Product Service

Choose certainty.
Add value.

Report On

Limited FCC Testing of the
Standard Communications Pty Ltd GX600D Fixed Mount VHF
(with Class D DSC)
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

Document 75901964 Report 01 Issue 3 November 2007

Product Service

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

REPORT ON	Limited FCC Testing of the Standard Communications Pty Ltd GX600D Fixed Mount VHF (with Class D DSC) In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006 Document 75901964 Report 01 Issue 3 November 2007
FCC ID	TXJGX600D
PREPARED FOR	Standard Communications Pty Ltd 6 Frank Street Gladesville NSW2111 Australia
PREPARED BY	**J Plummer** Technical Author
APPROVED BY	**M Jenkins** Authorised Signatory **J Adams** Authorised Signatory
DATED	2nd November 2007 2nd November 2007

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 15 and Part 80. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

S Bennett R Small A Guy A Hubbard

This report has been up-issued to Issue 3 due to typographical errors.

UKAS TESTING 0141

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

Limited FCC Testing of the
Standard Communications Pty Ltd GX600D Fixed Mount VHF (with Class D DSC)
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Limited FCC Testing of the Standard Communications Pty Ltd GX600D Fixed Mount VHF (with Class D DSC) to the requirements of FCC CFR 47 Part 15: 2006 and Part 80: 2006.

Objective	To perform Radio Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Standard Communications Pty Ltd
Type Number(s)	GX600D
Serial Number(s)	70701513 61100127
Number of Samples Tested	Two
Test Specification/Issue/Date	FCC CFR 47 Part 15: 2006 FCC CFR 47 Part 80: 2006
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	53040 6th August 2007
Start of Test	21st August 2007
Finish of Test	28th August 2007
Related Test Specification/Issue/Date	FCC CFR 47 Part 80: 2006
Name of Engineer(s)	A Guy S Bennett R Small A Hubbard

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006 is shown below.

FCC CFR 47 Part 15: 2006

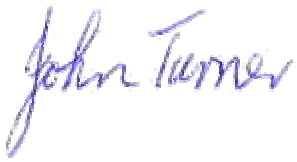
Section	Spec Clause	Test Description	Result	Comments
2.1	15.109	Spurious Radiated Emissions	Pass	

FCC CFR 47 Part 80: 2006

Section	Spec Clause	Test Description	Result	Comments
2.2	80.209(a)	Frequency Stability Under Voltage Variations	Pass	
2.3	80.209(a)	Frequency Stability Under Temperature Variations	Pass	
2.4	80.209(a)	Frequency Stability DSC Emissions	Pass	
2.5	80.211(f)(1)(2)	Emission Limitations (Emission Mask)	Pass	
2.6	80.211(f)(1)(2)	Emission Limitations DSC (Emission Mask)	Pass	
2.7	80.205(a)	Occupied Bandwidth	Pass	
2.8	80.205(a)	DSC Occupied Bandwidth	Pass	
2.9	80.211(c)(f)(3)	Emission Limitations (Conducted Transmitter Spurious)	Pass	
2.10	80.211(c)(f)(3)	Emission Limitations DSC (Conducted Transmitter Spurious)	Pass	
2.11	80.211(f)(3)	Emission Limitations (Radiated Transmitter Spurious)	Pass	
2.12	80.211(f)(3)	Emission Limitations (Radiated Transmitter Spurious)DSC	Pass	
2.13	80.213	Modulation Characteristics	Pass	
2.14	80.215	Transmitter Power	Pass	
2.15	80.215	Transmitter Power DSC	Pass	
2.16	80.215G(2)(3)	Transmitter High Power Inhibit	Pass	
2.17	80.217(b)	Suppression of Interference Aboard Ships	Pass	
2.18	80.255 (b)	FM Pre-Emphasis	Pass	
2.19	80.255	Modulation Rate for DSC	Pass	
2.20	80.255	Modulation Index for DSC	Pass	

1.3 APPLICATION FORM

MAIN EUT	
MANUFACTURING DESCRIPTION	VHF Radiotelephone
MANUFACTURER	Standard Communications Pty Ltd
TYPE	DSCF
PART NUMBER	GX600D
SERIAL NUMBER	70701513
HARDWARE VERSION	V1.0
SOFTWARE VERSION	V2.02
TRANSMITTER OPERATING RANGE	156.025 MHz to 157.425 MHz
RECEIVER OPERATING RANGE	156.025 MHz to 163.275 MHz
COUNTRY OF ORIGIN	Australia
INTERMEDIATE FREQUENCIES	1st 21.4 MHz, 2nd 450 kHz
ITU DESIGNATION OF EMISSION	Speech (16K0G3E), DSC (16K0G2B)
HIGHEST INTERNALLY GENERATED FREQUENCY	TX Channel 88 157.425 MHz
OUTPUT POWER (W or dBm)	(1) 25 Watts, (2) 1 Watt
FCC ID	
INDUSTRY CANADA ID	
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The GX600D is a VHF Marine Transceiver intended for installation on pleasure craft or light commercial vessel which do not require a continuous link. Power supply for the transceiver is supplied from a 12 volt lead acid storage battery system
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	
MANUFACTURER	
TYPE	
PART NUMBER	
VOLTAGE	
COUNTRY OF ORIGIN	

Signature 

Date 28/09/2007
Declaration of Build Status Serial Number

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Standard Communications Pty Ltd GX600D Fixed Mount VHF (with Class D DSC) as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test

1.4.2 Test Configurations

A 50 Ω load was connected to the antenna port of the EUT.

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.

Testing has been performed under the following site accreditation:

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

The EUT was powered from a 12V DC supply.

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

Modification State	Description of Modification	Fitted By	Date Fitted
0	As supplied (firmware version V2.0)	-	-
1	Firmware upgrade to version 2.01 enabling override function (to enable user to switch to high power on channels 13 and 67).	Standard Communications	As supplied 10/09/2007
2	Firmware upgrade to version 2.02 to automatically switch to low power on channels 75 and 76.	TUV	As supplied 20/09/2007

Product Service

SECTION 2

TEST DETAILS

Limited FCC Testing of the
Standard Communications Pty Ltd GX600D Fixed Mount VHF (with Class D DSC)
In accordance with FCC CFR 47 Part 15: 2006 and Part 80: 2006

2.1 SPURIOUS RADIATED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15: 2006 Clause 15.109

2.1.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 61100127

2.1.3 Date of Test and Modification State

26th September 2007 - Modification State 2 (Below 1GHz)
2nd October 2007 – Modification State 2 (Above 1GHz)

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 Test Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 26GHz were then formally measured using Peak and Average Detectors, as appropriate.

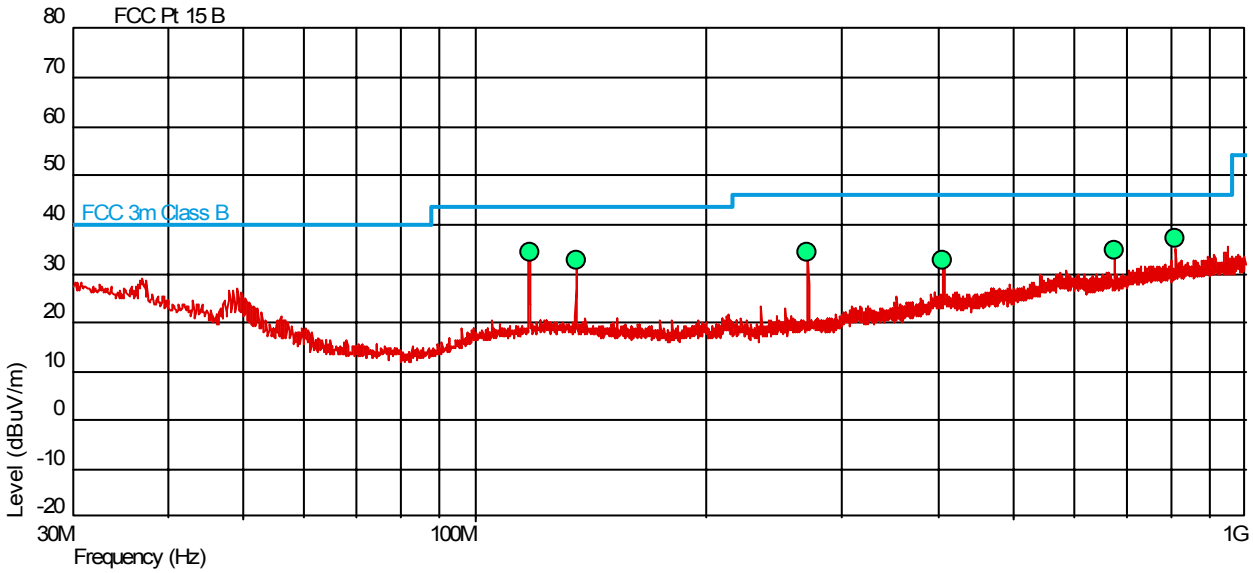
The measurements were performed at a 3m distance unless otherwise stated.

2.1.6 Environmental Conditions

	26th September	2nd October
Ambient Temperature	21°C	21.3
Relative Humidity	34%	55

2.1.7 Test Results

Results Below 1GHz



Final Result

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	Angle(Deg)	Height(m)	Polarity
117.683	34.4	43.5	-9.1	42.80	2.59	Horizontal
135.402	32.5	43.5	-11.0	345.00	1.00	Vertiucal
270.790	34.1	46.0	-11.9	296.90	1.00	Vertical
406.194	32.6	46.0	-13.4	315.50	1.00	Horizontal
677.029	34.9	46.0	-11.1	49.90	1.00	Vertical
812.408	37.1	46.0	-8.9	35.30	1.00	Horizontal

Results Above 1GHz

Frequency GHz	Antenna Polarisation	Antenna Height cm	EUT Arc Degrees	Final Peak dBµV/m	Final Average dBµV/m	Peak Limit dBµV/m	Average Limit dBµV/m
1.059	Vertical	100	205	45.73	40.35	74.0	54.0
1.177	Horizontal	100	0	44.05	36.44	74.0	54.0

2.2 FREQUENCY STABILITY UNDER VOLTAGE VARIATIONS

2.2.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.209(a)

2.2.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.2.3 Date of Test and Modification State

24th August 2007 - Modification State 0

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 Test Procedure

The EUT was set to transmit an unmodulated carrier on channels 60 and 88 at maximum power using a frequency counter, the frequency error was measured and the result recorded.

The voltage to the EUT was varied as shown in the table of results at a temperature of 20°C.

2.2.6 Environmental Conditions

Ambient Temperature	19°C
Relative Humidity	60%

2.2.7 Test Results

Channel: 60 Frequency: 156.025 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)
10.5	156.025	-0.0774	±1.56025
12.0	156.025	-0.1212	±1.56025
15.6	156.025	-0.1452	±1.56025

Channel: 88 Frequency: 157.425 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)
10.5	157.425	-0.637	± 1.57425
12.0	157.425	-0.0630	± 1.57425
15.6	157.425	-0.1270	± 1.57425

Limit

±1.56025 kHz / ± 1.57425 kHz or 10ppm

Channel: 60 Frequency: 156.025 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)
11.56	156.025	-0.1304	±1.56025
13.60	156.025	-0.1341	±1.56025
15.64	156.025	-0.1957	±1.56025

Channel: 88 Frequency: 157.425 MHz

DC Voltage (V)	Test Frequency (MHz)	Error (kHz)	Limit (kHz)
11.56	157.425	-0.1451	± 1.57425
13.60	157.425	-0.1854	± 1.57425
15.64	157.425	-0.1867	± 1.57425

Limit

±1.56025 kHz / ± 1.57425 kHz or 10ppm

2.3 FREQUENCY STABILITY UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.209(a)

2.3.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.3.3 Date of Test and Modification State

24th and 28th August 2007 - 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 Procedure

The EUT was set to transmit an unmodulated carrier on channels 16, 60 and 88 at maximum and minimum power. Using a frequency counter, the frequency error was measured and the result recorded. The temperature was adjusted between -20° and +50° in 10° steps.

2.3.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	60%

2.3.7 Test Results

Transmitting at 25W

Bottom Channel: 60 Frequency: 156.025 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	10.5	156.0249047	-95.3	-0.611
	12.0	156.0248988	-101.2	-0.649
	15.6	156.0248859	-114.1	-0.731
-10	10.5	156.0250599	59.9	0.384
	12.0	156.0249858	-14.2	-0.091
	15.6	156.0250011	1.1	0.007
0	10.5	156.0250238	23.8	0.153
	12.0	156.0249971	-2.9	-0.019
	15.6	156.0249843	-15.7	-0.101
+10	10.5	156.0249737	-26.3	-0.169
	12.0	156.0250165	16.5	0.106
	15.6	156.0249458	-54.2	-0.347
+20	10.5	156.0248339	-166.1	-1.065
	12.0	156.0248609	-139.1	-0.892
	15.6	156.0248379	-162.1	-1.039
+30	10.5	156.0248605	-139.5	-0.894
	12.0	156.0248812	-118.8	-0.761
	15.6	156.0248369	-163.1	-1.045
+40	10.5	156.0247808	-219.2	-1.405
	12.0	156.0247513	-248.7	-1.594
	15.6	156.0248169	-183.1	-1.174
+50	10.5	156.0248443	-155.7	-0.998
	12.0	156.0248392	-160.8	-1.031
	15.6	156.0248273	-172.7	-1.107

Transmitting at 25W

Middle Channel: 16 Frequency: 156.800 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	10.5	156.7999052	-94.8	-0.605
	12.0	156.7998381	-161.9	-1.033
	15.6	156.7999069	-93.1	-0.594
-10	10.5	156.8000496	49.6	0.316
	12.0	156.8000115	11.5	0.073
	15.6	156.7999915	-8.5	-0.054
0	10.5	156.8000321	32.1	0.205
	12.0	156.7999987	-1.3	-0.008
	15.6	156.7999909	-9.1	-0.058
+10	10.5	156.7999855	-14.5	-0.092
	12.0	156.7999957	-4.3	-0.027
	15.6	156.7999721	-27.9	-0.178
+20	10.5	156.7998376	-162.4	-1.036
	12.0	156.7998551	-144.9	-0.924
	15.6	156.799866	-134.0	-0.855
+30	10.5	156.7998606	-139.4	-0.889
	12.0	156.7998861	-113.9	-0.726
	15.6	156.7998194	-180.6	-1.152
+40	10.5	156.7997989	-201.1	-1.283
	12.0	156.7998148	-185.2	-1.181
	15.6	156.7998183	-181.7	-1.159
+50	10.5	156.7998124	-187.6	-1.196
	12.0	156.7997633	-236.7	-1.510
	15.6	156.7999141	-85.9	-0.548

Transmitting at 25W

Top Channel: 88 Frequency: 157.425 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	10.5	157.4249271	-72.9	-0.463
	12.0	157.4249465	-53.5	-0.340
	15.6	157.424937	-63.0	-0.400
-10	10.5	157.4250531	53.1	0.337
	12.0	157.4250012	1.2	0.008
	15.6	157.4249968	-3.2	-0.020
0	10.5	157.4250207	20.7	0.131
	12.0	157.4249971	-2.9	-0.018
	15.6	157.4249897	-10.3	-0.065
+10	10.5	157.4249799	-20.1	-0.128
	12.0	157.4250085	8.5	0.054
	15.6	157.4249584	-41.6	-0.264
+20	10.5	157.4248323	-167.7	-1.065
	12.0	157.4248584	-141.6	-0.899
	15.6	157.4248505	-149.5	-0.950
+30	10.5	157.4248616	-138.4	-0.879
	12.0	157.424884	-116.0	-0.737
	15.6	157.4248256	-174.4	-1.108
+40	10.5	157.4247814	-218.6	-1.389
	12.0	157.4247453	-254.7	-1.618
	15.6	157.4248479	-152.1	-0.966
+50	10.5	157.4248597	-140.3	-0.891
	12.0	157.4247963	-203.7	-1.294
	15.6	157.4248786	-121.4	-0.771

Limit

± 10 ppm

Transmitting at 1W

Bottom Channel: 60 Frequency: 156.025 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	11.56	156.0248635	-136.5	-0.875
	13.6	156.0248683	-131.7	-0.844
	15.64	156.0248987	-101.3	-0.649
-10	11.56	156.0249386	-61.4	-0.394
	13.6	156.0249640	-36.0	-0.231
	15.64	156.0249627	-37.3	-0.239
0	11.56	156.0250311	31.1	0.199
	13.6	156.0249927	-7.3	-0.047
	15.64	156.0249794	-20.6	-0.132
+10	11.56	156.0249948	-5.2	-0.033
	13.6	156.0249633	-36.7	-0.235
	15.64	156.0249609	-39.1	-0.251
+20	11.56	156.0248323	-167.7	-1.075
	13.6	156.0248203	-179.7	-1.152
	15.64	156.0249396	-60.4	-0.387
+30	11.56	156.0248542	-145.8	-0.934
	13.6	156.0249013	-98.7	-0.633
	15.64	156.0248006	-199.4	-1.278
+40	11.56	156.0247407	-259.3	-1.662
	13.6	156.0247484	-251.6	-1.613
	15.64	156.0247784	-221.6	-1.420
+50	11.56	156.0248423	-157.7	-1.011
	13.6	156.0248597	-140.3	-0.899
	15.64	156.0248185	-181.5	-1.163

Transmitting at 1W

Middle Channel: 16 Frequency: 156.800 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	11.56	156.7998777	-122.3	-0.780
	13.6	156.7998743	-125.7	-0.802
	15.64	156.7999432	-56.8	-0.362
-10	11.56	156.8000117	11.7	0.075
	13.6	156.8000109	10.9	0.070
	15.64	156.7999865	-13.5	-0.086
0	11.56	156.8000312	31.2	0.199
	13.6	156.7999912	-8.8	-0.056
	15.64	156.7999883	-11.7	-0.075
+10	11.56	156.7999818	-18.2	-0.116
	13.6	156.7999819	-18.1	-0.115
	15.64	156.7999675	-32.5	-0.207
+20	11.56	156.7998291	-170.9	-1.090
	13.6	156.7998339	-166.1	-1.059
	15.64	156.7998874	-112.6	-0.718
+30	11.56	156.7998415	-158.5	-1.011
	13.6	156.7998786	-121.4	-0.774
	15.64	156.7998106	-189.4	-1.208
+40	11.56	156.7997982	-201.8	-1.287
	13.6	156.7998003	-199.7	-1.274
	15.64	156.7997886	-211.4	-1.348
+50	11.56	156.7997827	-217.3	-1.386
	13.6	156.7998637	-136.3	-0.869
	15.64	156.7998796	-120.4	-0.768

Transmitting at 1W

Top Channel: 88 Frequency: 157.425 MHz

Temperature Interval ºC	DC Voltage (V)	Test Frequency (MHz)	Deviation (Hz)	Error (ppm)
-20	11.56	157.4248672	-132.8	-0.844
	13.6	157.4249529	-47.1	-0.299
	15.64	157.4249586	-41.4	-0.263
-10	11.56	157.4249647	-35.3	-0.224
	13.6	157.4250231	23.1	0.147
	15.64	157.4249778	-22.2	-0.141
0	11.56	157.4250313	31.3	0.199
	13.6	157.4249947	-5.3	-0.034
	15.64	157.4249839	-16.1	-0.102
+10	11.56	157.4249888	-11.2	-0.071
	13.6	157.4249732	-26.8	-0.170
	15.64	157.4249676	-32.4	-0.206
+20	11.56	157.4248278	-172.2	-1.094
	13.6	157.4248257	-174.3	-1.107
	15.64	157.4249065	-93.5	-0.594
+30	11.56	157.4248393	-160.7	-1.021
	13.6	157.4248886	-111.4	-0.708
	15.64	157.4248036	-196.4	-1.248
+40	11.56	157.4248019	-198.1	-1.258
	13.6	157.4248081	-191.9	-1.219
	15.64	157.4247761	-223.9	-1.422
+50	11.56	157.4248097	-190.3	-1.209
	13.6	157.4248927	-107.3	-0.682
	15.64	157.4248485	-151.5	-0.962

Limit

± 10 ppm

2.4 FREQUENCY STABILITY DSC EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.209(a)

2.4.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.4.3 Date of Test and Modification State

23rd August 2007 - 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 Procedure

The EUT was configured in a test mode supplied by the manufacturer to enable testing of the DSC modulation frequencies. The EUT was set to transmit with a B and Y state, 2100Hz and 1300Hz respectively. Using a modulation analyser and frequency counter, the modulation fequencies were measured and are recorded in the following table.

