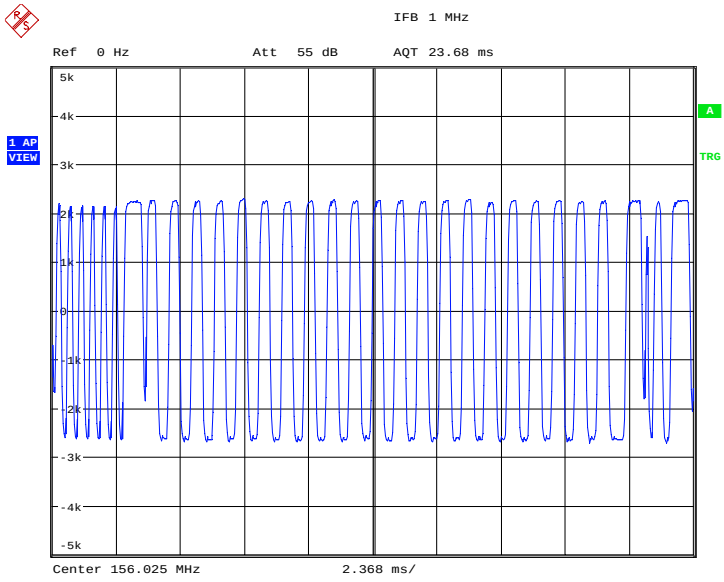
TX2



Date: 24.FEB.2011 11:35:33

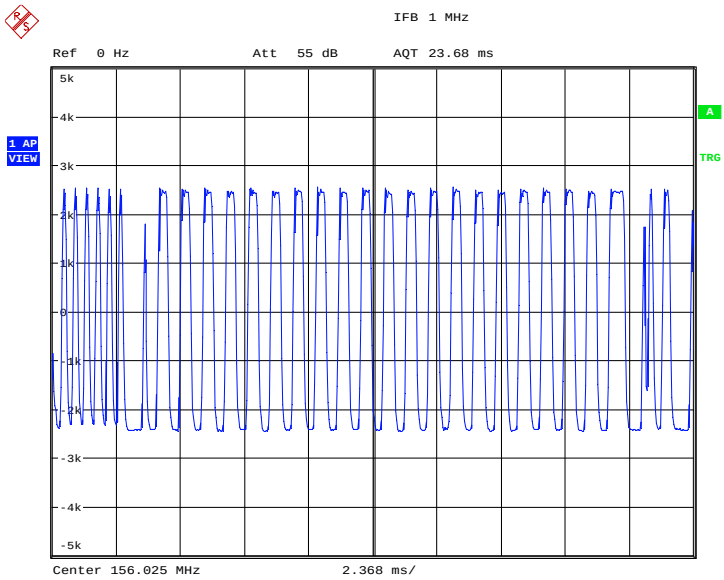
00001111

TX1



Date: 24.FEB.2011 11:32:22

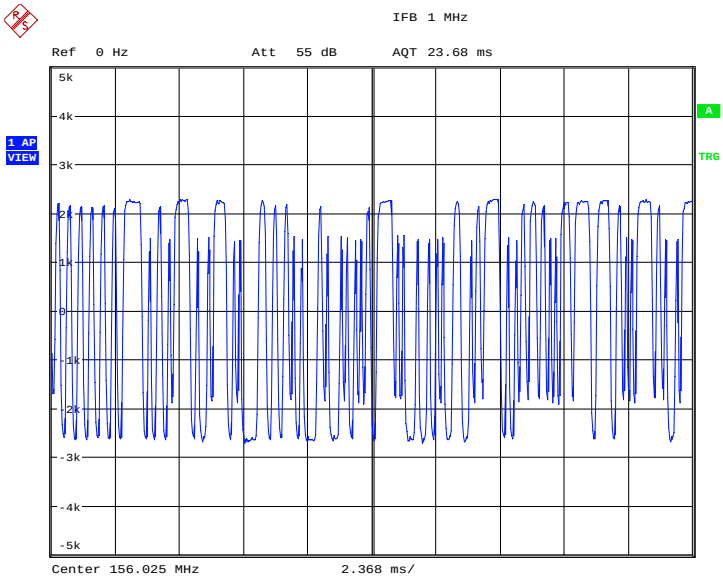
TX2



Date: 24.FEB.2011 11:42:29

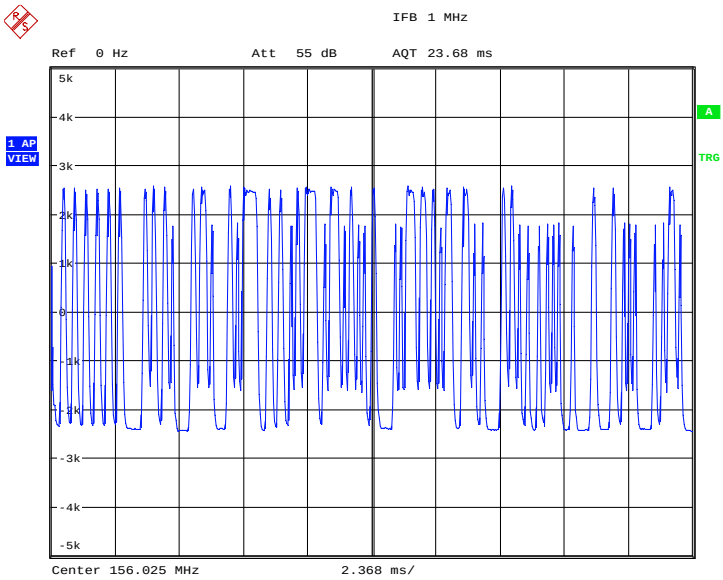
PRBS

TX1



Date: 24.FEB.2011 11:33:47

TX2



Date: 24.FEB.2011 11:44:04

Limit Clause

When phase or frequency modulatio is used int he 156-162 MHz bands the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ±5 kHz is defined as 100 percent peak modulation.

Ship and cost station transmitters operating in teh 156-162 MHz and 216-220 MHz bands must be capable of proper operation with a frequency deviation that does not exceed ±5 kHz.

2.7 TRANSMITTER POWER

2.7.1 Specification Reference

FCC Part 80, Clause 80.215
Industry Canada RSS-182, Clause 3.7, 3.9, 4.3 and 6.2

2.7.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.7.3 Date of Test and Modification State

14 January 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.0°C
Relative Humidity	39.0%

2.7.6 Test Procedure

The EUT was connected to a spectrum analyser via a cable and a 30 dB attenuator. The EUT was set to transmit at maximum power with a modulated and un-modulated carrier. A resolution bandwidth of 1 MHz and a video bandwidth of 10 MHz were used using an RMS detector and average trace. The results are shown in the table on the following page.

2.7.7 Test Results

12.2 V DC Supply

Test Voltage	Frequency	TX No	Result (dBm)		Result (W)	
			Unmodulated	Modulated	Unmodulated	Modulated
V_{nom} (12.2V)	156.025 MHz	TX1	33.23	33.20	2.104	2.089
		TX2	33.86	33.83	2.432	2.415
V_{FCC} (13.7V)		TX1	33.23	33.20	2.104	2.089
		TX2	33.85	33.84	2.427	2.421
V_{nom} (12.2V)	162.025 MHz	TX1	32.68	32.66	1.854	1.845
		TX2	33.33	33.33	2.153	2.153
V_{FCC} (13.7V)		TX1	32.68	32.66	1.854	1.845
		TX2	33.34	33.32	2.158	2.147

For FCC the supply voltage must be between 12.2V and 13.7V.

Limit Clause

FCC: ≥ 8 and 25 W
RSS-182: The output power shall be within ±1.0 dB of the manufacturer's rated power.