2.4.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	56%

2.4.7 Test Results

Channel: 70 Frequency: 156.25 MHz

Test Conditions		Transmitter Frequency (Hz)	
		fB-state	fY-state
T_{nom}(20 ºC)	V_{nom}(12 V DC)	2099.88	1299.84
Measurement uncertainty (Hz)		±0.15	

Limit

The measured frequency shall at any time for the B-state be 2100Hz ±10Hz and for the Y-state ne 1300Hz ±10Hz.

2.5 EMISSION LIMITATIONS (EMISSION MASK)

2.5.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(f)(1)(2)

2.5.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.5.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

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 Test Procedure

The EUT was connected to a Spectrum Analyser via attenuators. This configuration was used to measure emissions from 9kHz to 600MHz and the emission mask (B). From 600MHz to 1600MHz, attenuators and a high pass filter was used. The emissions were measured on Bottom, Middle and Top channels up to the 10th harmonic. The path loss was measured for both the above configurations and the worst case loss was entered as a reference level offset.

All Measurements were performed with the EUT modulated in accordance with Clause 4.3(a) The EUT was initially connected to a Modulation Analyser and the EUT set to transmit. Using an Audio Analyser, an audio frequency was swept between 300Hz to 5kHz to find the frequency which produced the highest deviation.

The amplitude at this frequency was then increased to give a deviation of 2.5kHz.

The amplitude and frequency levels were 11.8mV at 3.0kHz

Then at a frequency of 2.5kHz the amplitude recorded above was increased by 16dB to provide the Final Modulated level.

The EUT transmitting on full power was then connected to a Spectrum Analyser via a 40dB Attenuator. The modulated carrier was checked (for the bottom, middle and top channels of the EUT) against the emission mask.

The Path Loss was recorded and the worst case loss was entered as a Reference Level Offset

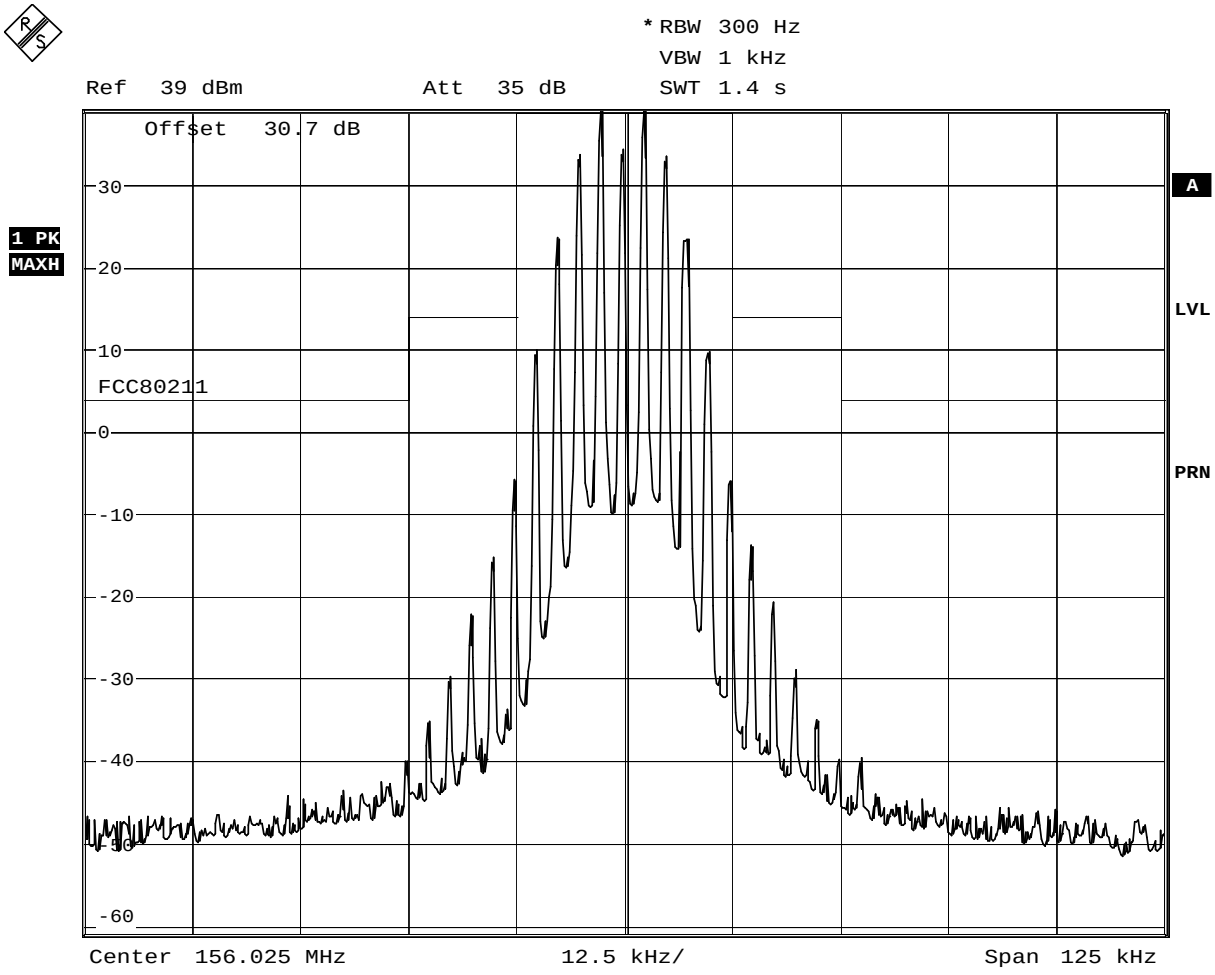
Total Path loss = 30.7

2.5.6 Environmental Conditions

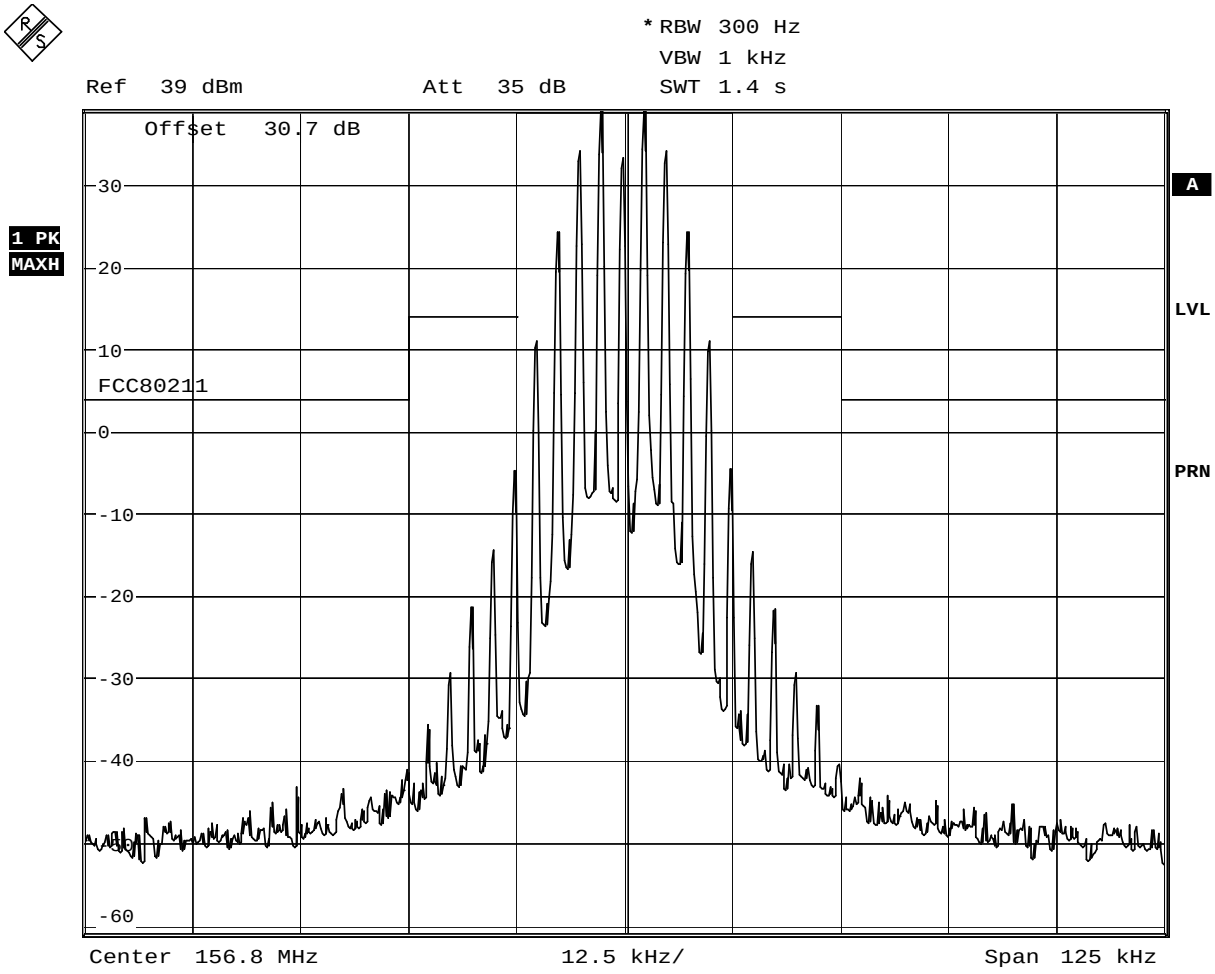
Ambient Temperature	19°C
Relative Humidity	53%

2.5.7 Test Results

Bottom Channel - 60

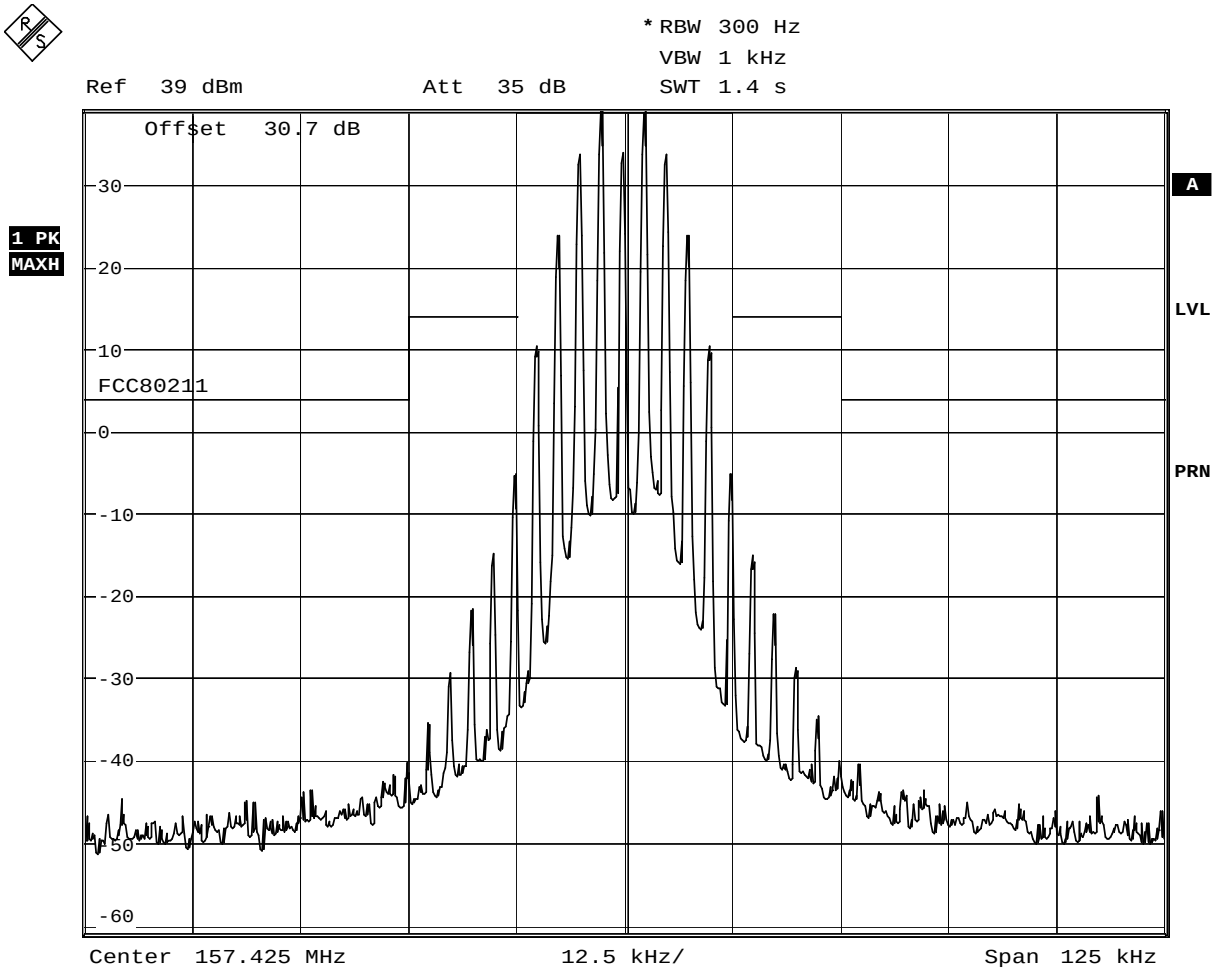


Middle Channel - 16



Date: 23.AUG.2007 13:02:33

Top Channel – 88



2.6 EMISSION LIMITATIONS DSC (EMISSION MASK)

2.6.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211 (f)(1)(2)

2.6.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.6.3 Date of Test and Modification State

23rd August 2007 - 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 Procedure

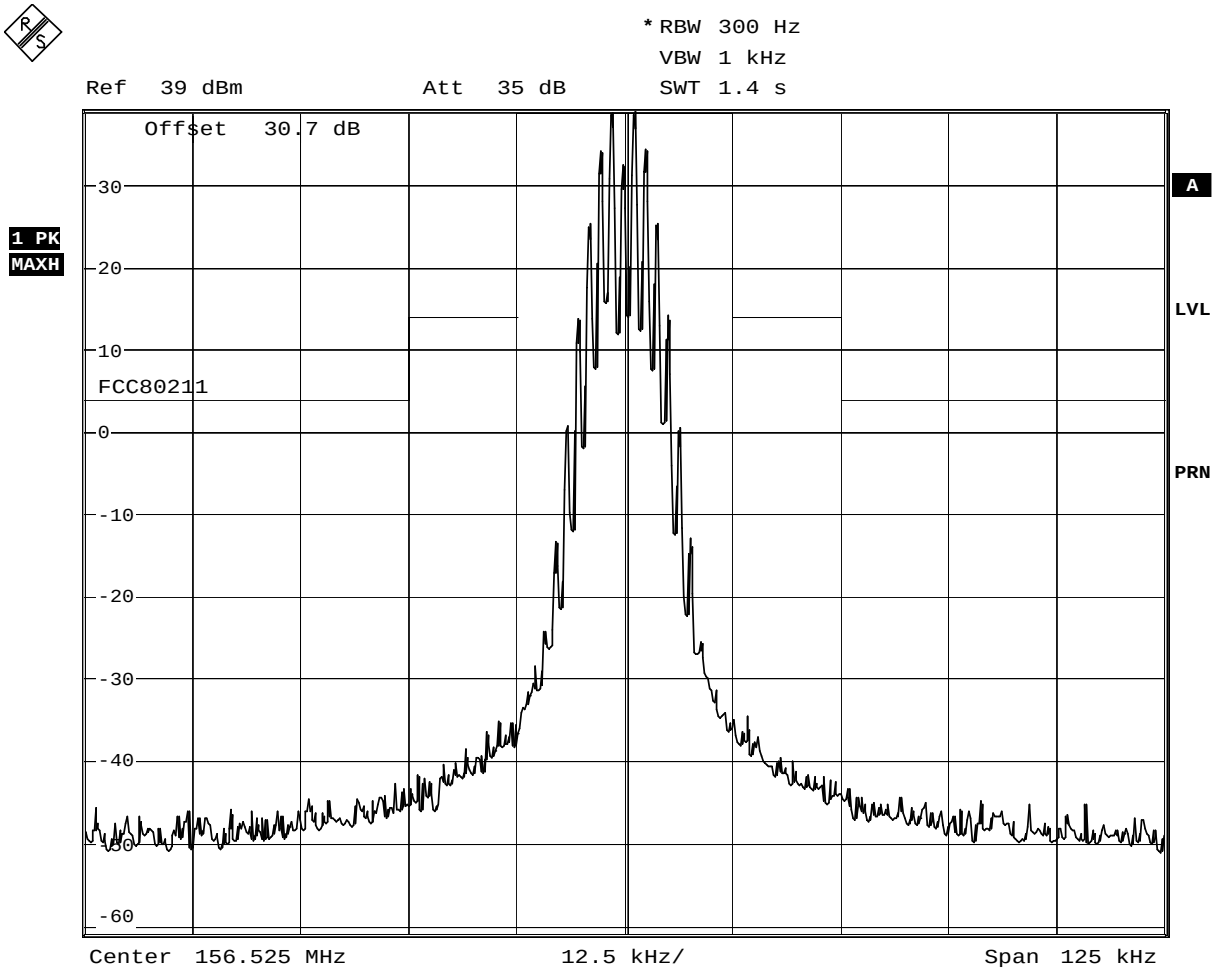
The EUT was tested in its DSC mode of operation. Using the test modes supplied by the manufacturer the FSK modulated carrier was checked for compliance against the emission mask defined in Clause 6.3.1. The EUT was tested in its B and Y states and Dotting Pattern.

2.6.6 Environmental Conditions

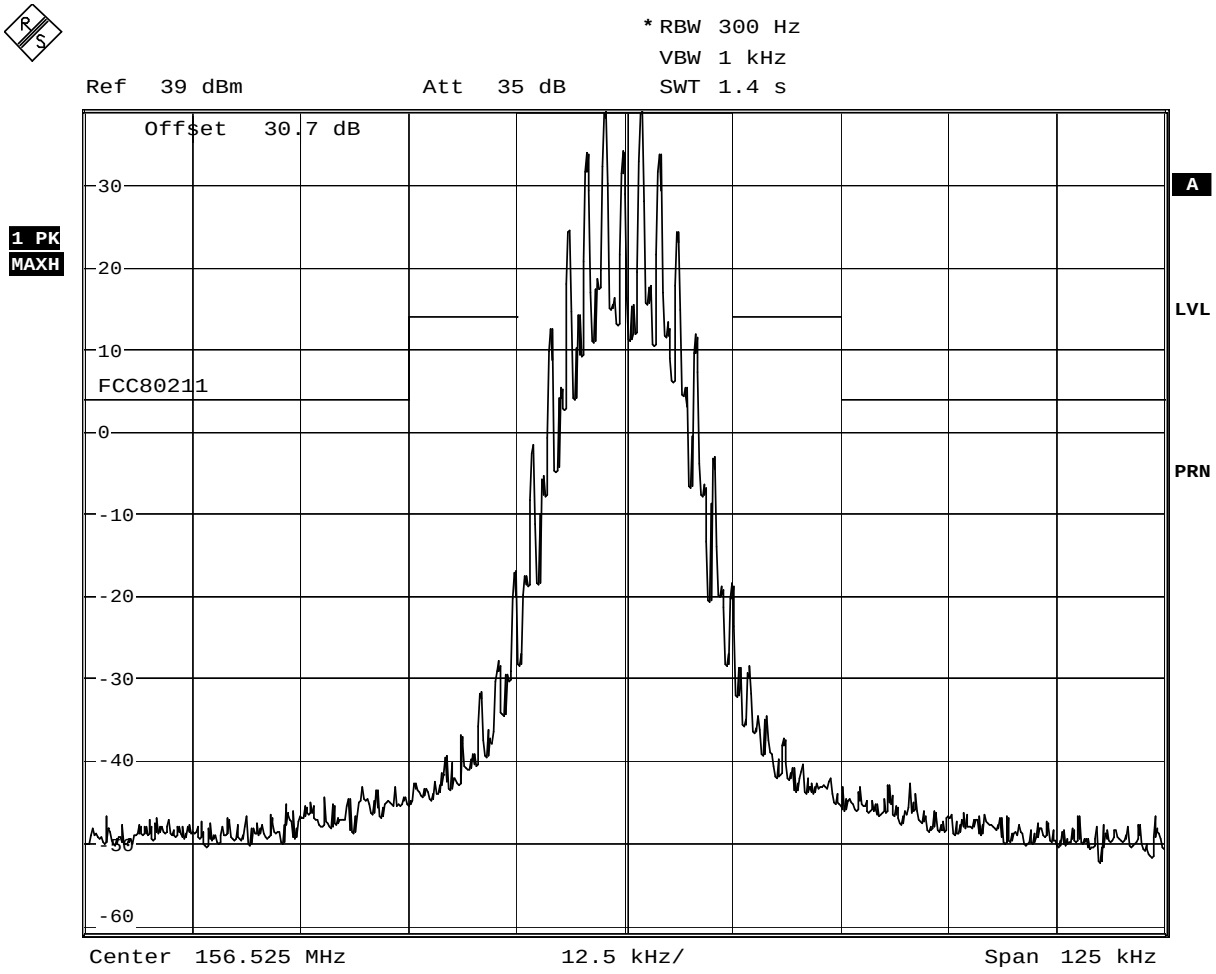
Ambient Temperature	19°C
Relative Humidity	53%