2.8 SUPRESSION OF INTERFERENCE ABOARD SHIPS

2.8.1 Specification Reference

FCC Part 80, Clause 80.217 (b)

2.8.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.8.3 Date of Test and Modification State

21 February 2011 - Modification State 1

2.8.4 Test Equipment Used

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

2.8.5 Environmental Conditions

Ambient Temperature	22.9°C
Relative Humidity	30.6%

2.8.6 Test Procedure

The EUT was connected to a spectrum analyser via a 10 dB attenuator. The spectrum was measured between 9 kHz to 2 GHz. A resolution bandwidth of 100 kHz was used below 1 GHz and 1 MHz was used above 1 GHz. The traces were recorded as shown on the following pages.

2.8.7 Test Results

12 V DC Supply

AIS: RX1 and RX2: 156.025 MHz

Frequency of Interfering Emissions (MHz)	Power to Artificial Antenna (µW)	Power to Artificial Antenna (dBm)
9 kHz to 30 MHz	0.081	-40.93
30 MHz to 100 MHz	0.057	-42.47
100 MHz to 300 MHz	0.053	-42.73
300 MHz to 1000 MHz	0.056	-42.51
300 MHz to 2000 MHz	0.183	-37.37

AIS: RX1 and RX2: 162.025 MHz

Frequency of Interfering Emissions (MHz)	Power to Artificial Antenna (µW)	Power to Artificial Antenna (dBm)
9 kHz to 30 MHz	0.082	-40.85
30 MHz to 100 MHz	0.049	-43.08
100 MHz to 300 MHz	0.055	-42.56
300 MHz to 1000 MHz	0.0.61	-42.16
300 MHz to 2000 MHz	0.184	-37.35

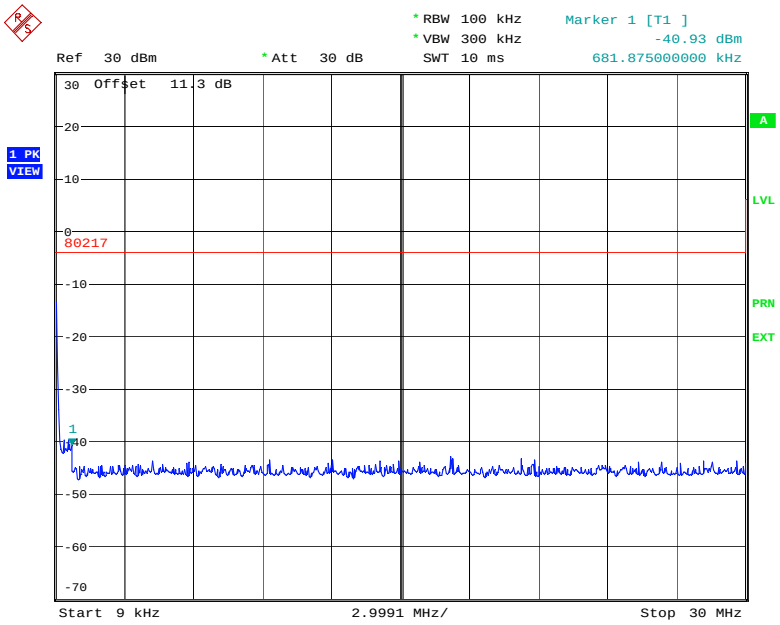
DSC: RX1 and RX2: 156.525 MHz

Frequency of Interfering Emissions (MHz)	Power to Artificial Antenna (µW)	Power to Artificial Antenna (dBm)
9 kHz to 30 MHz	0.066	-41.79
30 MHz to 100 MHz	0.053	-42.75
100 MHz to 300 MHz	0.064	-41.93
300 MHz to 1000 MHz	0.059	-42.28
300 MHz to 2000 MHz	0.211	-36.75

RX1 and RX2

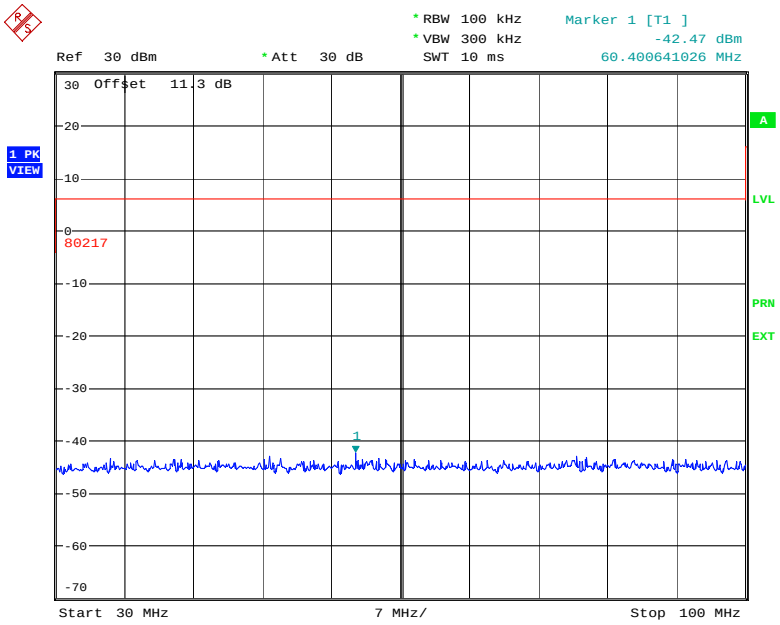
156.025 MHz

9 KHz to 30 MHz



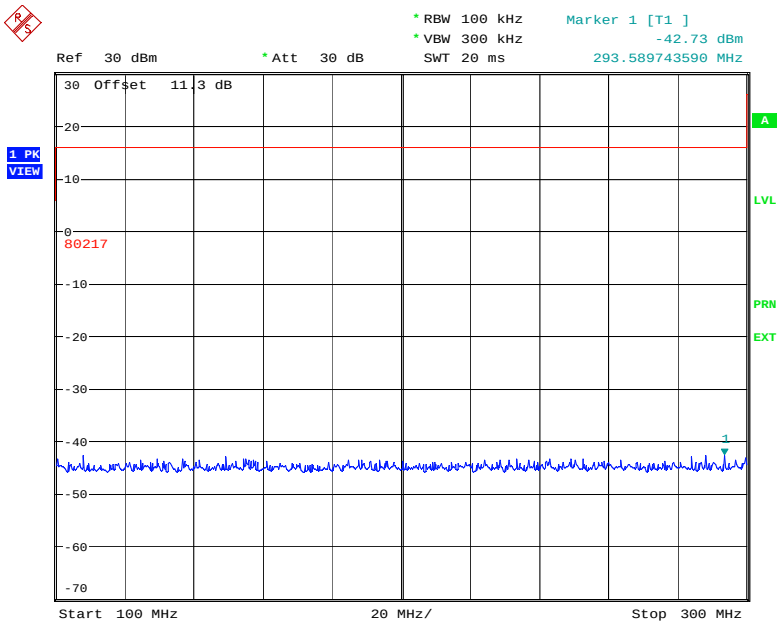
Date: 21.FEB.2011 15:00:00

30 MHz to 100 MHz



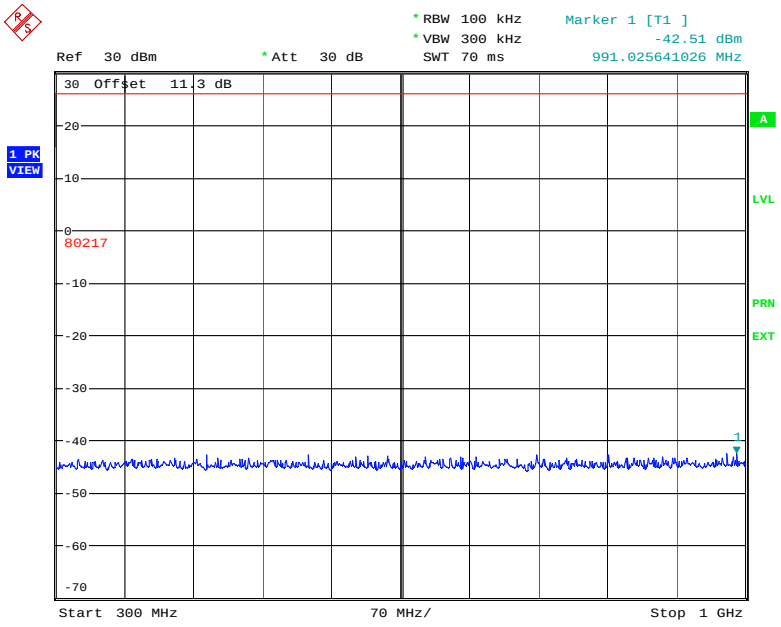
Date: 21.FEB.2011 15:06:56

100 MHz to 300 MHz



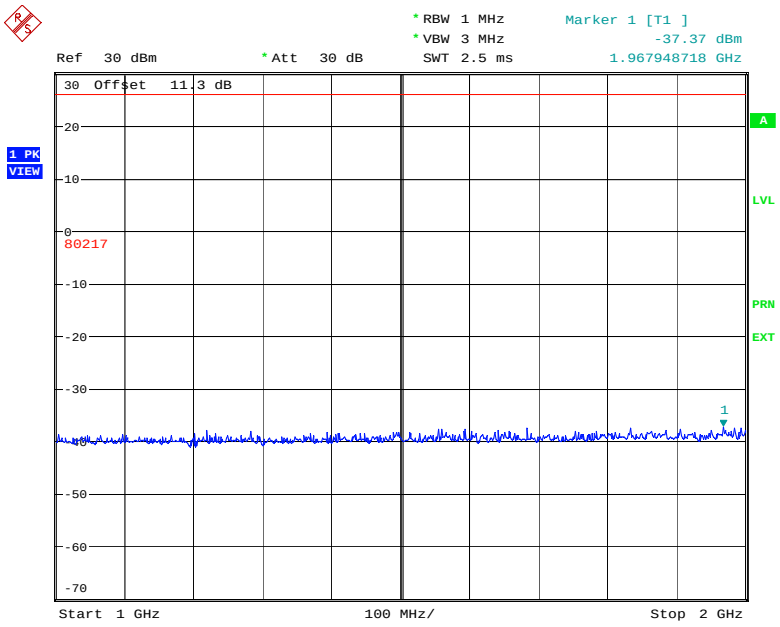
Date: 21.FEB.2011 15:09:14

300 MHz to 1000 MHz



Date: 22.FEB.2011 10:16:50

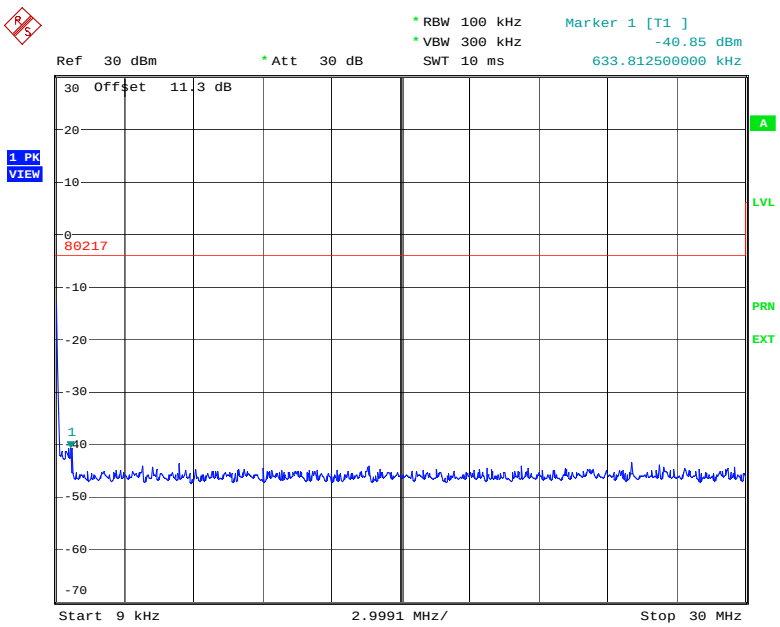
300 MHz to 2000 MHz



Date: 21.FEB.2011 15:15:55

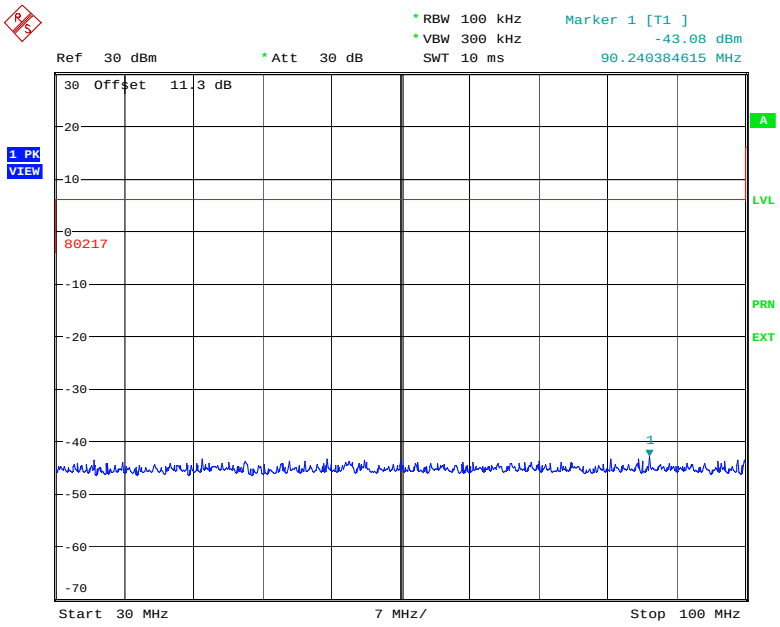
162.025 MHz

9 KHz to 30 MHz



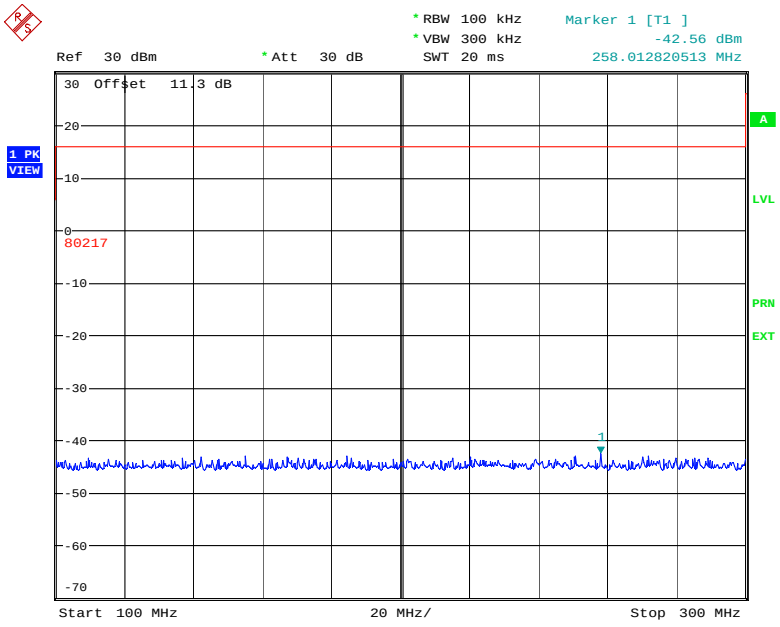
Date: 21.FEB.2011 15:02:24

30 MHz to 100 MHz



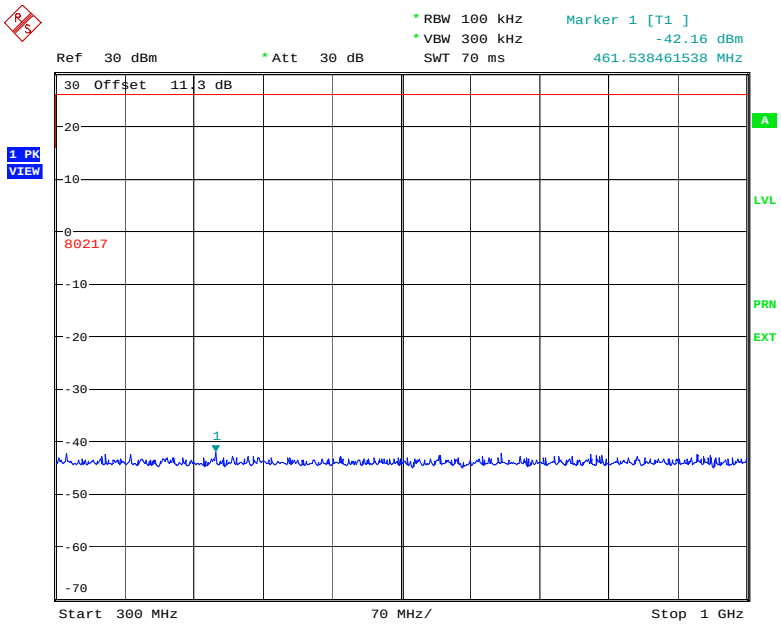
Date: 21.FEB.2011 15:04:05

100 MHz to 300 MHz



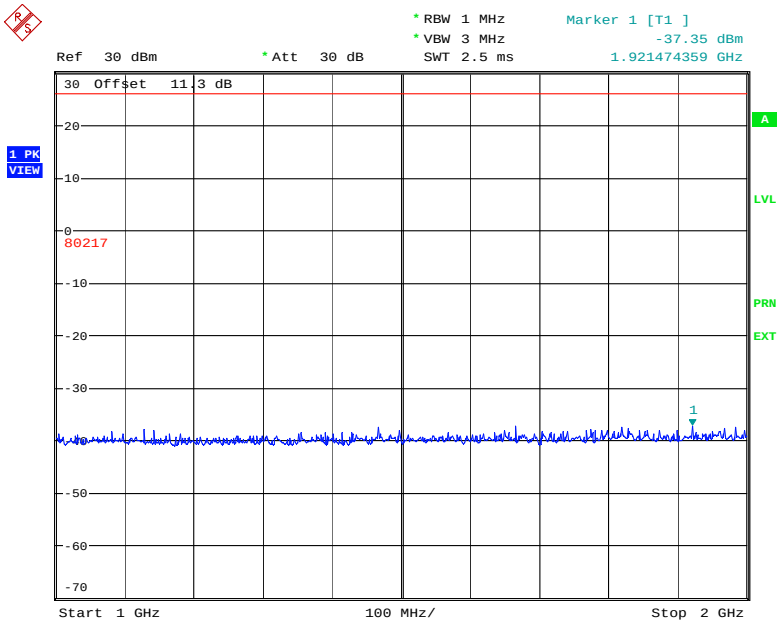
Date: 21.FEB.2011 15:11:15

300 MHz to 1000 MHz



Date: 22.FEB.2011 10:20:57

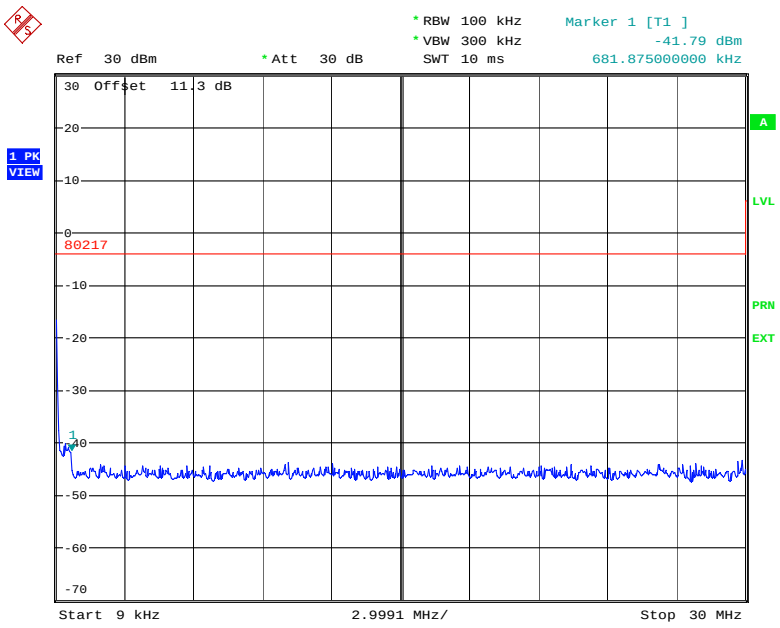
300 MHz to 2000 MHz



Date: 21.FEB.2011 15:12:45

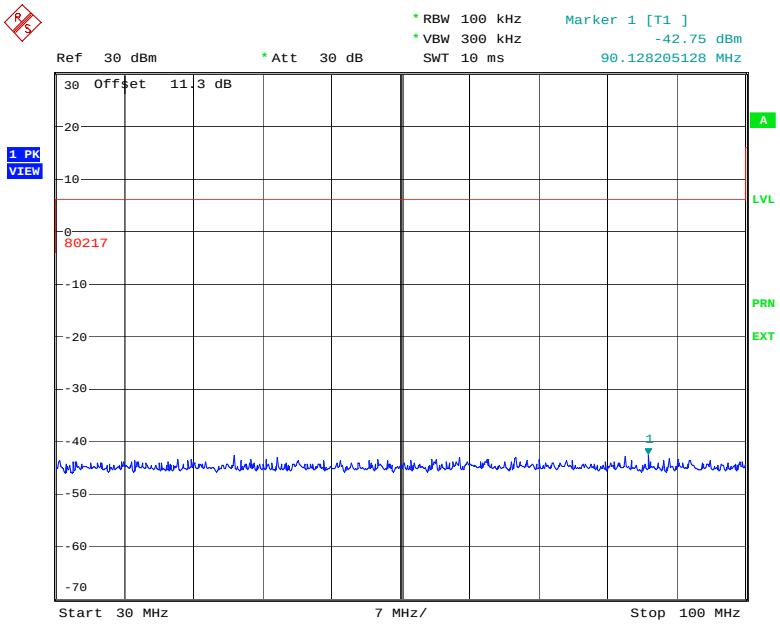
156.525 MHz

9 KHz to 30 MHz



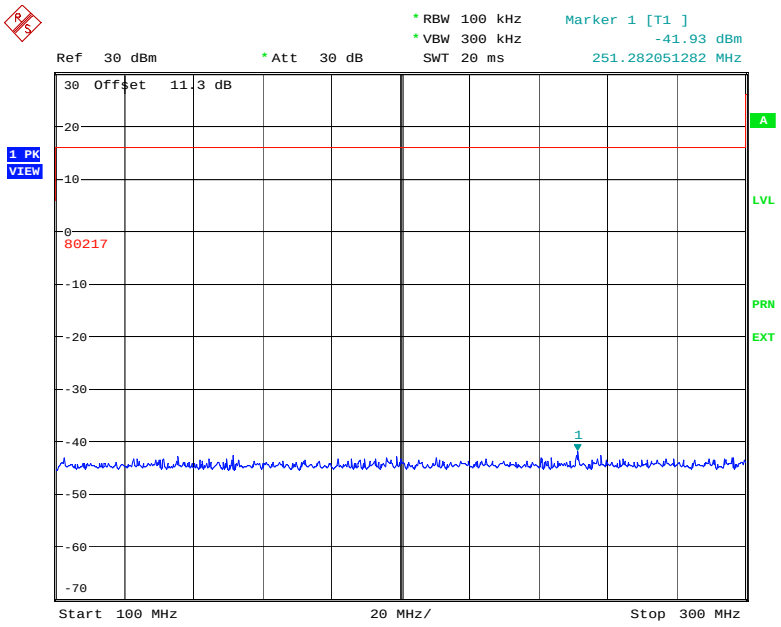
Date: 22.FEB.2011 10:00:39

30 MHz to 100 MHz



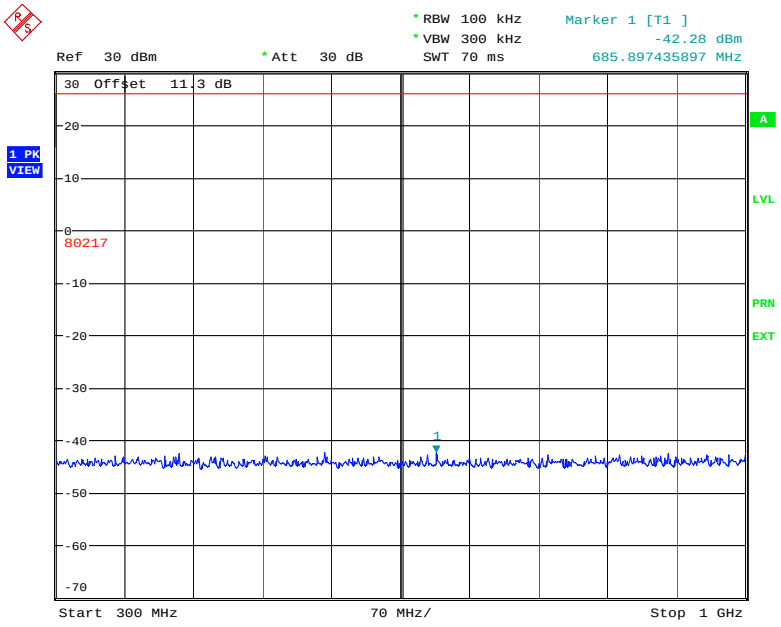
Date: 22.FEB.2011 10:03:37

100 MHz to 300 MHz



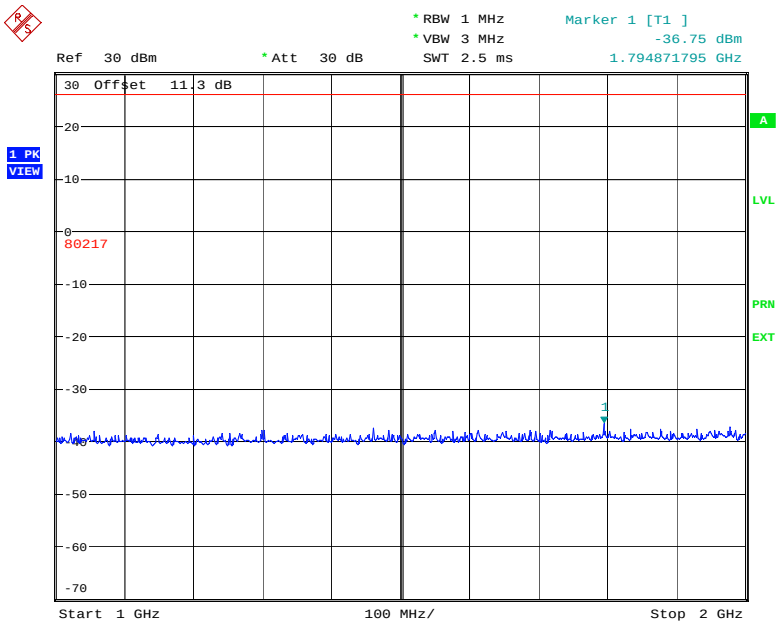