2.6.7 Test Results

1300 Hz Test Mode

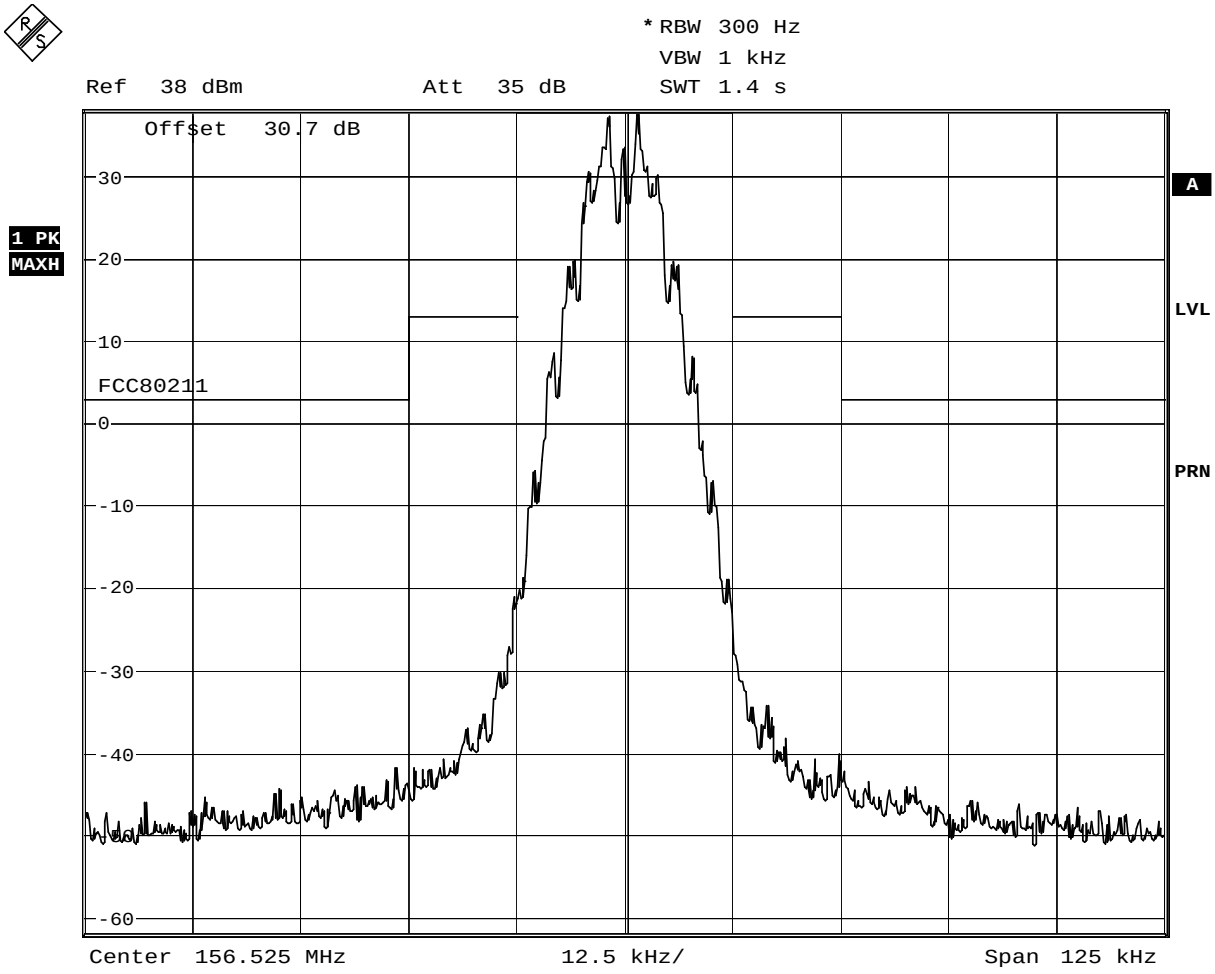


2100 Hz Test Mode



Date: 23.AUG.2007 11:58:22

Dotting Pattern Mode



Date: 23.AUG.2007 11:56:21

2.7 OCCUPIED BANDWIDTH

2.7.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.205(a)

2.7.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.7.3 Date of Test and Modification State

23rd August 2007 - 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 Procedure

The EUT is declared as having an emission designator of: 16K0G3E for voice application which equates to an Authorised Bandwidth of: 16kHz.

Initially, the EUT was connected via a 30dB Attenuator to a Modulation Analyser, which was set to measure the Deviation. From the results in 80.213, the audio frequency for a set input level which produces the highest level of deviation was 3.0kHz. Thus, the Audio Analyser was set to supply the EUT with an audio tone of 2.5kHz at an amplitude which produced a deviation corresponding to 50% of the maximum permissible frequency deviation, (±2.5kHz). The level was then increased on the audio analyser by 16dB.

The Modulation Analyser was then replaced with a Spectrum Analyser and the 99% Bandwidth was measured. The measurements were performed on Channel 16, bottom and top channels on maximum power levels.

2.7.6 Environmental Conditions

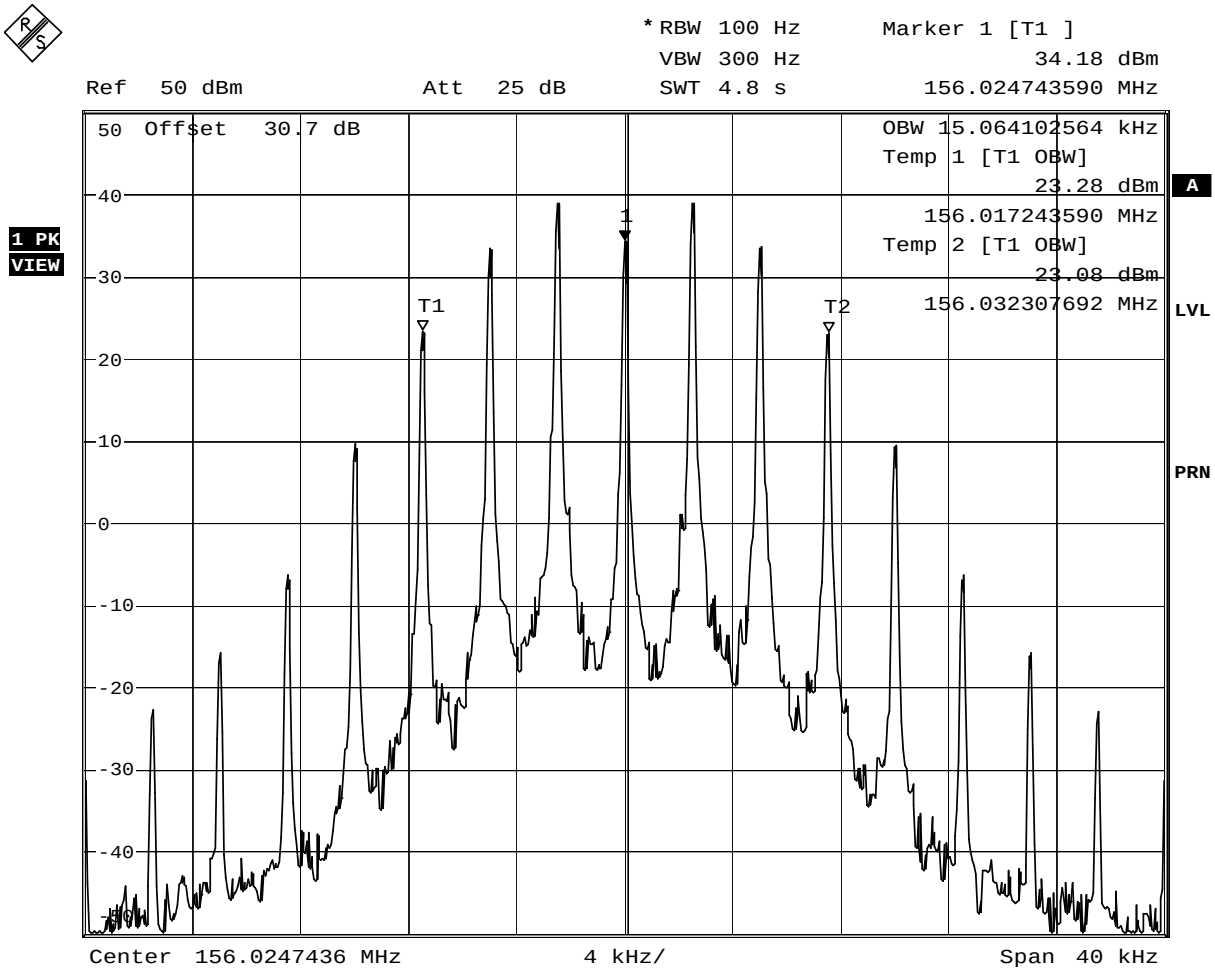
Ambient Temperature	20°C
Relative Humidity	55%

2.7.7 Test Results

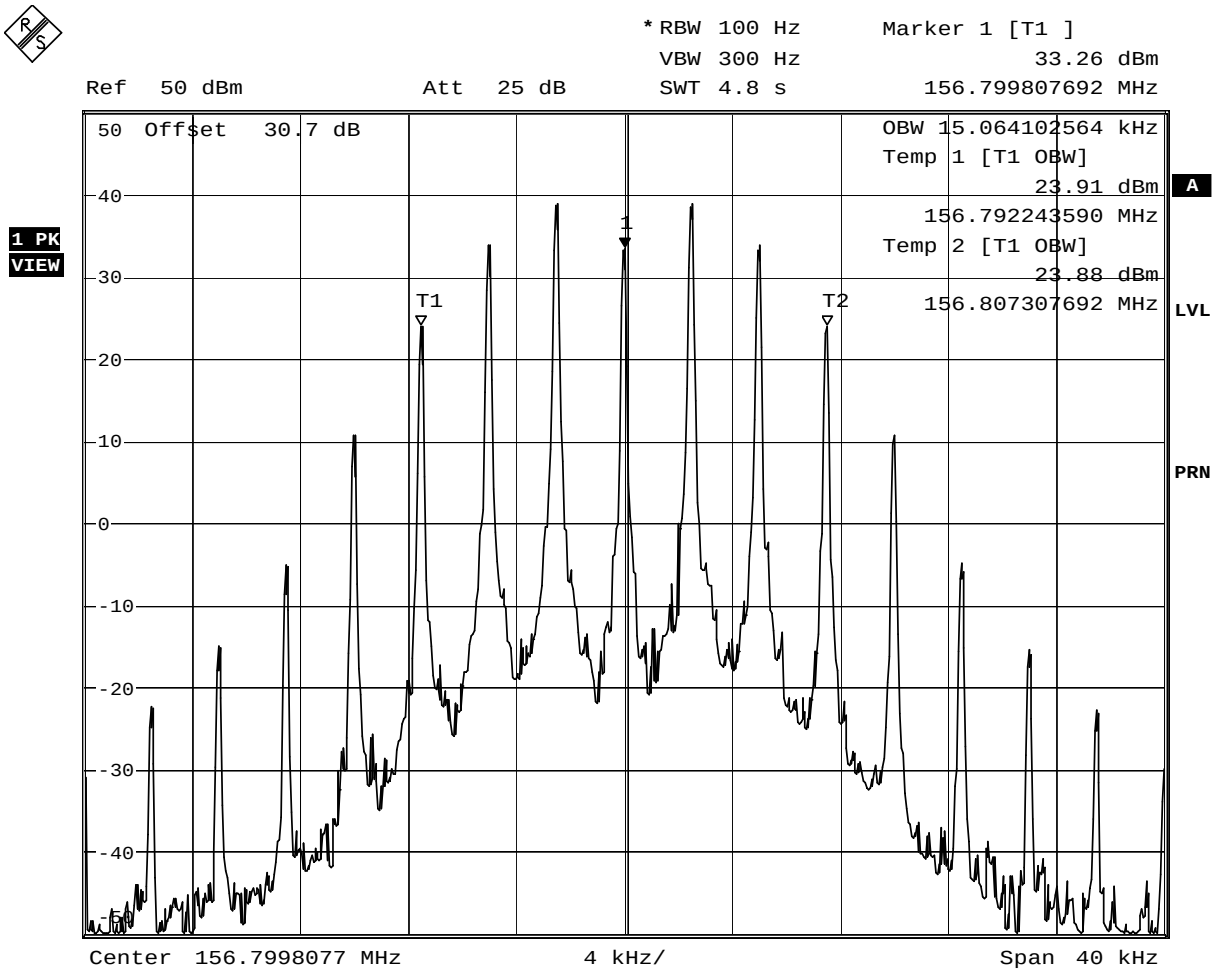
Channel Number/Frequency	Power Level (W)	Result (kHz)	Authorised Bandwidth (kHz)
60 / 156.025MHz	25	15.064	16
16 / 156.800MHz	25	15.064	16
88 / 157.425MHz	25	15.064	16

The test result plots are presented below.

Bottom Channel - 60

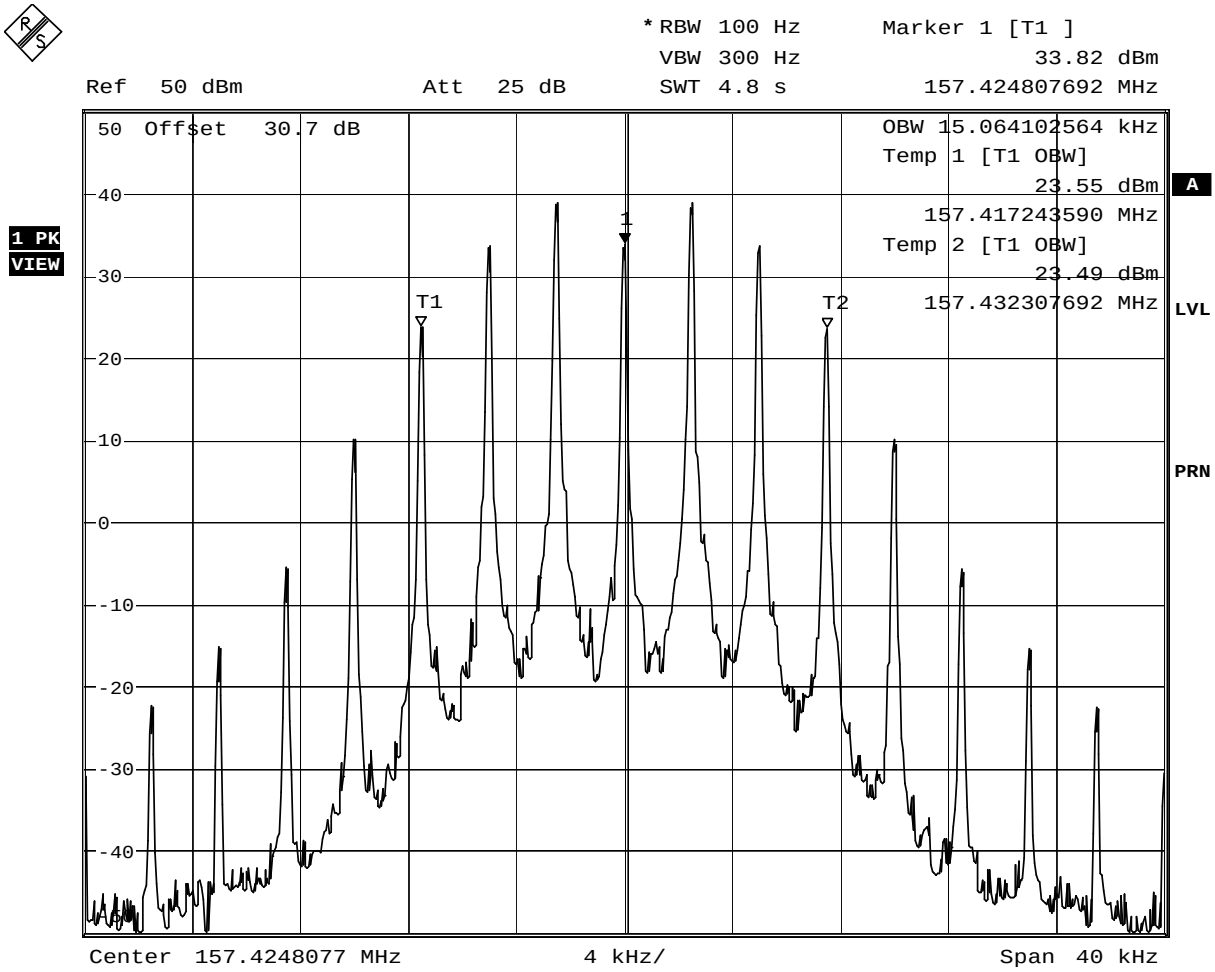


Middle Channel - 16



Date: 23.AUG.2007 10:29:40

Top Channel – 88



Date: 23.AUG.2007 11:01:53

2.8 DSC OCCUPIED BANDWIDTH

2.8.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.205(a)

2.8.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.8.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

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 Test Procedure

The EUT is declared as having an emission designator of: 16K0G2B for DSC application which equates to an Authorised Bandwidth of: 20kHz.

The input level is not adjustable in DSC mode. The 1300Hz and 2100Hz tones are generated from within the EUT, using the test modes supplied, three plots have been taken showing the carrier modulated with B and Y states and dotting pattern.

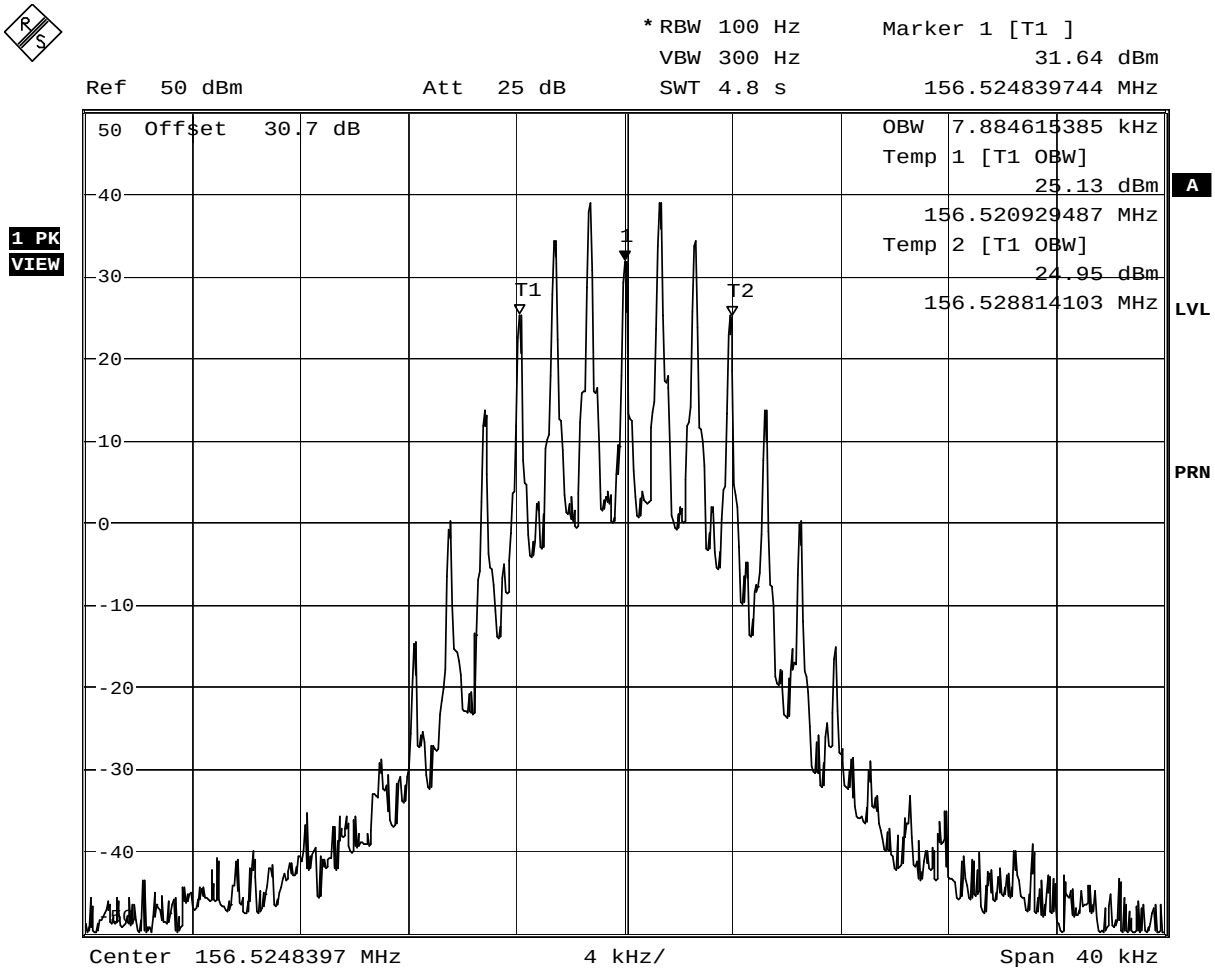
2.8.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	55%

2.8.7 Test Results

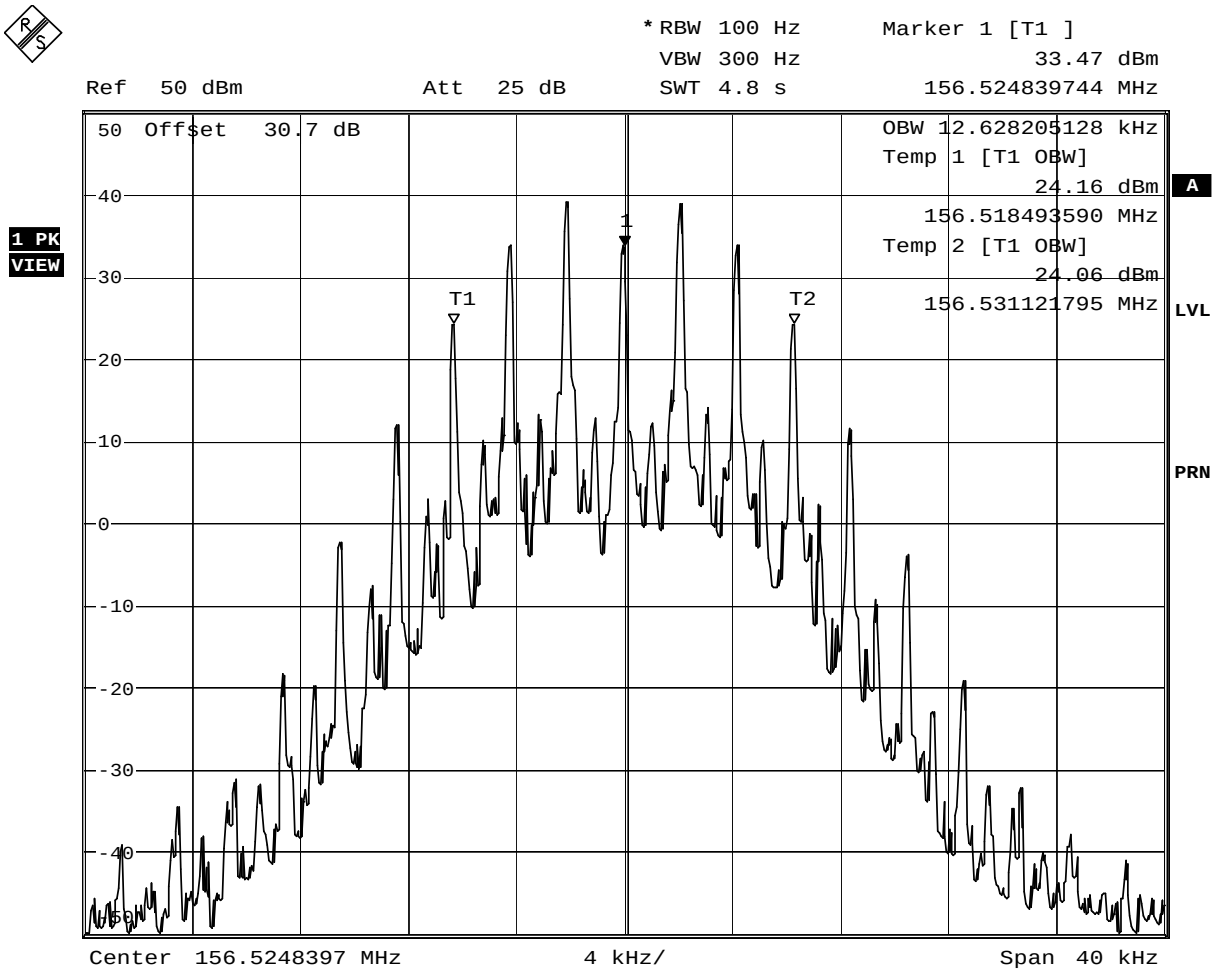
Channel Number / Frequency	Result (kHz)	Authorised Bandwidth (kHz)
1300 Hz	7.885	20
2100 Hz	12.628	20
Dotting Pattern	11.410	20

1300 Hz Test Mode



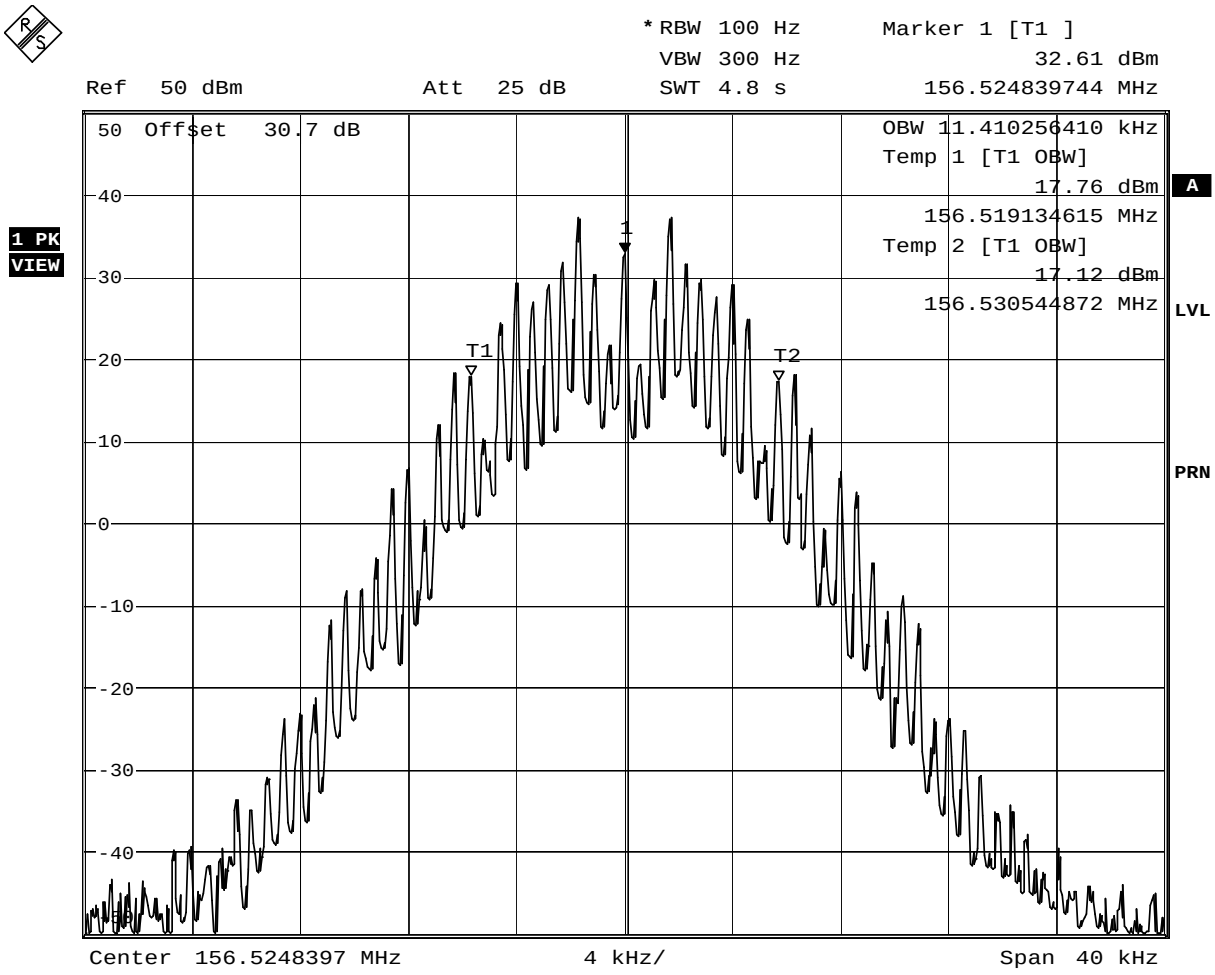
Date: 23.AUG.2007 10:07:19

2100 Hz Test Mode



Date: 23.AUG.2007 10:05:10

Dotting Pattern Test Mode



Date: 23.AUG.2007 10:10:14

2.9 EMISSION LIMITATIONS (CONDUCTED TRANSMITTER SPURIOUS)

2.9.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(c)(f)(3)

2.9.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.9.3 Date of Test and Modification State

23rd August 2007 - 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 Procedure

All Measurements were performed with the EUT modulated, in accordance with Clause 4.3 (a). Where the EUT was initially connected to a Modulation Analyser and the EUT set to transmit, using an Audio Analyser, an audio frequency was swept between 300Hz to 5kHz to find the frequency which produced the highest deviation.

The amplitude at this frequency was then increased to give a deviation of 2.5kHz.

The amplitude and frequency levels were 11.8mV at 3.0kHz

Then at a frequency of 2.5kHz the amplitude recorded above was increased by 16dB to provide the Final Modulated level.

The EUT transmitting on full power, was then connected to a Spectrum Analyser via 40dB of attenuation in the 9kHz - 600MHz frequency range and via a 30dB Attenuator with 600MHz High Pass Filter in the 600MHz - 1.7GHz frequency range.

The EUT was checked (for the bottom, middle and top channels of the EUT) against the specification limit for all emissions >250% removed from the assigned Frequency, between 9kHz - 1.6GHz.

The Path Loss for each frequency range was recorded and the worst case loss was entered as a Reference Level Offset.

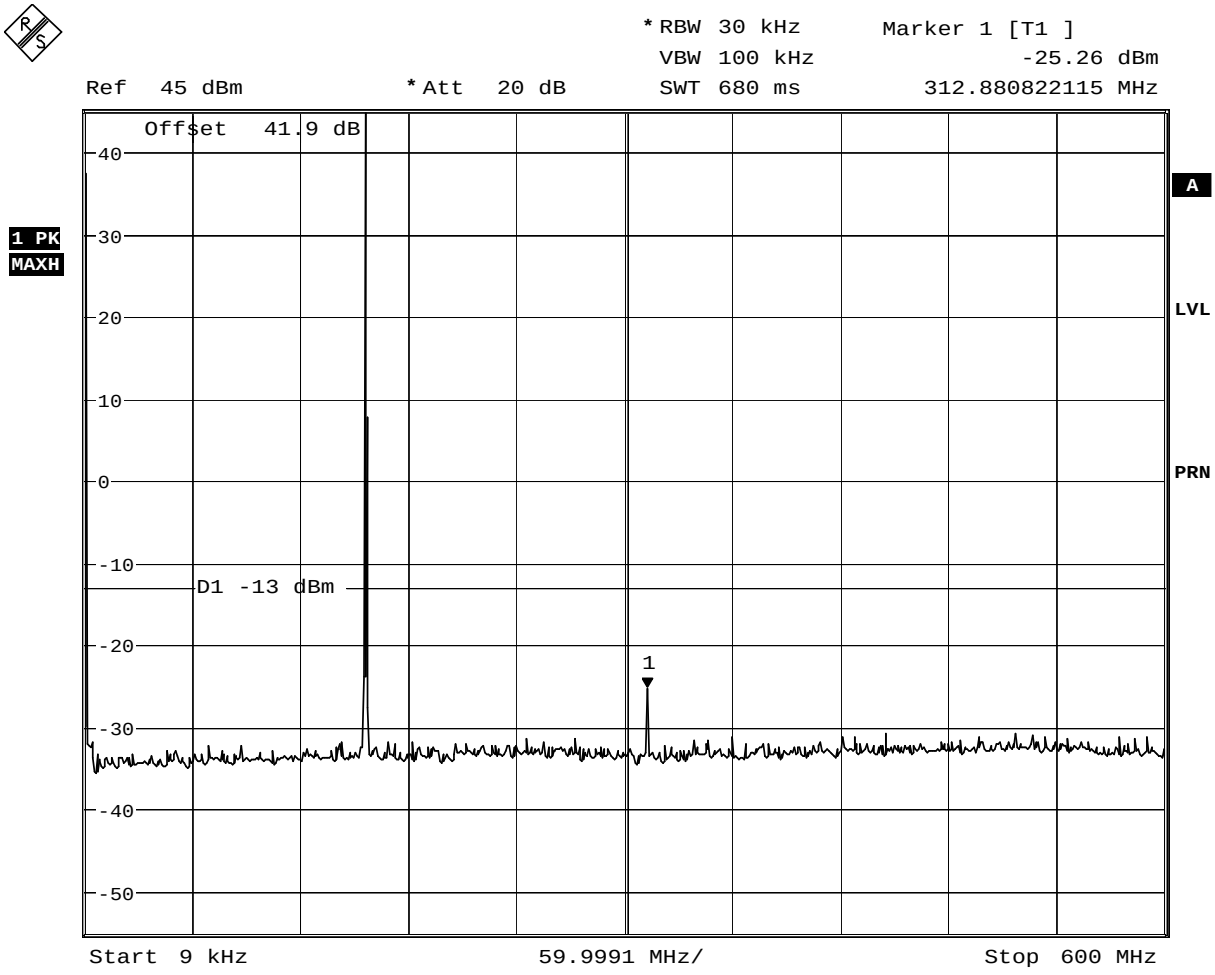
Total Path loss (9kHz - 600MHz) = 41.90dB
Total Path loss (600MHz - 1.7GHz) = 32.2dB