Date: 22.FEB.2011 10:06:33

300 MHz to 1000 MHz



Date: 22.FEB.2011 10:10:31

300 MHz to 2000 MHz



Date: 22.FEB.2011 09:57:41

Remarks

No antenna gain was included in the measurement result due to the significant margin from the limit line.

Limit Clause

The EUT shall deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of interfering emissions	Power to artificial antenna in µW
Below 30 MHz	400
30 to 100 MHz	4,000
100 to 300 MHz	40,000
Over 300 MHz	400,000

2.9 TRANSMITTER CARRIER POWER REDUCTION

2.9.1 Specification Reference

FCC Part 80, Clause 80.215 (e)(g)(1)(2)(3)
Industry Canada RSS-182, Clause 3.7

2.9.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.9.3 Date of Test and Modification State

14 January 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	24.0°C
Relative Humidity	39.0%

2.9.6 Test Procedure

The EUT will never be used on channels 156.375 MHz, 156.650 MHz, 156.775 MHz or 156.825 MHz, as declared by the manufacturer.

2.9.7 Test Results

12V DC Supply

Frequency	TX No	Default Power (W)	Manual Overide to 25 W Possible (Yes / No)
156.025 MHz	TX1	33.50	No
	TX2	32.98	No
162.025 MHz	TX1	33.54	No
	TX2	33.03	No

Limit Clause

All transmit and remote control units must be capable of reducing the carrier power to 1 W or less.

All transmitters must automatically reduce the carrier power to 1W or less when transmitting on to 156.375 MHz or 156.650 MHz, and must be provided with a manual override switch which when held by an operator will permit full carrier power operation on 156.375 MHz and 156.650 MHz.

All transmitters must be capable of tuning to 156.775 MHz and 156.825 MHz and must automatically reduce the carrier power to 1W or less, with no manual override capability, when the transmitter is tuned to either 156.775 MHz or 156.825 MHz.

2.10 TRANSMITTER FREQUENCY DEVIATION

2.10.1 Specification Reference

FCC Part 80, Clause 80.213 (a)(2)
Industry Canada RSS-182, Clause 3.4 (b)

2.10.2 Equipment Under Test

Cobalt: Class B AIS Unit, S/N: 10

2.10.3 Date of Test and Modification State

27 January 2011 - Modification State 1

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 Environmental Conditions

Ambient Temperature	23.0°C
Relative Humidity	17.0%

2.10.6 Test Procedure

The EUT was configured to transmit three different packet data loads at maximum power. These were 11110000, 10101010 and PRBS. The maximum deviation was recorded using the modulation analysis function on the spectrum analyser.