2.9.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	54%

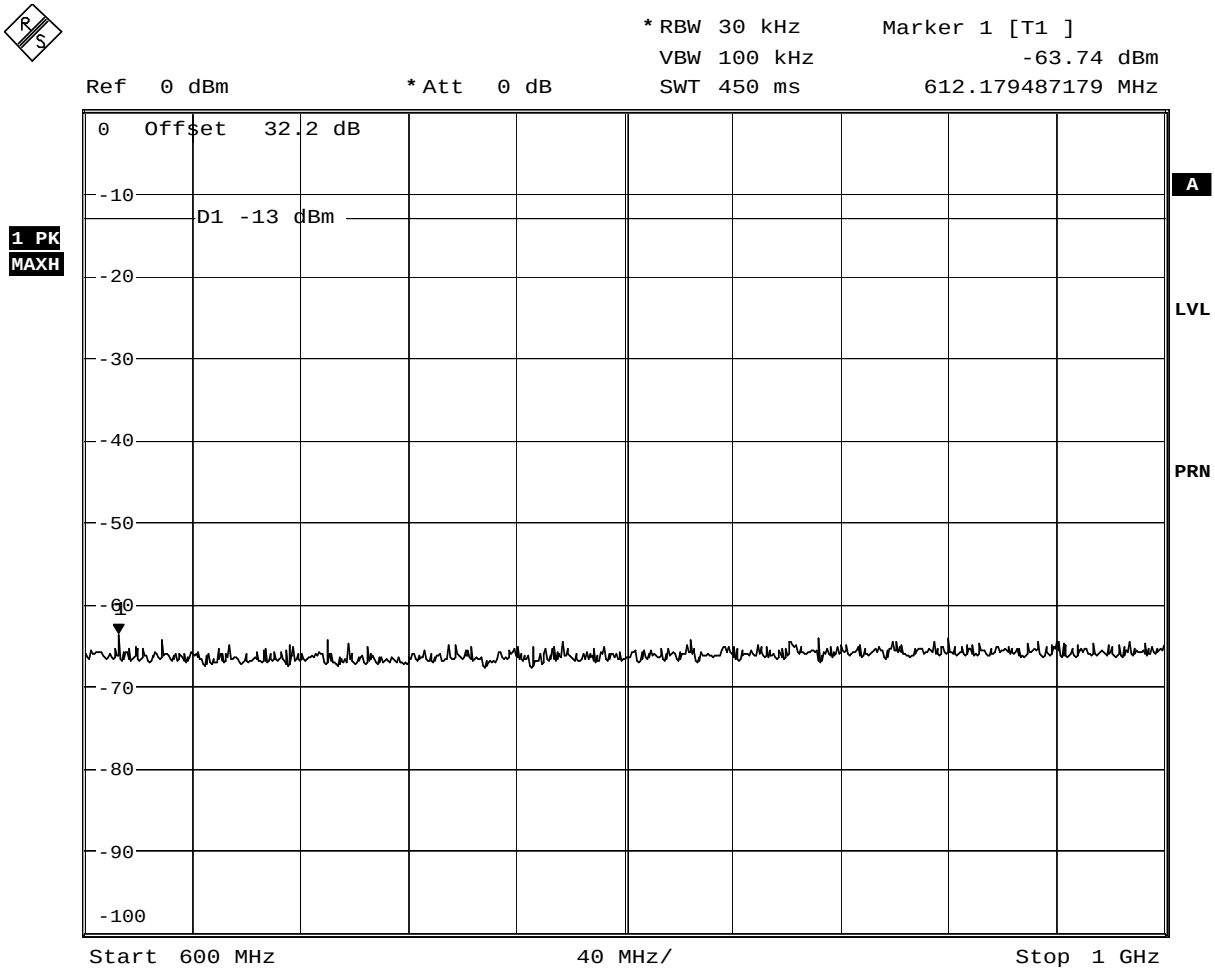
2.9.7 Test Results

Bottom Channel – 60 – 9kHz to 600MHz



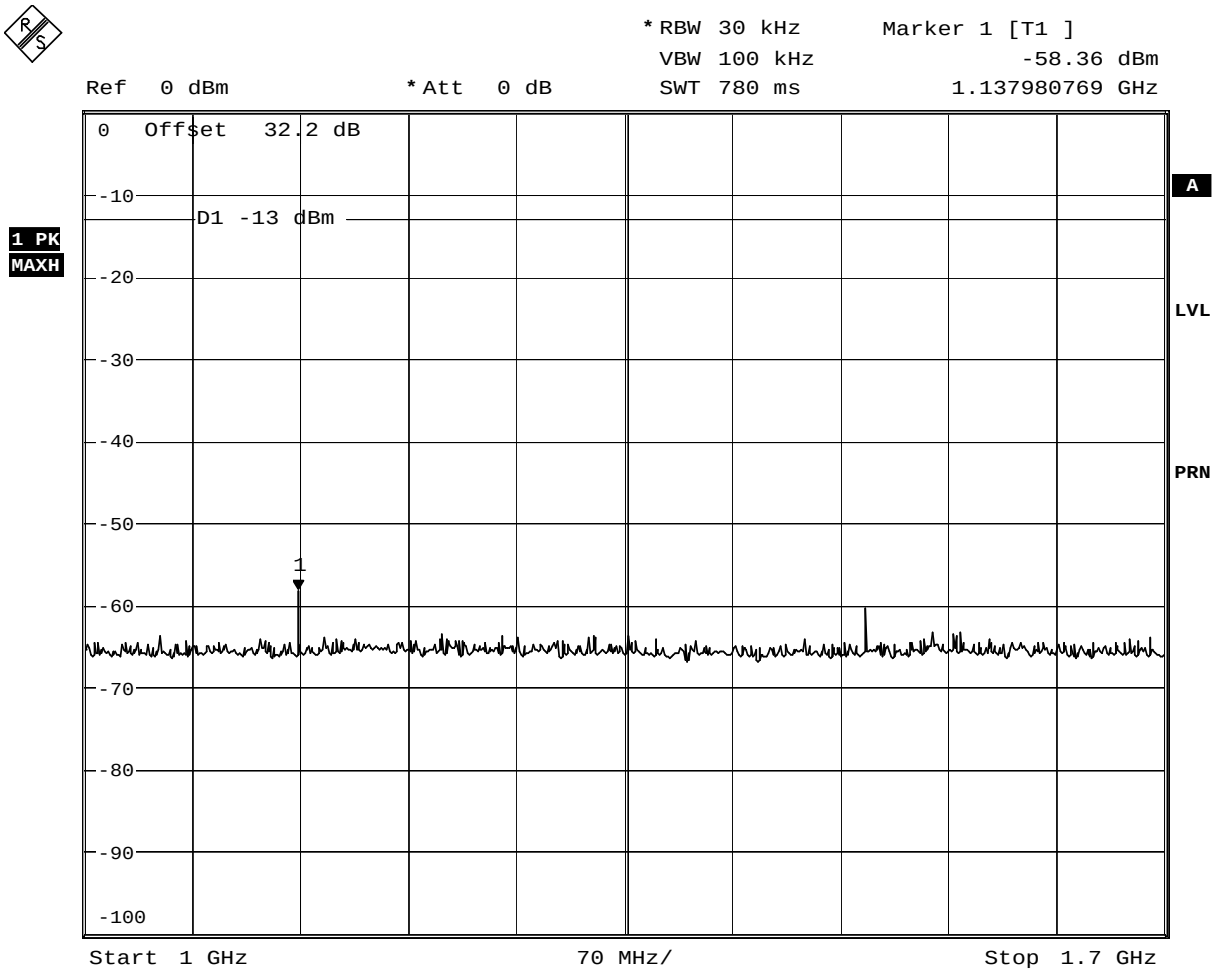
Date: 23.AUG.2007 13:48:50

Bottom Channel – 60 – 600 MHz to 1000 MHz



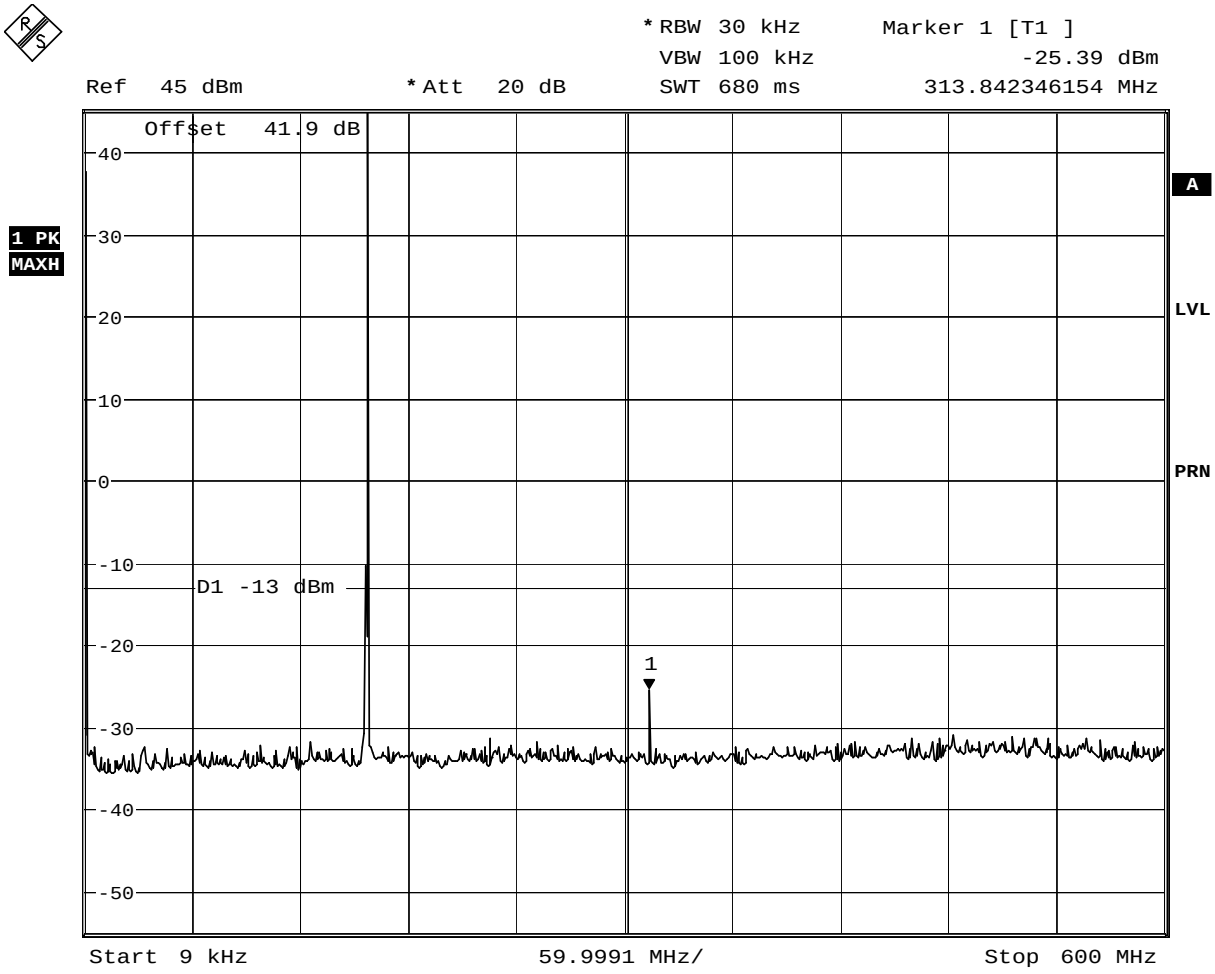
Date: 23.AUG.2007 14:02:12

Bottom Channel – 60 – 1000 MHz to 1700 MHz



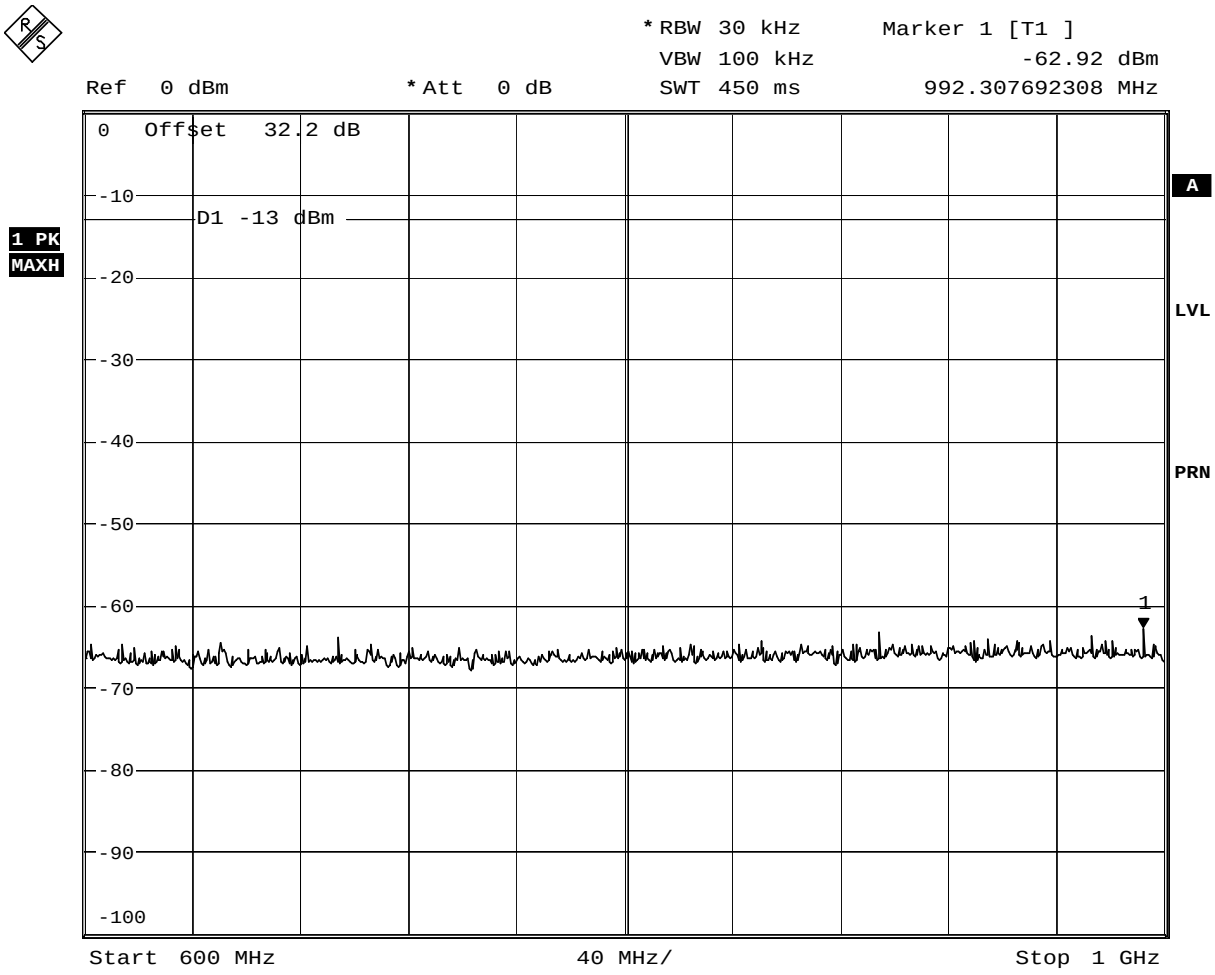
Date: 23.AUG.2007 14:07:39

Middle Channel – 16 – 9kHz to 600MHz



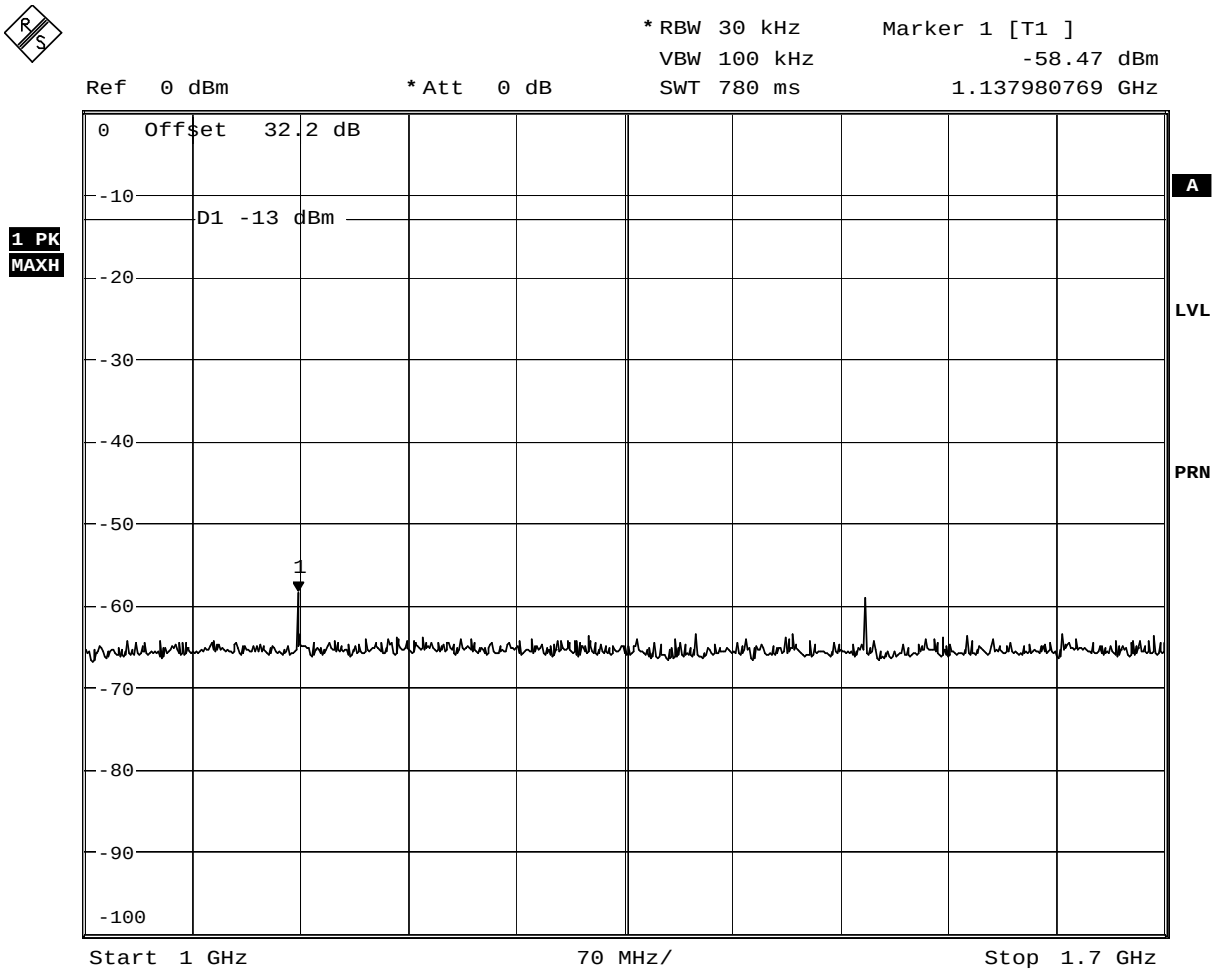
Date: 23.AUG.2007 13:46:49

Middle Channel – 16 – 600MHz to 1000MHz



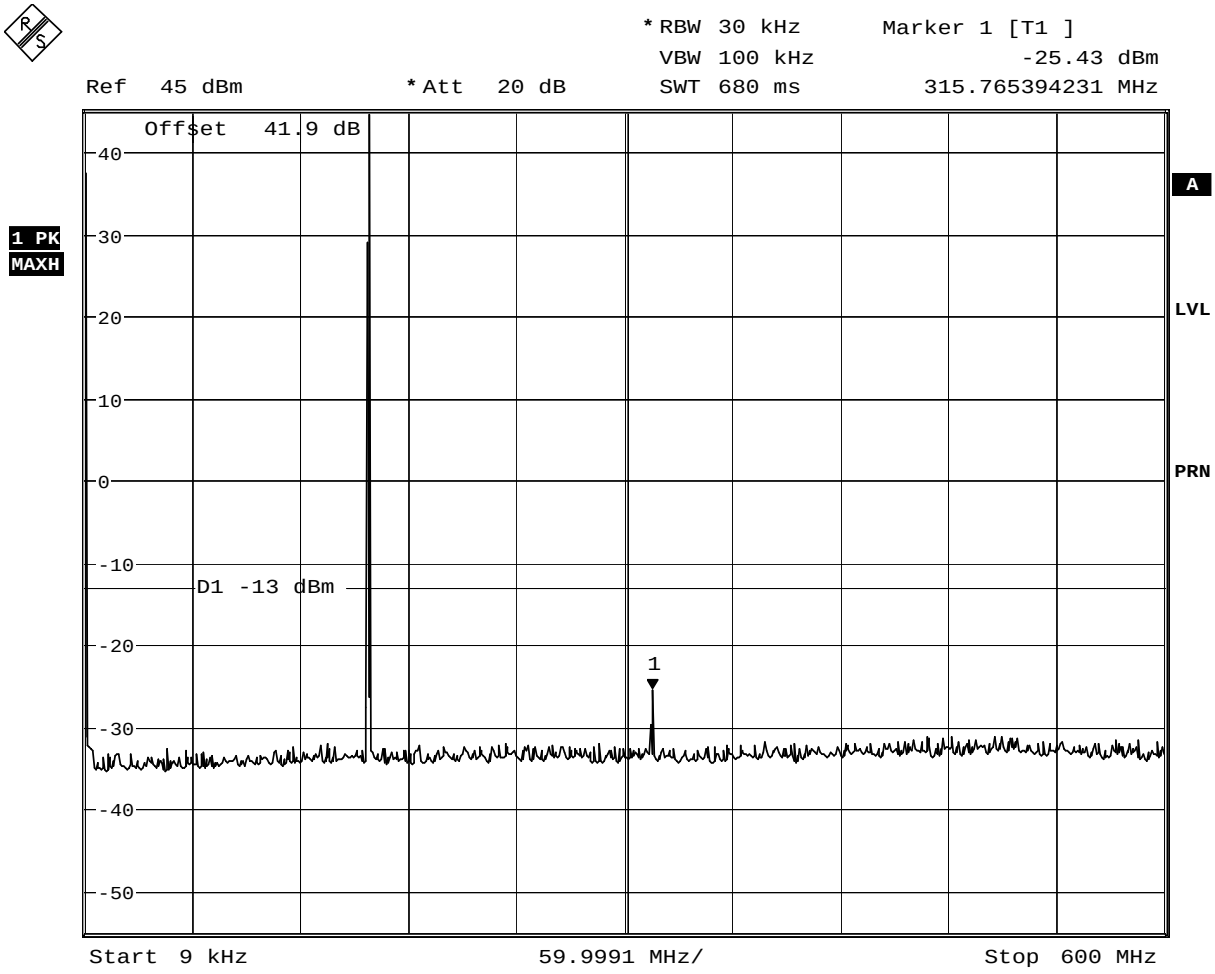
Date: 23.AUG.2007 14:11:31

Middle Channel – 16 – 1000MHz to 17000MHz



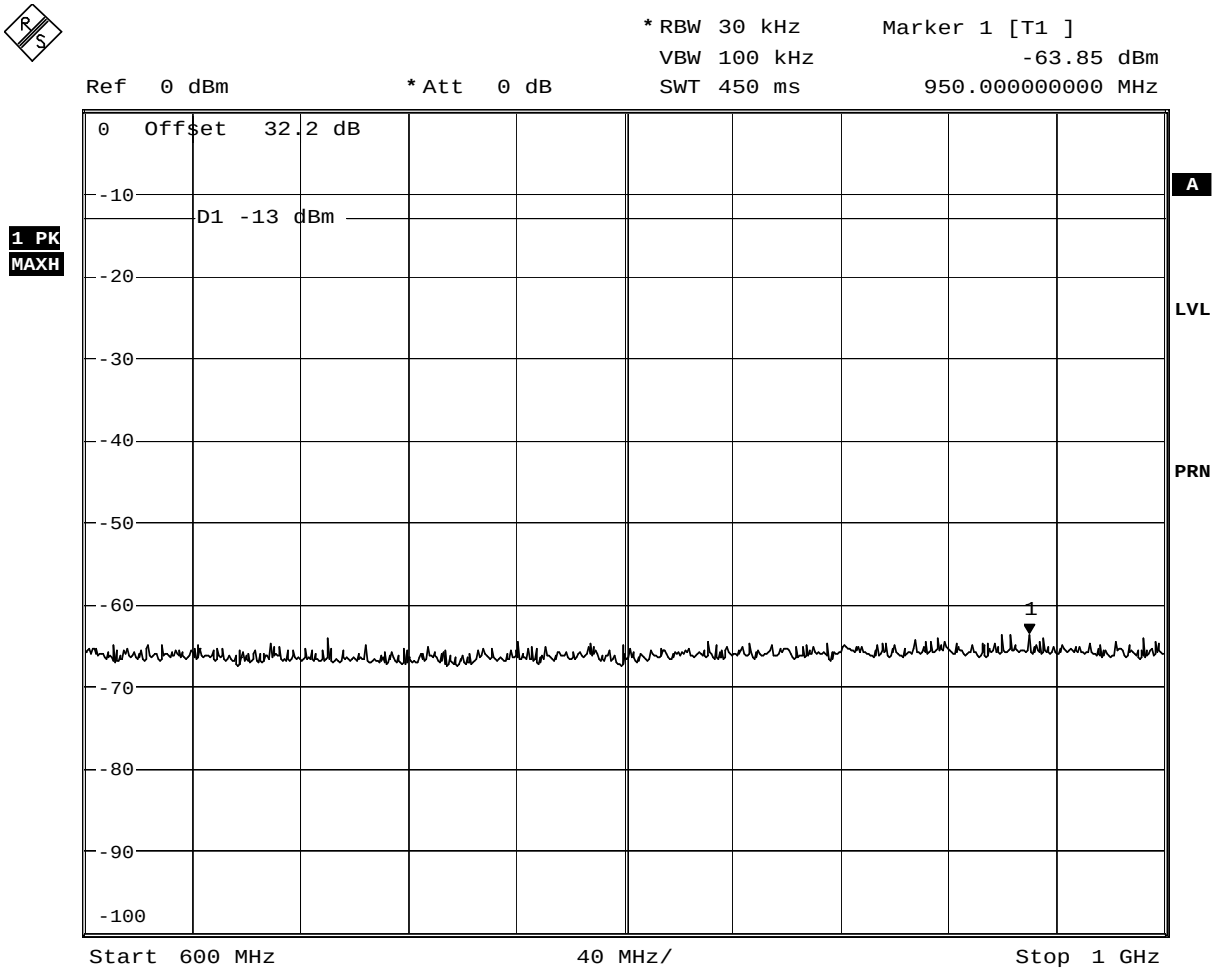
Date: 23.AUG.2007 14:09:44

Top Channel –88 – 9kHz to 600MHz



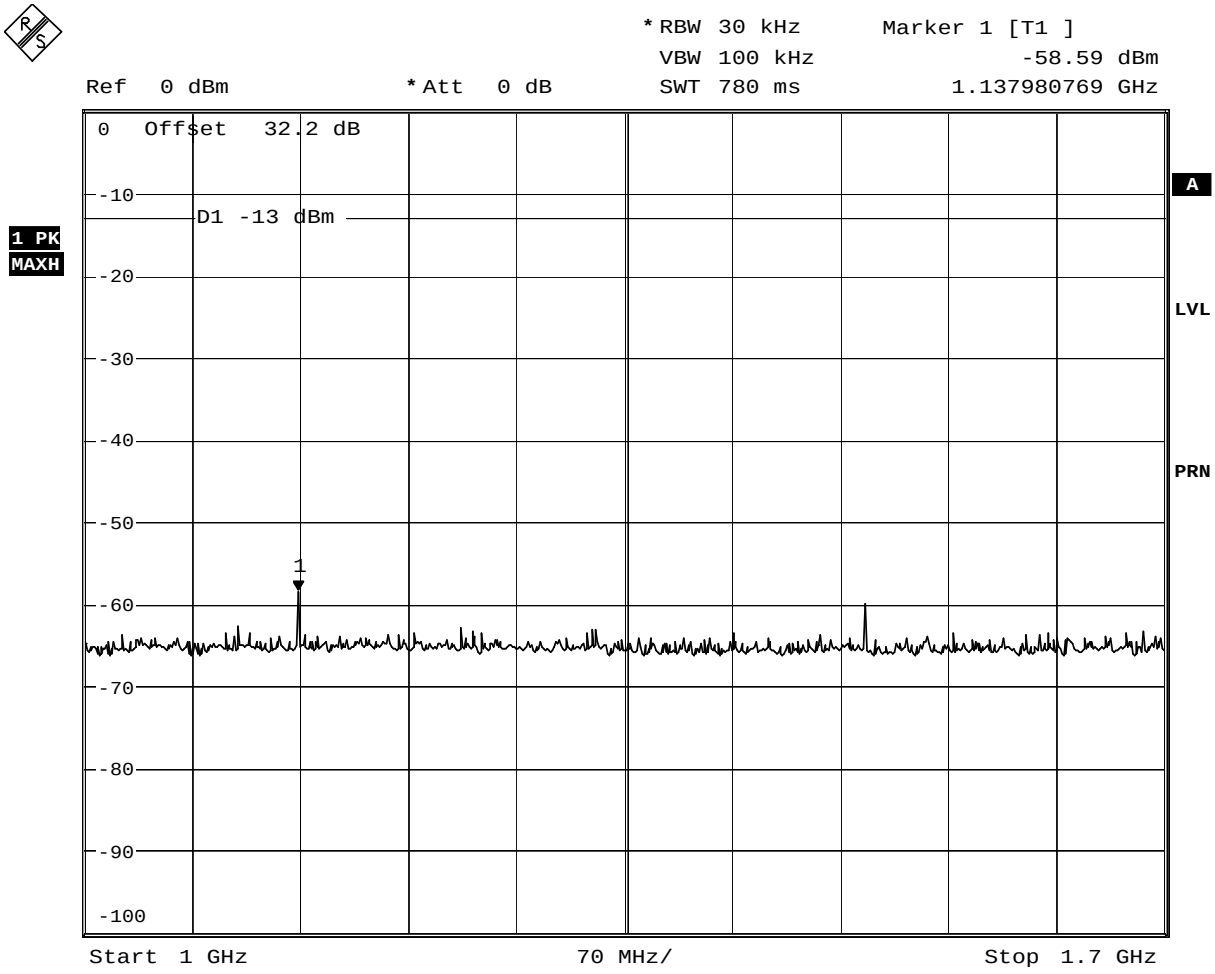
Date: 23.AUG.2007 13:49:59

Top Channel –88 – 600MHz to 1000MHz



Date: 23.AUG.2007 14:12:54

Top Channel –88 – 1000MHz to 1700MHz



Date: 23.AUG.2007 14:15:00

2.10 EMISSION LIMITATIONS DSC (CONDUCTED TRANSMITTER SPURIOUS)

2.10.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(c)(f)(3)

2.10.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.10.3 Date of Test and Modification State

23rd August 2007 - 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 Procedure

All Measurements were performed with the EUT in the DSC mode. The EUT was tested in the dotting pattern test state on DSC channel 70.

The EUT transmitting on full power, was then connected to a Spectrum Analyser via a 40dB Attenuator in the 9kHz - 600MHz frequency range and via a 30dB Attenuator with 600MHz High Pass Filter in the 600MHz - 1.7GHz frequency range.

The Path Loss for each frequency range was recorded and the worst case loss was entered as a Reference Level Offset.

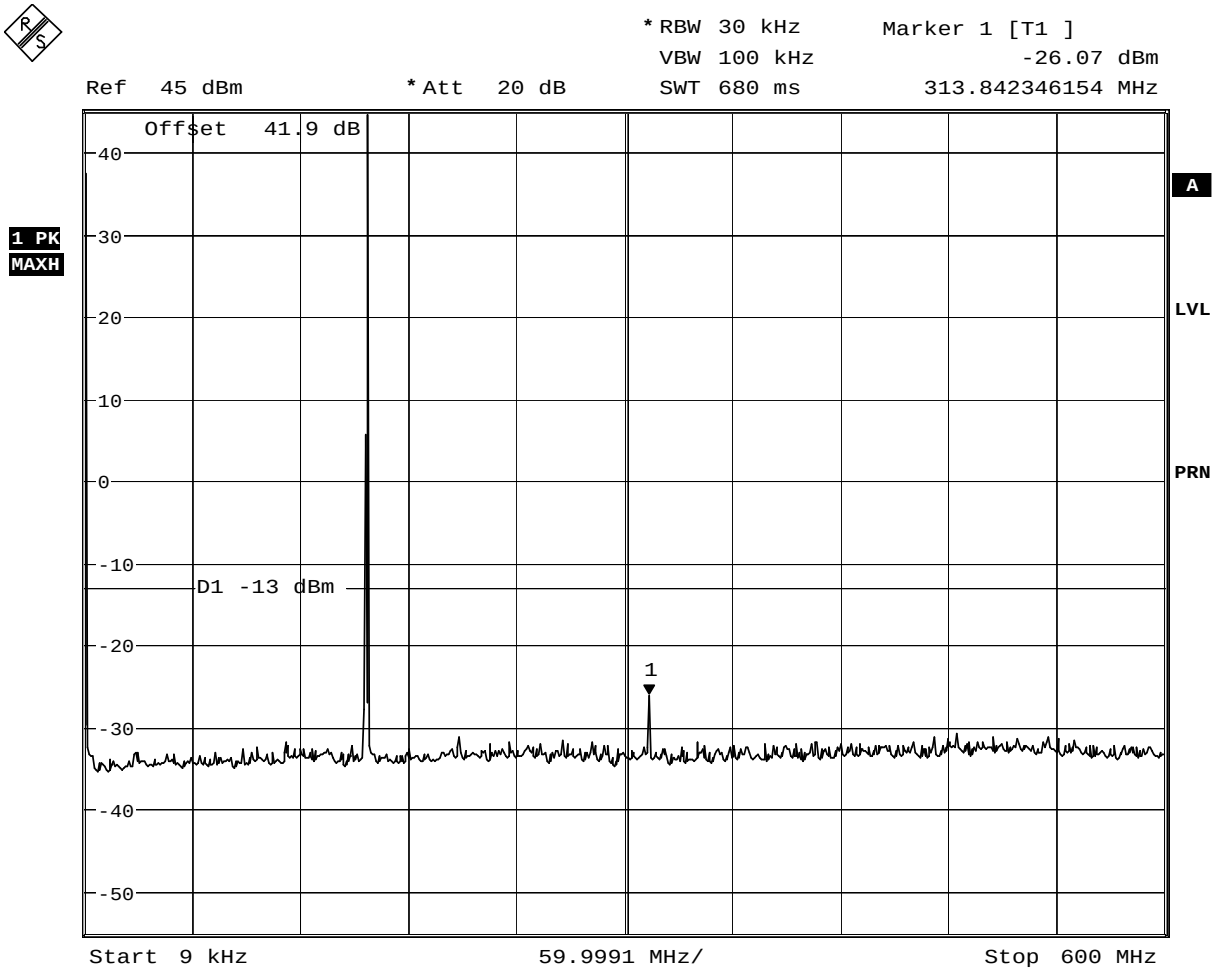
Total Path loss (9kHz - 600MHz) = 41.90dB
Total Path loss (600MHz - 1.7GHz) = 32.2dB

2.10.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	54%

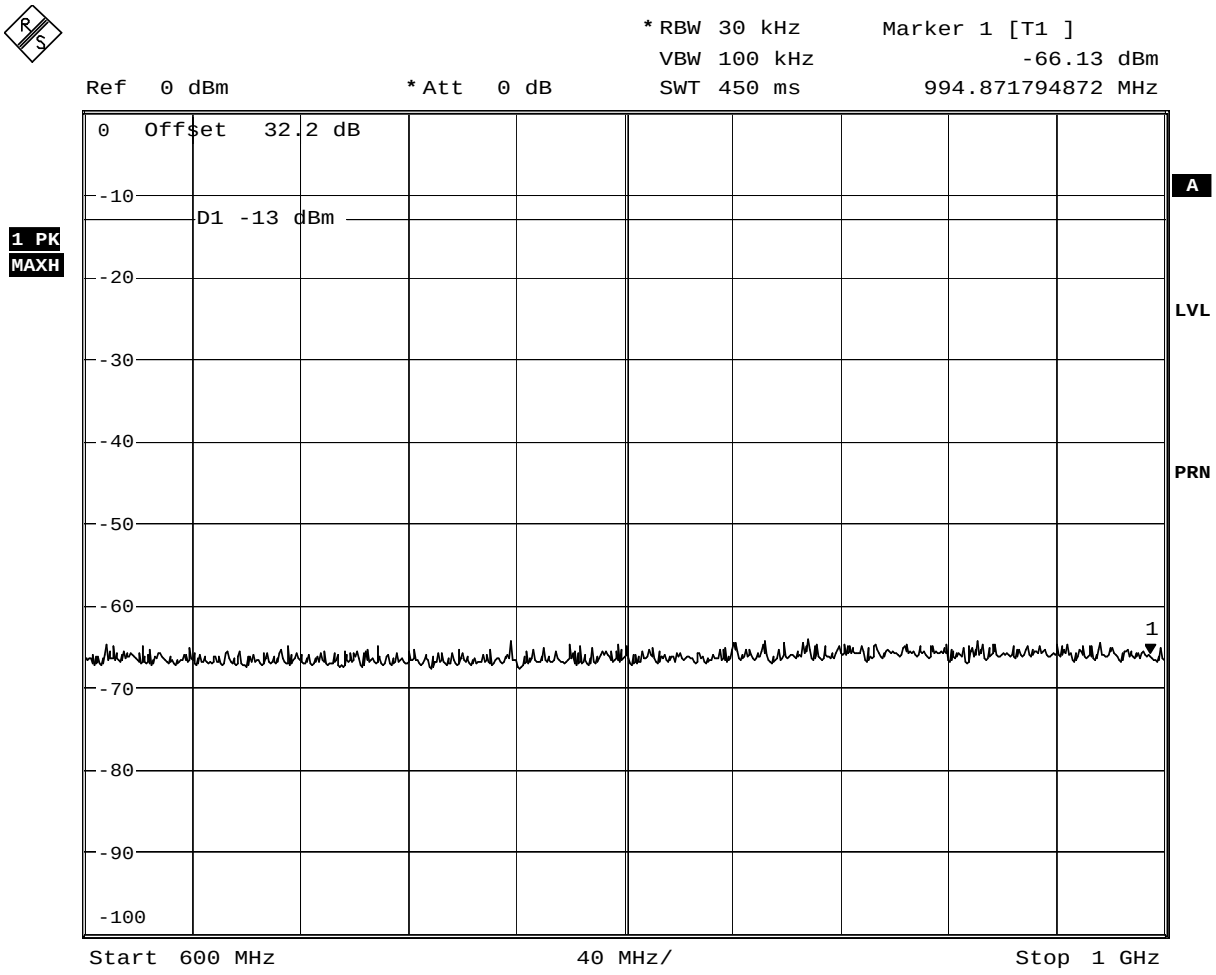
2.10.7 Test Results

Channel 70 DSC – 9kHz to 600MHz



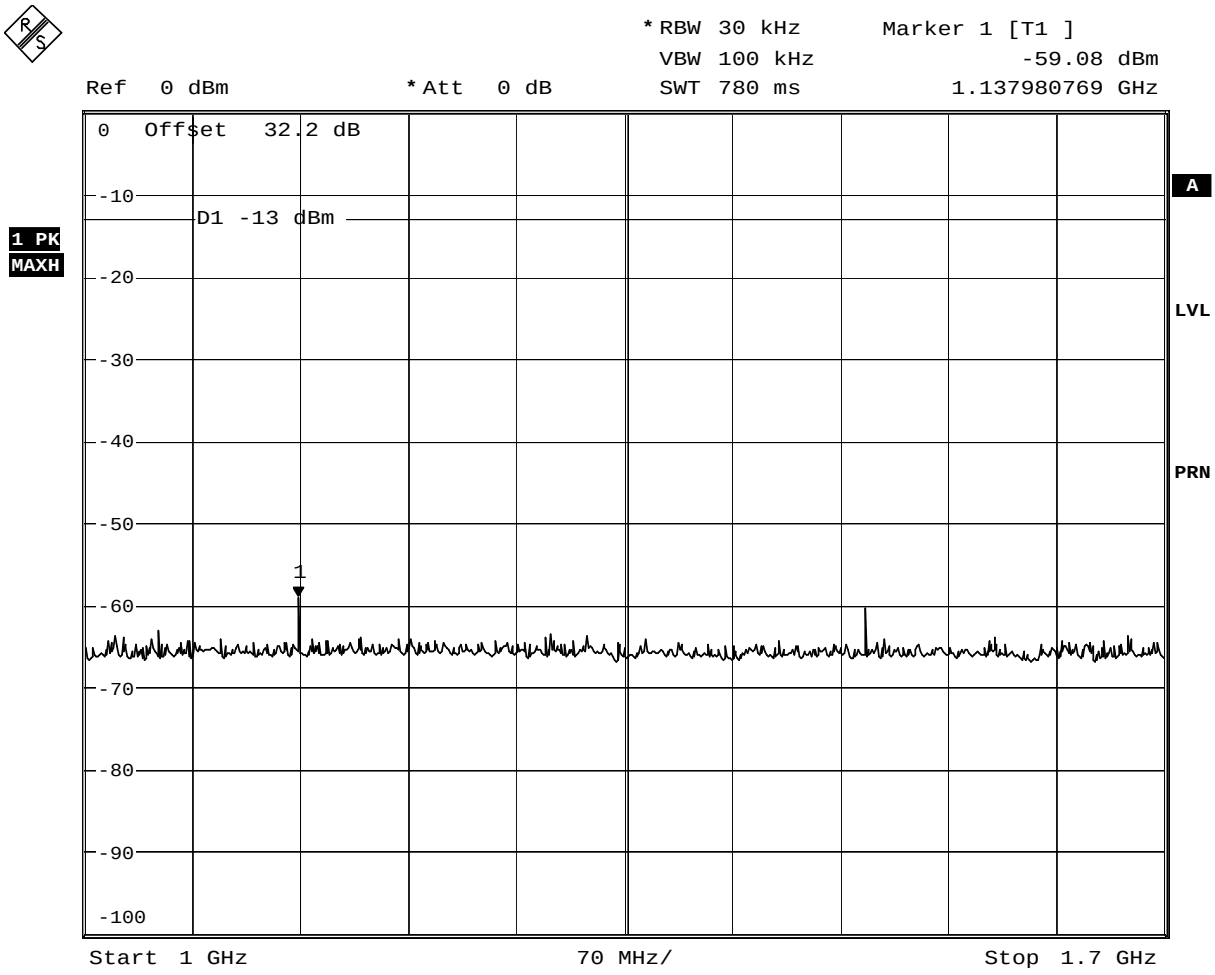
Date: 23.AUG.2007 13:51:36

Channel 70 DSC – 600MHz to 1000MHz



Date: 23.AUG.2007 13:54:42

Channel 70 DSC – 1000MHz to 1700MHz



Date: 23.AUG.2007 13:55:43

2.11 EMISSION LIMITATIONS (RADIATED TRANSMITTER SPURIOUS)

2.11.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(f)(3)

2.11.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 61100127

2.11.3 Date of Test and Modification State

27th September 2007 - Modification State 2

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 Procedure

Test Performed in accordance with ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT. The list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector.

Emissions identified within the range 1GHz – 2GHz were then formally measured using Peak and Average Detectors, as appropriate.

The measurements were performed at a 3m distance unless otherwise stated.

2.11.6 Environmental Conditions

Ambient Temperature	20.9°C
Relative Humidity	34%

2.11.7 Test Results

Bottom Channel – 60 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
312.0	Vertical	100	330	-42.9	-13.0	-29.9
624.0	Vertical	100	143	-30.0	-13.0	-17.0

Middle Channel – 16 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
313.6	Vertical	100	327	-42.9	-13.0	-29.9
627.2	Vertical	100	157	-31.5	-13.0	-18.5

Top Channel – 88 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
314.8	Vertical	100	339	-41.6	-13.0	-28.6
629.7	Vertical	100	126	-31.8	-13.0	-18.8

2.12 EMISSION LIMITATIONS (RADIATED TRANSMITTER SPURIOUS) DSC

2.12.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.211(f)(3)

2.12.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 61100127

2.12.3 Date of Test and Modification State

2nd October 2007 - Modification State 2

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 Procedure

The EUT was set up in accordance with the manufacturer's instruction in a semi-anechoic chamber conforming to the requirements of ANSI-C63.4.

The frequency spectrum was investigated between 30MHz and 1700MHz. Where emissions were present, they were measured at a distance of 3m. A height search between 1 and 4m was carried out and the EUT rotated through 360º to maximise the response.

The receivers detector was set to peak and max hold function utilised. Below 1GHz an RBW of 100kHz and UBW of 300kHz was used. Above 1GHz on RBW of 1MHz and VBW of 3MHz was used.

The EUT was tested on the DSC channel on maximum power with modulation applied.

2.12.6 Environmental Conditions

Ambient Temperature	22.1°C
Relative Humidity	52%

2.12.7 Test Results

Channel – 70 – 30MHz to 2GHz

Frequency MHz	Antenna Polarisation	Antenna Height	Antenna Azimuth	Result (dBm)	Limit (dBm)	Margin (dBm)
313.045	Vertical	100	0	-44.15	-13.00	-31.15
469.565	Vertical	100	27	-51.98	-13.00	-38.98
626.075	Vertical	100	231	-34.96	-13.00	-21.96
782.605	Vertical	100	91	-45.25	-13.00	-32.25
939.155	Horizontal	100	356	-57.00	-13.00	-44.00
1065.645	Vertical	100	213	-42.49	-13.00	-29.49
1252.175	Horizontal	100	307	-45.00	-13.00	-32.00
1408.675	Vertical	100	24	-44.94	-13.00	-31.94
1565.215	Vertical	100	95	-44.80	-13.00	-31.80

2.13 MODULATION CHARACTERISTICS

2.13.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.213

2.13.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.13.3 Date of Test and Modification State

22nd August 2007 - 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 Test Procedure

In each of the test modes listed in the table below, the maximum frequency deviation was checked to ensure that the deviation remained within ±5kHz as defined in 3.4.

The frequency deviation remains within ±5kHz as the amplitude is fixed for the B and Y states, it is not possible for the deviation to exceed ±5kHz. The table shows that the EUT meets the requirements of the specification.

A curve has been produced displaying the frequency response of the audio modulating circuit over a range of 100Hz to 5kHz. The plot shows the data for all of the circuitry installed between the microphone input and the modulated stage.

The EUT was connected to a Modulation Analyser via a 30dB Attenuator. An Audio Analyser was connected to the microphone input at a set voltage level and the frequency varied between 100Hz and 5kHz. The demodulated audio was measured and plotted as a graph, which is shown below.