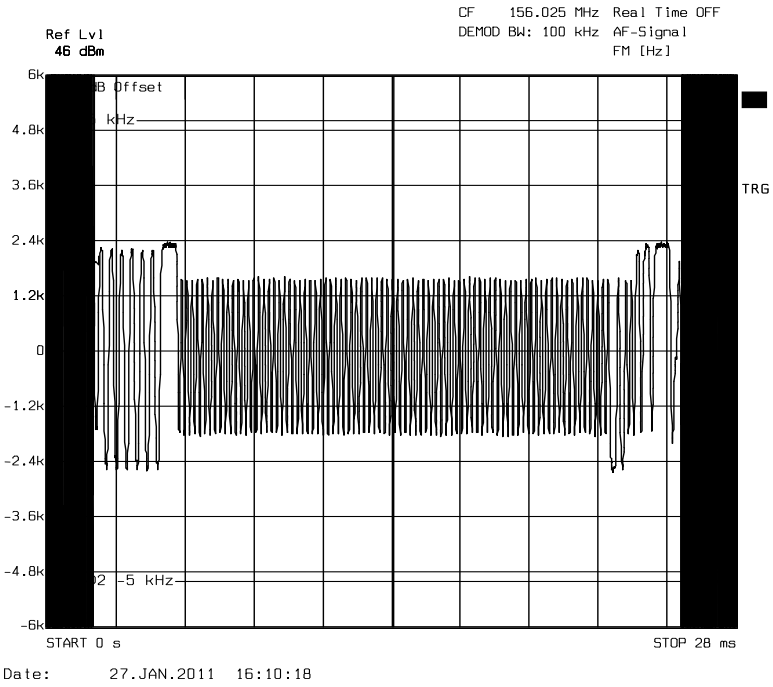
2.10.7 Test Results

12 V DC Supply

156.025 MHz

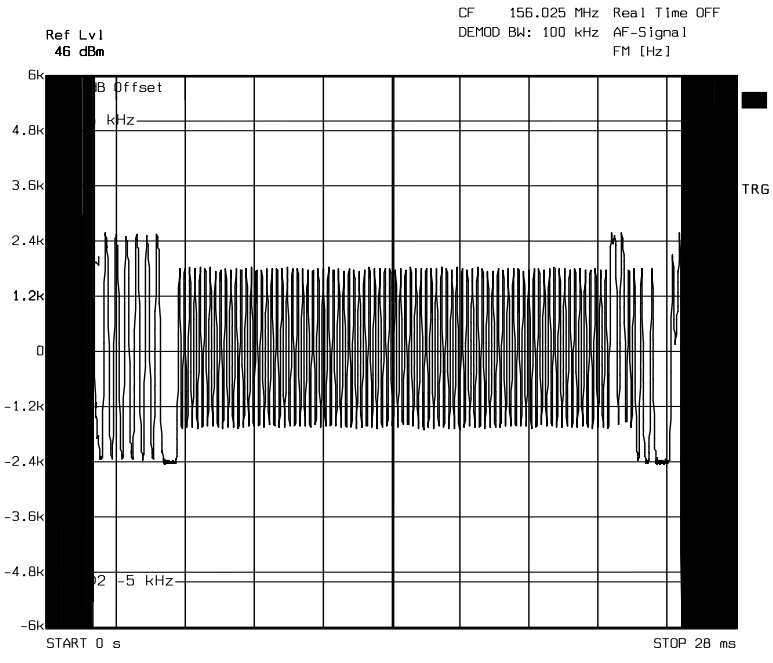
101010

TX1



Date: 27.JAN.2011 16:10:18

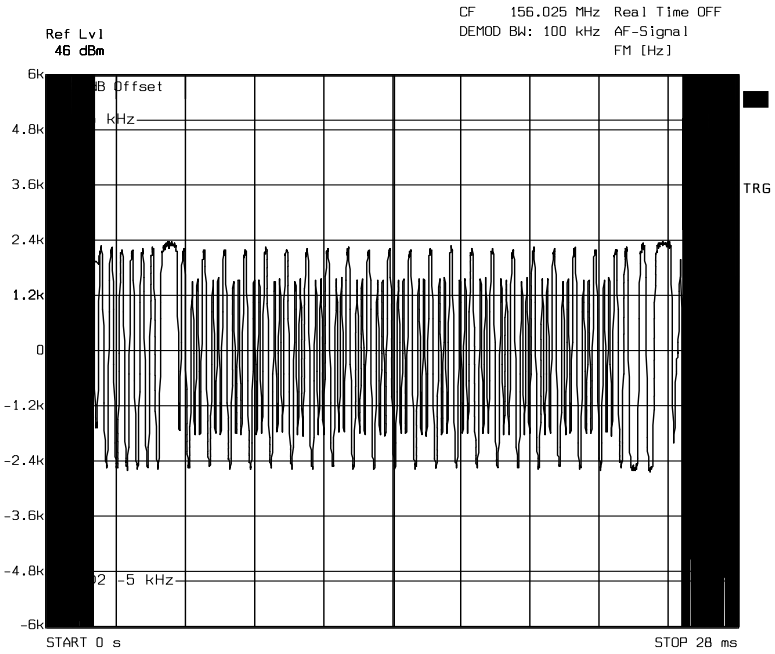
TX2



Date: 27.JAN.2011 16:13:10

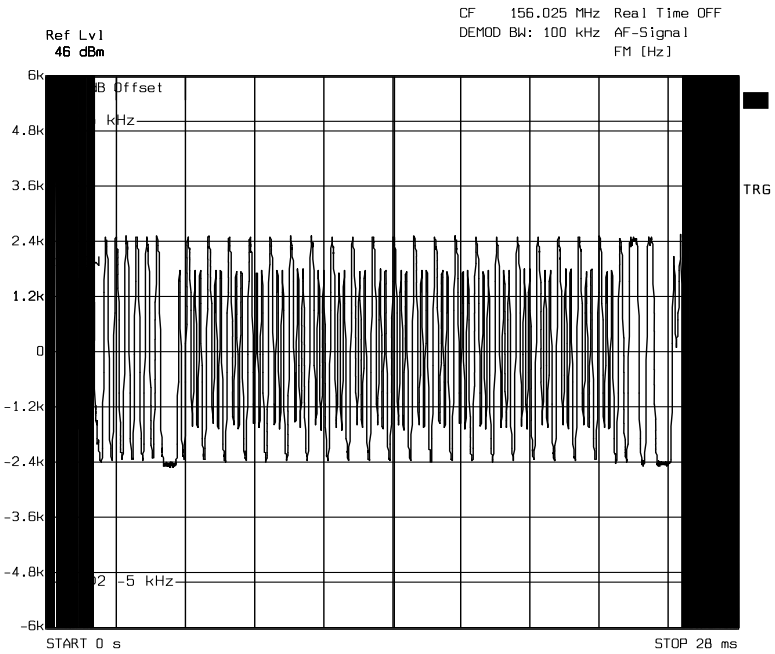
00001111

TX1



Date: 27.JAN.2011 16:23:21

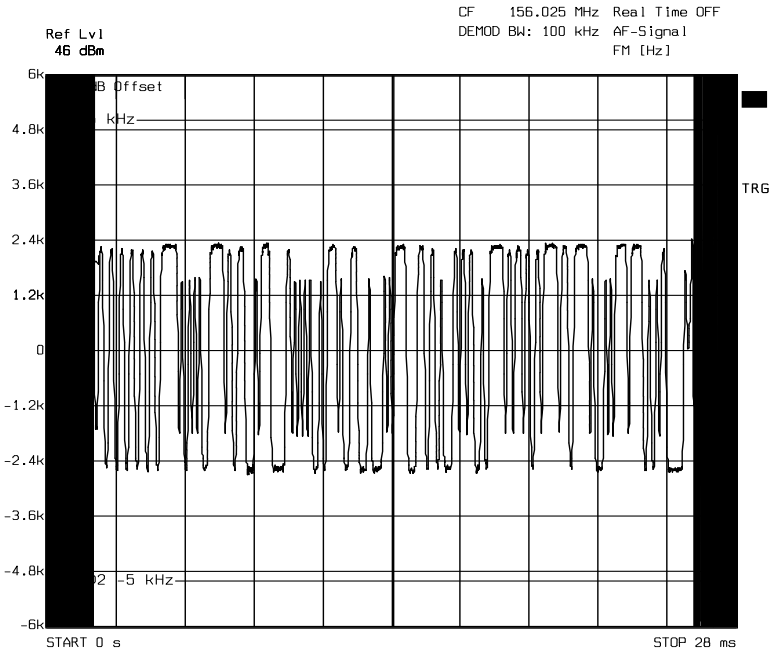
TX2