2.13.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	51%

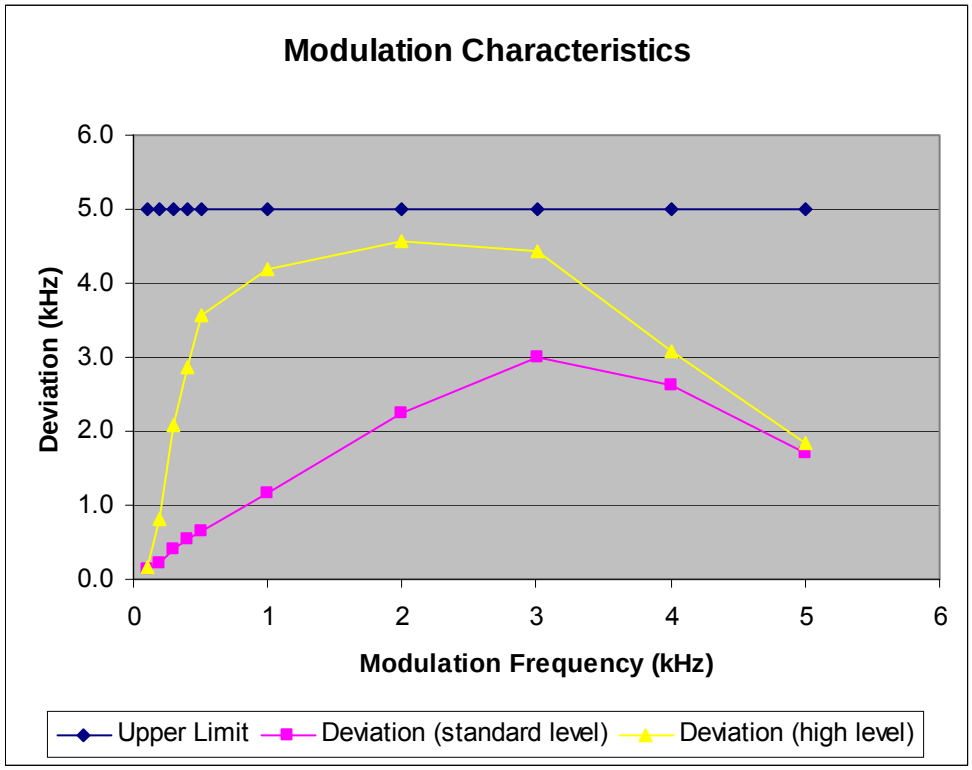
2.13.7 Test Results

Frequency Deviation (kHz)	Modulation State	Limit
2.69	1300Hz	≤ 5kHz
4.21	2100Hz	≤ 5kHz
4.22	Dotting Pattern	≤ 5kHz

Two sets of results are shown in the table below. One gives the audio frequency curve as described above. The curve has been plotted and is shown below. The second set of data gives the maximum frequency deviation where the peak responce is determined from the frequency responce curve. The audio input was then increased until a deviation of 3kHz was measured on the Modulation Analyser. The audio input was then increased by 16dB.

MODULATION FREQUENCY (Hz)	MAXIMUM DEVIATION (kHz)	
	CH 16	CH16 Amplitude Increased By 16dB
Lowest frequency	-	-
100	0.138	0.167
200	0.221	0.822
300	0.410	2.082
400	0.533	2.878
500	0.639	3.569
1000	1.169	4.200
2000	2.248	4.560
3000	2.999	4.440
4000	2.621	3.069
5000	1.694	1.82
Maximum Deviation (kHz)	2.999	4.560
Measurement uncertainty (Hz)	± 85	

The test result plot is presented below.


Modulation Characteristics
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Deviation (kHz)
0
1
2
3
4
5
6
Modulation Frequency (kHz)
Upper Limit
Deviation (standard level)
Deviation (high level)

2.14 TRANSMITTER POWER

2.14.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.215

2.14.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.14.3 Date of Test and Modification State

22nd August 2007 - 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 Test Procedure

The EUT was connected via a 30dB attenuator to a power meter and sensor. The path loss between the EUT and the power sensor was measured and recorded. The power meter reading and adjusted by the path loss value.

The emissions designator for the EUT is declared as G3E. The measurement of G3E designations is defined as being Carrier Power. The Carrier Power was measured unmodulated.

The carrier power was measured on the top, middle and bottom channels of the operating frequency band at maximum and minimum power levels.

The carrier power was measured in two ways, modulated and unmodulated. The emissions designator is G3E and as such, this measurement is defined as carrier power.

2.14.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	52%

2.14.7 Test Results

Maximum Power – 25W Unmodulated

Frequency (MHz)	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1	13.14	30.12	43.26	21.18
Channel 16	13.13	30.10	43.23	21.04
(Top) Channel 88	13.14	30.06	43.20	20.89

Minimum Power - 1W Unmodulated

Test Mode	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1	-0.13	30.12	29.99	0.998
Channel 16	-0.11	30.10	29.99	0.998
(Top) Channel 88	-0.12	30.06	29.94	0.986

Limit

≤ 25W or <+43.98 dBm and ≤ 1W or <+30.00 dBm

Note: Power was also measured when the supply voltage was varied between 12.2 V DC and 13.7 V DC – there was no discernable change in transmitter power.

Maximum Power – 25W Modulated

Frequency (MHz)	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1	13.11	30.12	43.23	21.04
Channel 16	13.11	30.10	43.21	20.94
(Top) Channel 88	13.09	30.06	43.15	20.65

Minimum Power - 1W Modulated

Test Mode	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
(Bottom) Channel 1	-0.12	30.12	30.00	1.000
Channel 16	-0.11	30.10	29.99	0.998
(Top) Channel 88	-0.12	30.06	29.94	0.986

Limit

≤ 25W or <+43.98 dBm

Note: Power was also measured when the supply voltage was varied between 12.2 V DC and 13.7 V DC – there was no discernable change in transmitter power.

2.15 TRANSMITTER POWER DSC

2.15.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.215

2.15.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.15.3 Date of Test and Modification State

28th August 2007 - Modification State 0

2.15.4 Test Equipment Used

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

2.15.5 Test Procedure

The EUT was connected via a 30dB attenuator to a power meter and sensor. The path loss between the EUT and the power sensor was measured and recorded. The power meter reading and adjusted by the path loss value.

The emissions designator for the EUT is declared as G3E. The measurement of G3E designations is defined as being Carrier Power. The Carrier Power was measured in 'All 0s', 'All 1s' and 'Dotting' test modes.

The carrier power was measured on Channel 70 at the maximum power level.

2.15.6 Environmental Conditions

Ambient Temperature	24°C
Relative Humidity	44%

2.15.7 Test Results

Maximum Power – 25W

Test Mode	Output Power (Uncorrected) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
0000….	13.16	30.31	43.47	22.23
1111….	13.17	30.31	43.48	22.28
1010….	13.16	30.31	43.47	22.23

Limit

≤ 25W or <+43.98 dBm

2.16 TRANSMITTER HIGH POWER INHIBIT

2.16.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.215g (2) (3)

2.16.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 61100127

2.16.3 Date of Test and Modification State

21st September 2007 - Modification State 2

2.16.4 Test Equipment Used

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

2.16.5 Test Procedure

The EUT was connected via a 30dB annenuator to a power meter and sensor. The path loss between the EUT and the power sensor was measured and recorded. The power meter reading was recorded and adjusted by the path loss value.

The unmodulated carrier power was measured on the specificaic channels of the operating frequency band. The measurement was repeated with the inhibit over-ride switch depressed.

2.16.6 Environmental Conditions

Ambient Temperature	24°C
Relative Humidity	49%

2.16.7 Test Results

Inhibit Over-ride Not Depressed

Frequency (MHz)	Output Power (Uncorrect) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)
156.375 (CH 67)	-0.31	30.16	29.85	0.966
156.650 (CH 13)	-0.30	30.16	29.86	0.968
156.775 (CH 75)	-0.31	30.17	29.86	0.968
156.825 (CH 76)	-0.29	3.18	29.89	0.975

Inhibit Over-ride Depressed

Frequency (MHz)	Output Power (Uncorrect) (dBm)	Path Loss (dB)	Result (dBm)	Result (W)	Inhibit Override Operates (Y/N)
156.375 (CH 67)	13.57	30.16	43.73	23.61	Y
156.650 (CH 13)	13.58	30.16	43.74	23.666	Y
156.775 (CH 75)	-0.31	30.17	29.86	0.968	N
156.825 (CH 76)	-0.29	3.18	29.89	0.975	N

Frequency (MHz)	Inhibit Over-ride Not Depressed	Inhibit Over-ride Depressed	Inhibit Override Operates (Y/N)
	Limit	Limit	
156.375 (CH 67)	≤1W or <+30dBm	≤25W or <+43.98dBm	Y
156.650 (CH 13)	≤1W or <+30dBm	≤25W or <+43.98dBm	Y
156.775 (CH 75)	≤1W or <+30dBm	≤25W or <+43.98dBm	N
156.825 (CH 76)	≤1W or <+30dBm	≤25W or <+43.98dBm	N

2.17 SUPPRESSION OF INTERFERENCE ABOARD SHIPS

2.17.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.217 (b)

2.17.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.17.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

2.17.4 Test Equipment Used

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

2.17.5 Test Procedure

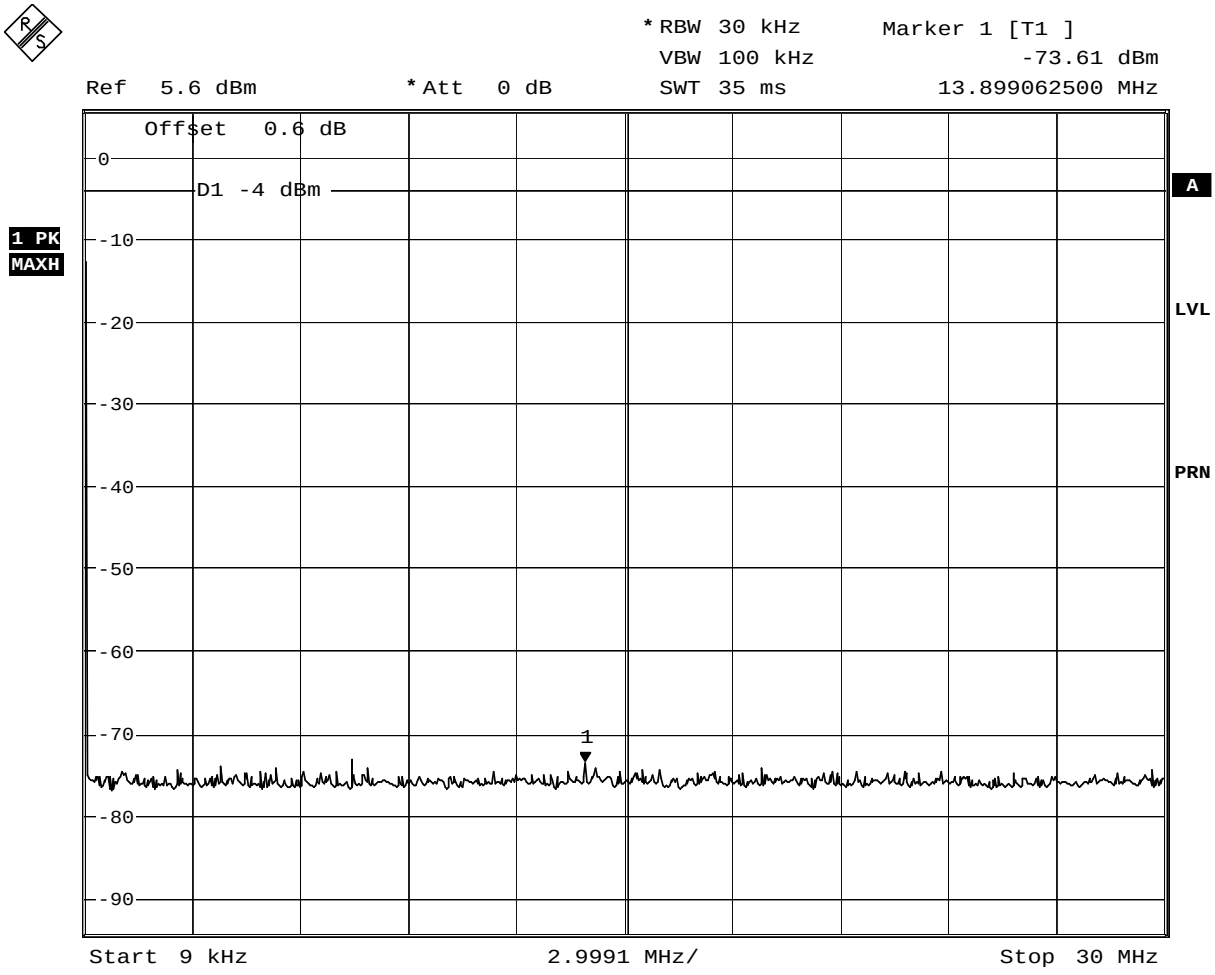
The EUT was connected to a spectrum Analyser via a cable. The EUT was set to its receive mode. The cable worst case cable loss was entered into the spectrum analyser as a reference level offset. The emissions were measured over the frequency range 9kHz to 1.7GHz with the Spectrum Analyser trace set to Max Hold.