Date: 27.JAN.2011 16:25:28

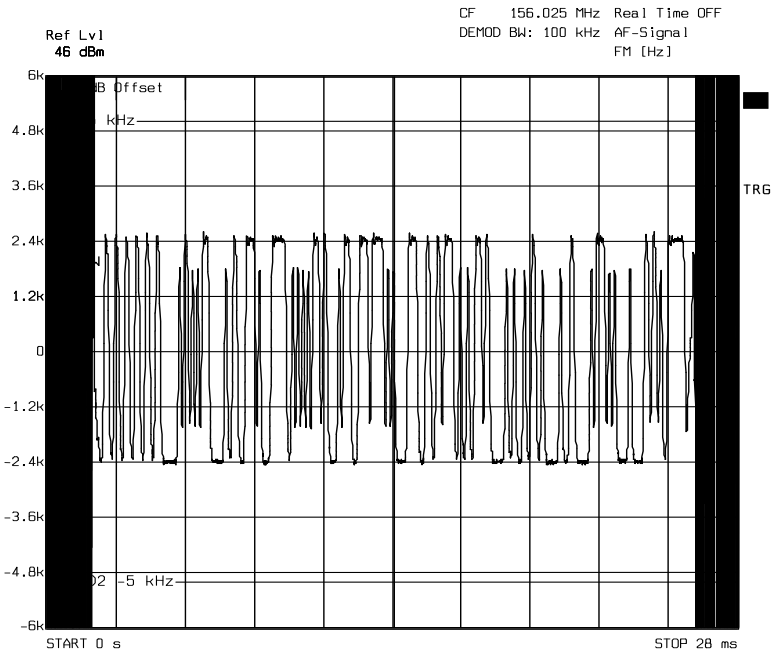
PRBS

TX1



Date: 27.JAN.2011 17:00:20

TX2

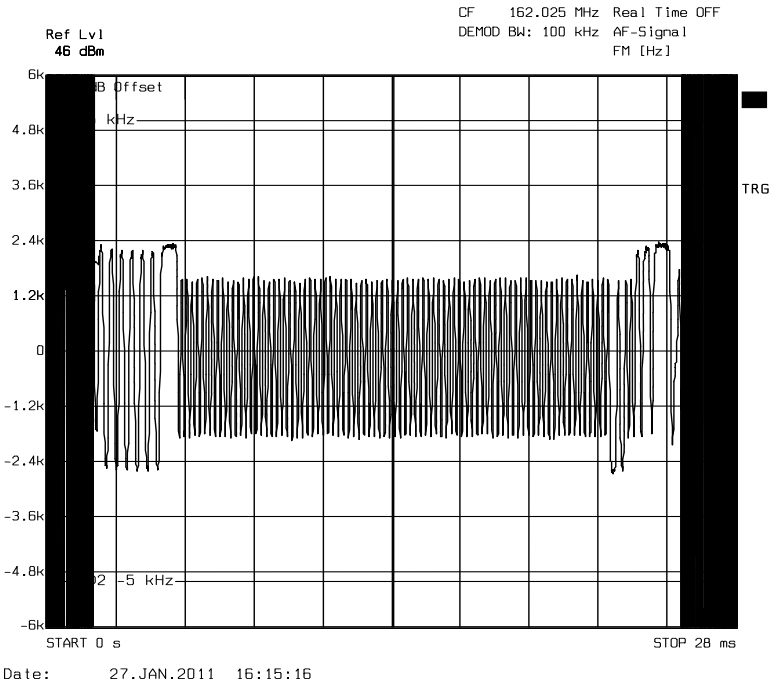


Date: 27.JAN.2011 17:03:18

162.025 MHz

101010

TX1



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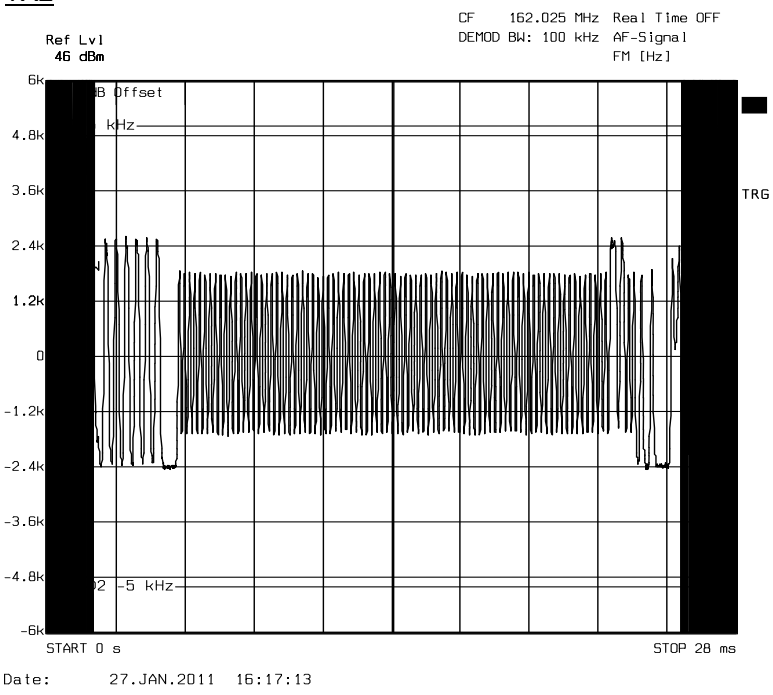

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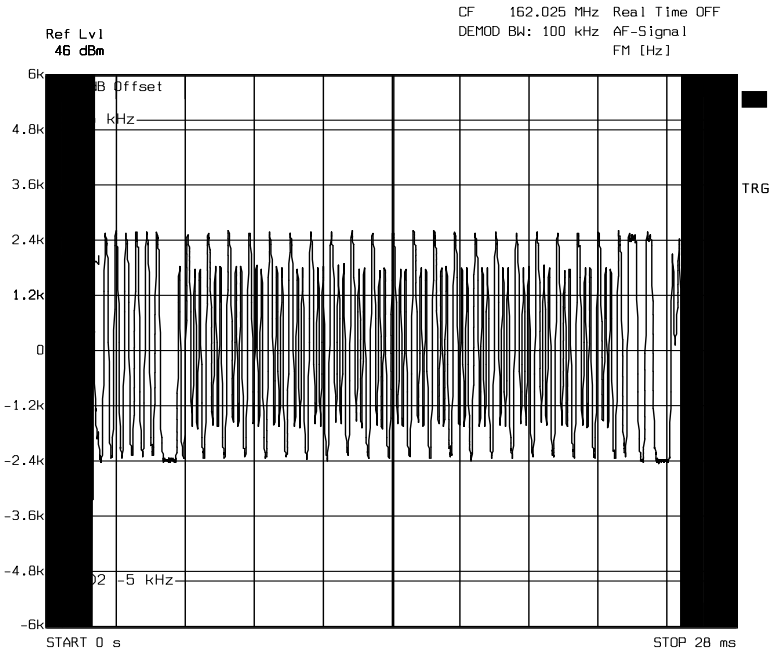

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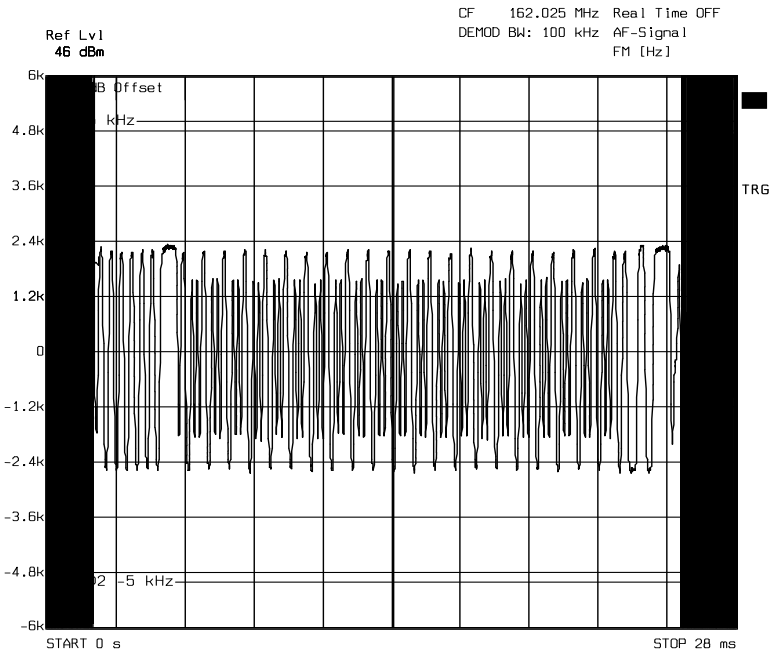

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PRBS

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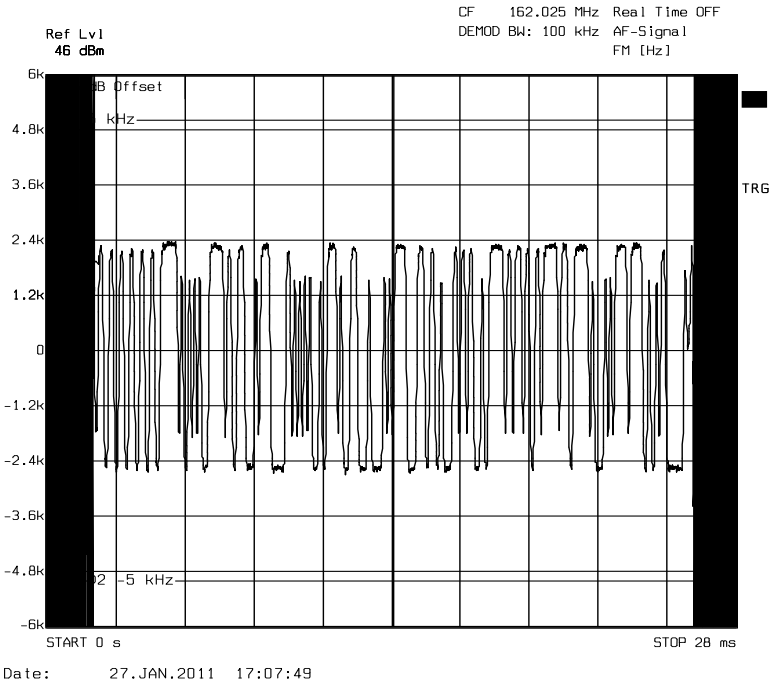

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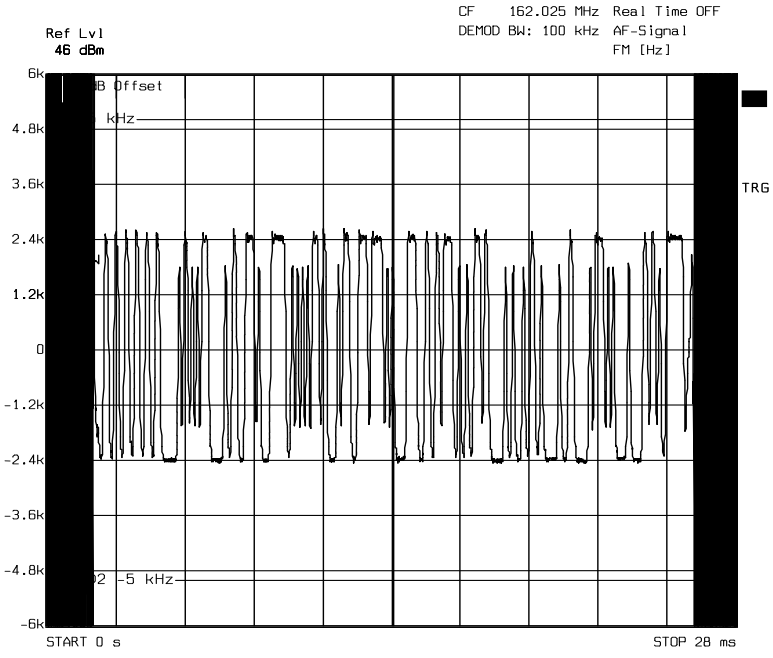

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Limit Clause

The frequency deviation corresponding to 100% modulation shall approach ± 5 kHz as nearly as practicable. In no event shall the frequency deviation exceed ± 5 KHz.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 and 2.2 - Frequency Tolerance under Voltage Variations and Transmitter Frequency Tolerance					
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	79 Series III	611	12	22-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	1-Dec-2011
Section 2.3 - Occupied Bandwidth					
Dual Power Supply Unit	Hewlett Packard	6253A	292	-	O/P Mon
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	26-Mar-2011
1GHz Digital Oscilloscope	Lecroy	9370M	612	12	19-Oct-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
Attenuator (10dB, 150W)	Narda	769-10	3368	12	24-May-2011
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon
Section 2.4 – Emission Limitations (Emission Mask)					
Dual Power Supply Unit	Hewlett Packard	6253A	292	-	O/P Mon
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	26-Mar-2011
1GHz Digital Oscilloscope	Lecroy	9370M	612	12	19-Oct-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
Attenuator (10dB, 150W)	Narda	769-10	3368	12	24-May-2011
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Emission Limitations (Conducted Transmitter Spurious)					
Dual Power Supply Unit	Hewlett Packard	6253A	292	-	O/P Mon
Dual programable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	26-Mar-2011
1GHz Digital Oscilloscope	Lecroy	9370M	612	12	19-Oct-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
High Pass Filter	Mini-Circuits	NHP-300	1640	12	12-Aug-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
Attenuator (10dB, 150W)	Narda	769-10	3368	12	24-May-2011
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon
Section 2.6 - Modulation Characteristics					
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Cystal Detector (Pos O/P)	ASL (TUV)	RAB1	479	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
Attenuator (10dB, 150W)	Narda	769-10	3368	12	24-May-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
Logic Level Shifter	Andy Blagg	0V to 10V to TTL Interface	3584	-	O/P Mon
Section 2.7 – Transmitter Power					
Signal Generator	Rohde & Schwarz	SMY 01	118	12	28-Jun-2011
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	79 Series III	611	12	22-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	1-Dec-2011
Section 2.8 - Suppression of Interference Aboard Ships					
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	26-Mar-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Section 2.9 - Transmitter Carrier Power Reduction					
Signal Generator	Rohde & Schwarz	SMY 01	118	12	28-Jun-2011
Dual programmable power supply	Thurlby	T-1000	418	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	12-Nov-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	1-Dec-2011

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.10 - Transmitter Frequency Deviation					
Dual programmable power supply	Thurlby	T-1000	418	-	TU
Multimeter	Fluke	75 Mk3	455	12	5-Jan-2012
Multimeter	Fluke	79 Series III	611	12	22-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	1-Dec-2011
Spectrum Analyser	Rohde & Schwarz	FSEA30	S/N: 841557/009	12	19-Aug-2011

TU – Traceability Unscheduled
OP MON – Output Monitored with Calibrated Equipment

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).