2.17.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	54%

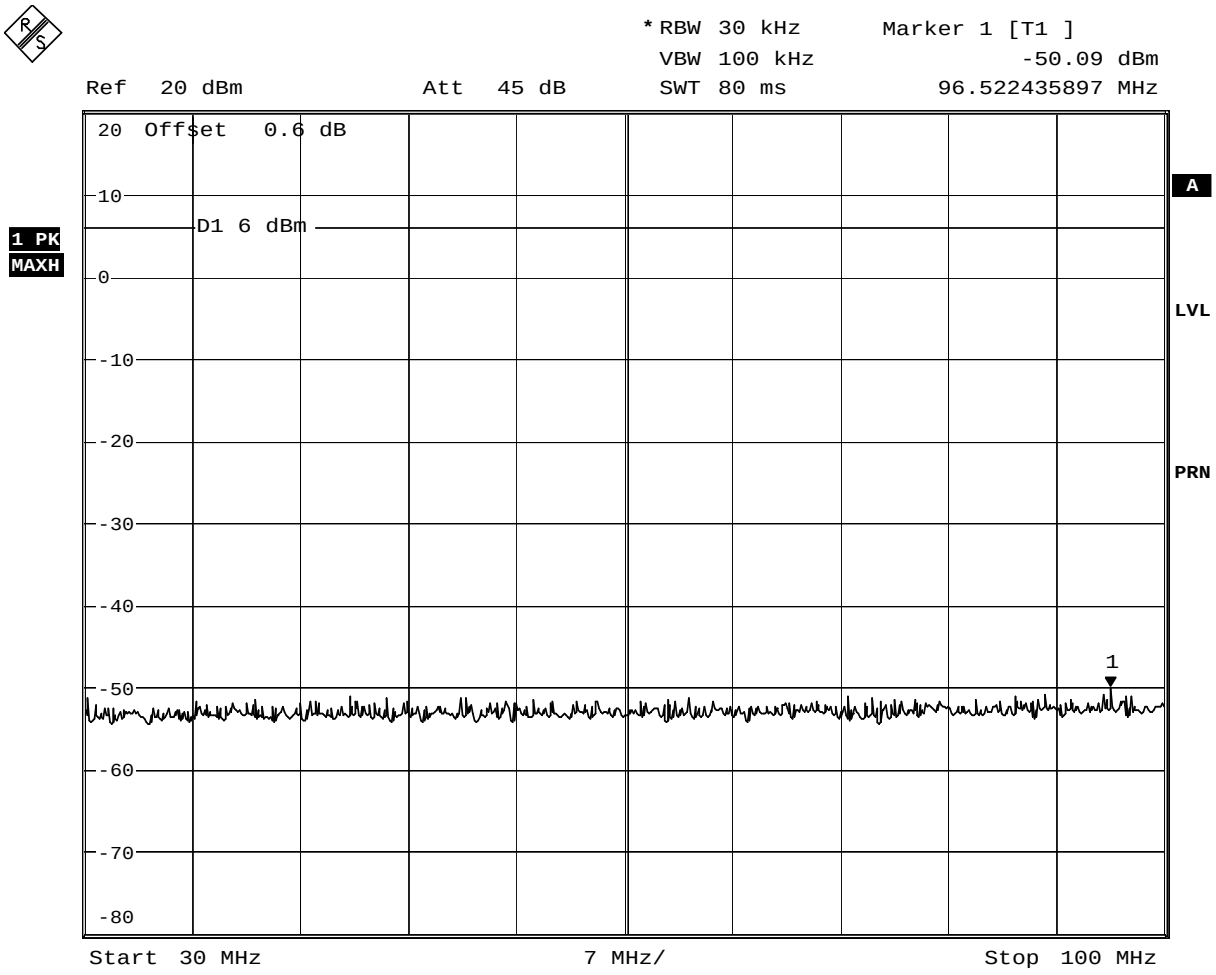
2.17.7 Test Results

9kHz – 30MHz



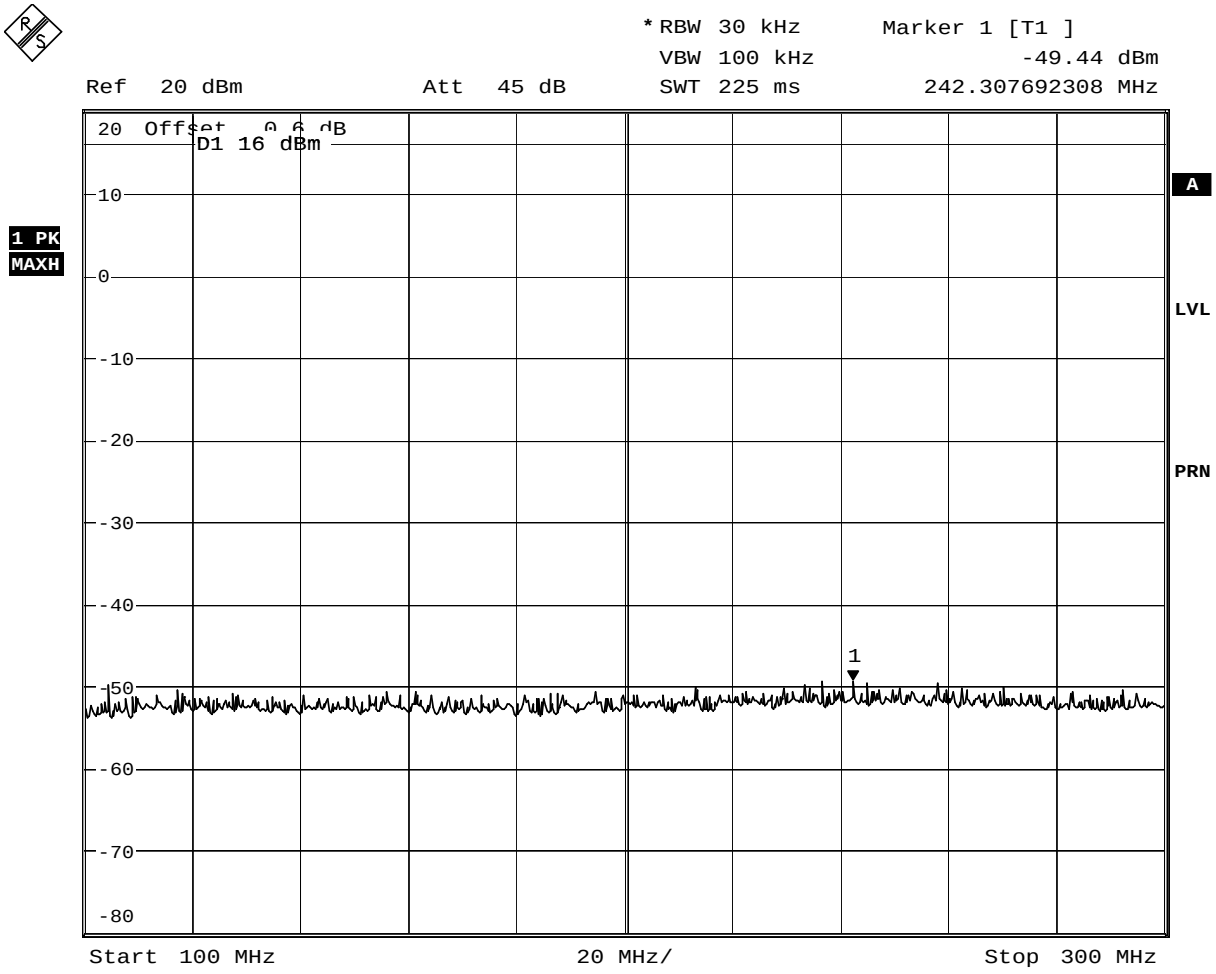
Date: 23.AUG.2007 15:05:22

30MHz – 100MHz



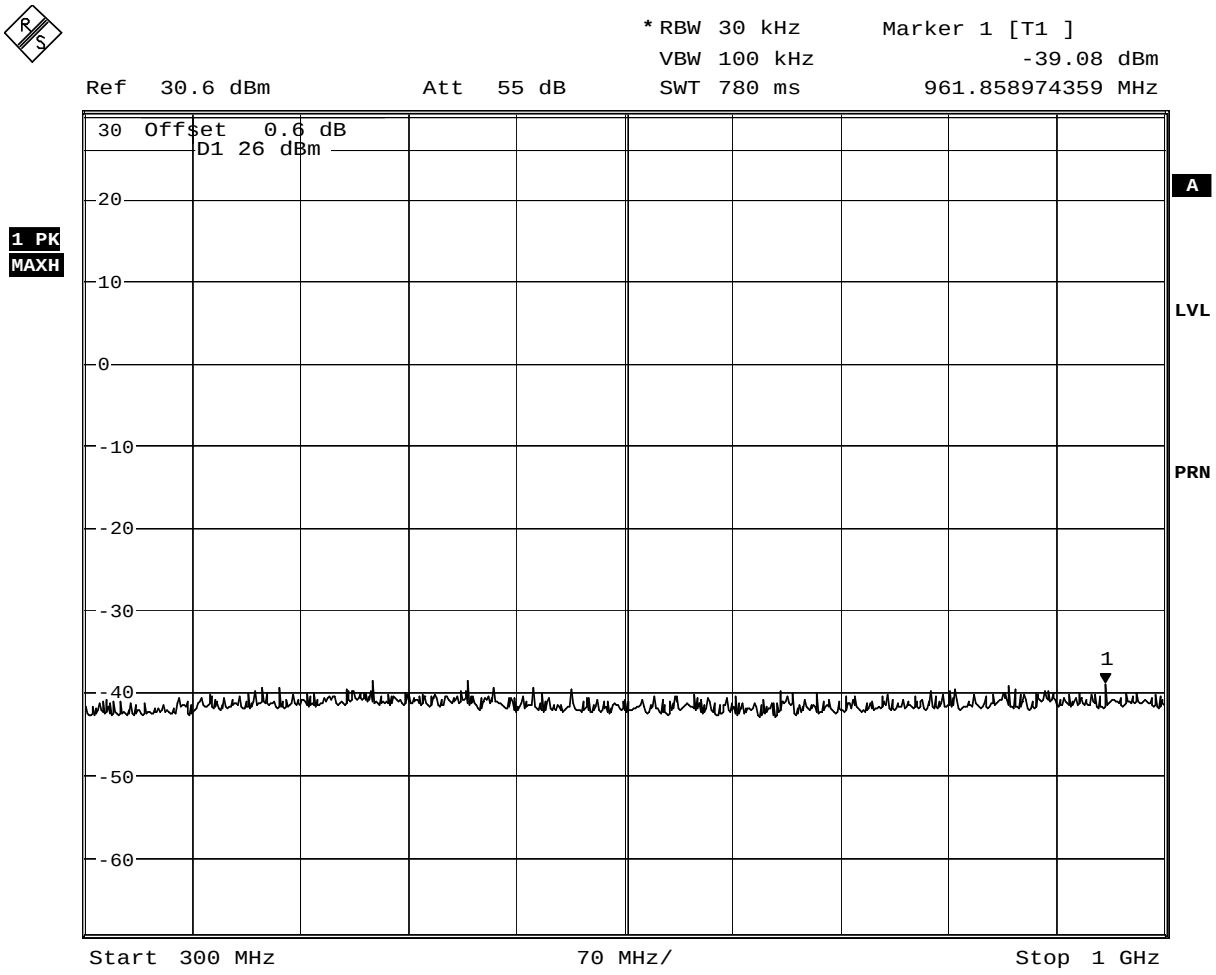
Date: 23.AUG.2007 15:06:39

100MHz – 300MHz



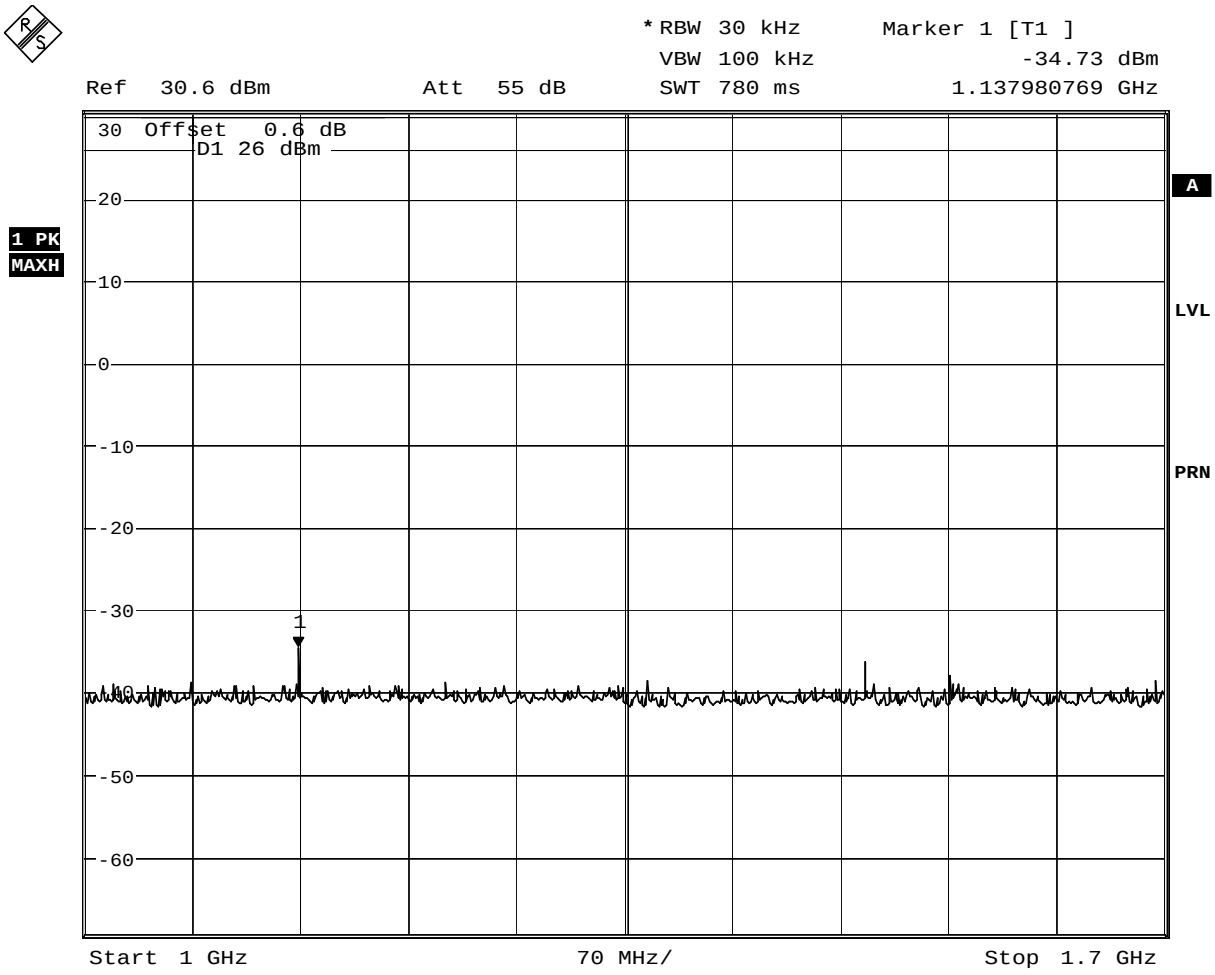
Date: 23.AUG.2007 15:07:36

300MHz – 1000MHz



Date: 23.AUG.2007 15:08:43

1000MHz – 1700MHz



Date: 23.AUG.2007 15:09:50

2.18 FM PRE-EMPHASIS

2.18.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.225 (b)

2.18.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.18.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

2.18.4 Test Equipment Used

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

2.18.5 Test Procedure

The EUT was connected to a modulation analyser via a 30dB attenuator. A 1kHz tone was generated using a Audio Analyser and input to the EUT via the supplied test box. The amplitude of the 1kHz tone was adjusted to give a deviation of 1kHz. A reference point was established by using the 'ratio' function of the Modulation Analyser. The audio frequency was then adjusted between 300Hz and 3kHz and the differential to 1kHz recorded.

A graph has been produced to accompany the table of results.

2.18.6 Environmental Conditions

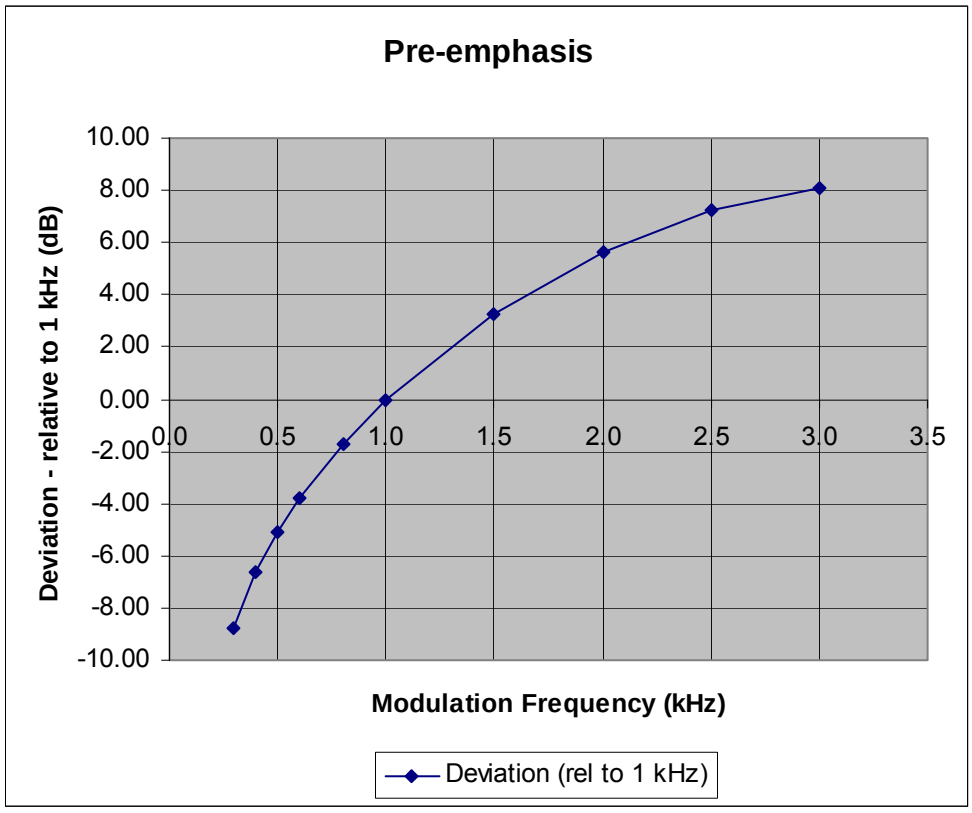
Ambient Temperature	19°C
Relative Humidity	57%

2.18.7 Test Results

Power level at which the measurment was carried out 25W

12V DC Supply

MODULATION FREQUENCY (Hz)	DEVIATION (relative to 1kHz) dB
	CH 16
100	-8.78
200	-6.63
300	-5.13
400	-3.82
500	-1.71
1000	0
1500	+3.27
2000	+5.60
2500	+7.23
3000	+8.10
Measurement uncertainty (Hz)	± 85



2.19 MODULATION RATE FOR DSC

2.19.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.225

2.19.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.19.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

2.19.4 Test Equipment Used

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

2.19.5 Test Procedure

The EUT was connected to a modulation analyser via a 30dB attenuator. The EUT was set to transmit a dotting pattern. The demodulation audio was fed to a modem and the modulation rate was measured using a frequency counter.

2.19.6 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	53%

2.19.7 Test Results

Channel Frequency – CH70

		MODULATION RATE (Hz)
T_{nom}(21°C)	V_{nom}(12V DC)	600.031
Measurement uncertainty (Hz)		± 46

LIMIT

The frequency shall be 600Hz ± 30ppm corresponding to a modulation rate of 1200 baud

2.20 MODULATION INDEX FOR DSC

2.20.1 Specification Reference

FCC CFR 47 Part 80: 2006 Clause 80.225

2.20.2 Equipment Under Test

GX600D Fixed Mount VHF (with Class D DSC), 70701512

2.20.3 Date of Test and Modification State

23rd August 2007 - Modification State 0

2.20.4 Test Equipment Used

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

2.20.5 Test Procedure

The EUT was connected to a modulation analyser via a 30dB attenuator. The EUT was set to transmit a continuous B and then a continuous Y state. Both states were measured and the Modulation Index calculated and recorded.

2.20.6 Environmental Conditions

Ambient Temperature	20°C
Relative Humidity	58%

2.20.7 Test Results

Channel Frequency – CH70

		MODULATION RATE (Hz)	
T_{nom}(20°C)	V_{nom}(12V DC)	B State	Y State
		1.98	2.04
Measurement uncertainty (Hz)		± 46	

LIMIT

The modulation index shall be 2.0, ± 10%

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 Number	Calibration Due
Section 2.17 Radio (Rx) - Suppression of Interference Aboard Ships				
Multimeter	Fluke	79-3	611	31-May-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Section 2.18 Radio (Tx) - Audio Frequency Response				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.9 and 2.10 Radio (Tx) - Conducted Spurious Emissions				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Filter (Hi Pass)	Mini-Circuits	NHP-600	2834	24-Oct-2007
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Attenuator (dc - 18GHz)	Suhner	6810.17.B	2966	23-Feb-2008
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	11-Jul-2008
Section 2.4 Radio (Tx) - DSC - Frequency Error				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Section 2.20 Radio (Tx) - DSC - Modulation Index				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Section 2.19 Radio (Tx) - DSC - Modulation Rate				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
DSC Decoder/Encoder	TUV	DSC TPOO1	81	TU
Counter	Hewlett Packard	53181A	159	17-Sep-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Sections 2.5 and 2.6 Radio (Tx) - Emission Mask				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.2 and 2.3 Radio (Tx) - Frequency Characteristics				
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Counter	Hewlett Packard	53181A	159	17-Sep-2007
Multimeter	Fluke	79-3	611	31-May-2008
Digital Temperature Indicator	Fluke	51	1385	16-Aug-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Climatic Chamber	TAS	Micro 225	2892	15-Feb-2008
Section 2.13 Radio (Tx) - Modulation Characteristics				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Section 2.7 and 2.8 Radio (Tx) - Occupied Bandwidth				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Multimeter	Fluke	79-3	611	31-May-2008
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	24-Jul-2008
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008

Instrument	Manufacturer	Type No	TE Number	Calibration Due
Sections 2.14, 2.15 and 2.16 Radio (Tx) - Power Characteristics				
Modulation Analyser	Hewlett Packard	8901B	45	4-Jul-2008
Attenuator (30dB/ 50W)	Bird	8321	46	15-Nov-2007
Power Meter	Hewlett Packard	436A	47	9-Jul-2008
Signal Generator	Rohde & Schwarz	SMY01	118	26-Jun-2008
Sensor	Hewlett Packard	11722A	493	27-Jul-2008
Attenuator (30dB, 50W)	Bird	8321	494	7-Dec-2007
Multimeter	Fluke	79-3	611	31-May-2008
Sensor Module	Hewlett Packard	11722A	1333	21-Nov-2007
Audio Analyser	Hewlett Packard	8903B	1350	12-Jul-2008
Power Supply Unit	Farnell	TSV-70	2043	O/P Mon
Cable (2m, N(m) - N(m))	Reynolds	269-0088-2000	2410	TU
Hygrometer	Rotronic	I-1000	2891	6-Jan-2008
Power Sensor	Agilent	8482A	3289	15-Nov-2007
Modulation Analyser	Hewlett Packard	8901B	3292	20-Nov-2007
Sections 2.1, 2.11 and 2.12 EMC - Radiated Emissions				
Antenna (Bilog)	Schaffner	CBL6143	287	13-Jan-2008
Test Receiver	Rohde & Schwarz	ESIB40	1006	21-Apr-2008
Mast Controller	Inn-Co GmbH	CO 1000	1606	TU
Turntable/Mast Controller	EMCO	2090	1607	TU
Signal Generator	Marconi	2031	2015	18-Nov-2007
Antenna (Bilog)	Chase	CBL6143	2904	10-Nov-2007

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

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Frequency Stability Under Voltage Variations		± 47Hz
Frequency Stability Under Temperature Variations		± 47Hz
Frequency Stability DSC Emissions		± 47Hz
Emission Limitations (Emission Mask)		± 1.11dB
Emission Limitations DSC (Emission Mask)		± 1.11dB
Occupied Bandwidth		± 360Hz
DSC Occupied Bandwidth		± 360Hz
Emission Limitations (Conducted Transmitter Spurious)		± 2.41dB
Emission Limitations DSC (Conducted Transmitter Spurious)		± 2.41dB
Emission Limitations (Radiated Transmitter / Receiver Spurious)	30MHz to 1GHz Amplitude	± 5.1dB
	1GHz to 40GHz Amplitude	6.3dB*
Modulation Characteristics		± 1.73%
Transmitter Power		± 0.7dB
Transmitter Power DSC		± 0.7dB
Transmitter High Power Inhibit		-
Suppression of Interference Aboard Ships		± 2.41dB

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

*In accordance with CISPR 16-4
†In accordance with UKAS Lab 34

Product Service

SECTION 4

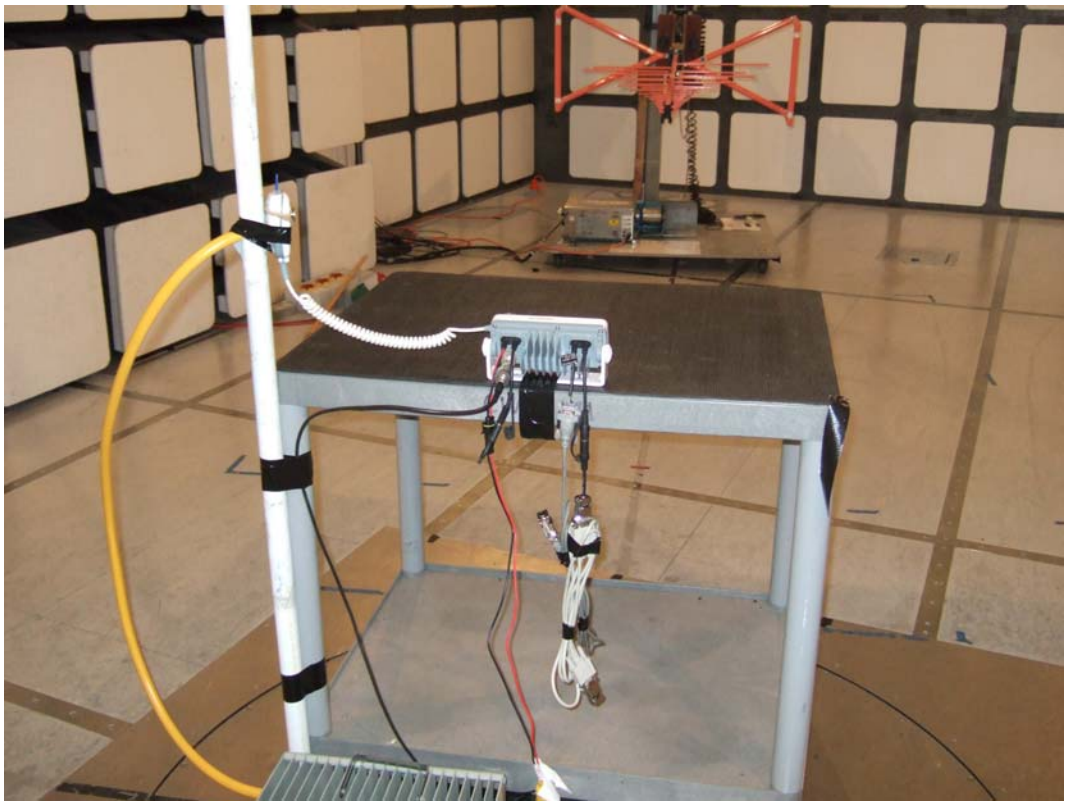
PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Photograph of Front of EUT

Photograph of Rear of EUT

4.2 PHOTOGRAPHS OF TEST SETUP



Photograph of Radiated Emissions Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 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).