

## Laboratory Test Report

For the

TPCC0A Handportable Transceiver

Tested In accordance with

FCC 47 CFR Parts 80, 90, and 90T.

Report Revision: 1  
Issue Date: 4-July-2008  
FCC ID: CASTPCC0A

PREPARED BY: Garry Pringle \_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: Steve Crompton \_\_\_\_\_  
Laboratory Manager



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

This document must not be reproduced except in full, without the written permission of the Compliance Laboratory Manager.

## TABLE OF CONTENTS

<b>REVISION HISTORY .....</b>	<b>3</b>
<b>INTRODUCTION .....</b>	<b>4</b>
<b>REPORT PREPARED FOR .....</b>	<b>4</b>
<b>DESCRIPTION OF SAMPLE .....</b>	<b>4</b>
<b>STATEMENT OF COMPLIANCE .....</b>	<b>4</b>
<b>TEST CONDITIONS .....</b>	<b>4</b>
<b>MODULATION TYPES AND EMISSION DESIGNATORS .....</b>	<b>5</b>
<b>TEST RESULTS .....</b>	<b>6</b>
TRANSMITTER OUTPUT POWER (CONDUCTED) .....	6
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS .....	7
TRANSMITTER MODULATION LIMITING .....	10
OCCUPIED BANDWIDTH .....	13
ANALOGUE VOICE .....	14
FFSK .....	20
SPURIOUS EMISSIONS (CONDUCTED) .....	26
SPURIOUS EMISSIONS (RADIATED) .....	29
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE) .....	32
TRANSMITTER FREQUENCY STABILITY (VOLTAGE) .....	35
TEST EQUIPMENT USED .....	36
<b>ANNEX A .....</b>	<b>37</b>
TEST SETUP DETAILS .....	37

## REVISION HISTORY

Date	Revision	Comments
4-July-2008	1	Initial test report

## INTRODUCTION

Type Approval Testing of the  
T03-00003-GAAA  
Serial No 25036137  
174 → 225 MHz

in accordance with:

**FCC 47 CFR Parts 80, 90, and 90T**

## REPORT PREPARED FOR

Tait Electronics Ltd  
PO Box 1645  
558 Wairakei Rd  
Christchurch  
New Zealand

## DESCRIPTION OF SAMPLE

Equipment:	Handportable Transceiver
Type:	TPCC0A
Product code:	T03-00003-GAAA
Serial Numbers:	25036137
Quantity:	1
Hardware	0101
Firmware	01.03.00
Boot Code	QPC1B_std_1.00.00.0000
Radio Application	QPC1C_std_1.03.00.0003

## STATEMENT OF COMPLIANCE

The T03-00003-GAAA Handportable transceiver as tested in this report was found to conform to the following standards:

**FCC 47 CFR Parts 80, 90, and 90T**

## TEST CONDITIONS

All testing was performed at the following conditions.

Ambient Temperature	15°C → 30°C
Relative Humidity	20% → 75%
Standard Test Voltage	7.5 V <sub>DC</sub>

## MODULATION TYPES AND EMISSION DESIGNATORS

### **Modulation Types:**

F3E	Analogue FM
F2D	FFSK Data ( 1200 bps )

### **Channel Spacings:**

12.5 kHz,  
25.0 kHz

### **Emission Designators:**

Analogue FM	11k0F3E, 16k0F3E
-------------	------------------

FFSK Data 1200bps	6k60F2D, 9k60F2D
-------------------	------------------

## TEST RESULTS

### TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603C 2.2.1

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment set up.
2. The coaxial attenuator has an impedance of 50 Ohms.
3. The unmodulated output power was measured with an RF Power meter.

**MEASUREMENT RESULTS:**

FCC 47 CFR 80.215

Manufacturer's Rated Output Power: Switchable: 5 W and 1 W

217.1 MHz	5 W nominal	1 W nominal
POWER (W)	5.0	0.98
Variation from Nominal (%)	0.0	-2.0
Measurement Uncertainty	± 0.6 dB	

FCC 47 CFR 90.729

Manufacturer's Rated Output Power: Switchable: 5 W and 1 W

221.975 MHz	5 W nominal	1 W nominal
POWER (W)	5.0	0.98
Variation from Nominal (%)	0.0	-2.0
Measurement Uncertainty	± 0.6 dB	

LIMIT CLAUSE: FCC 47 CFR 90.205 (r)

Radio Type: Handportable Transceiver

Frequency Band: 216 MHz ~ 222 MHz

The output power shall not exceed by more than 20% the manufacturer's rated output power for the particular transmitter.

**TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS**

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603C 2.2.6

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000Hz was measured.

**MEASUREMENT RESULTS:**

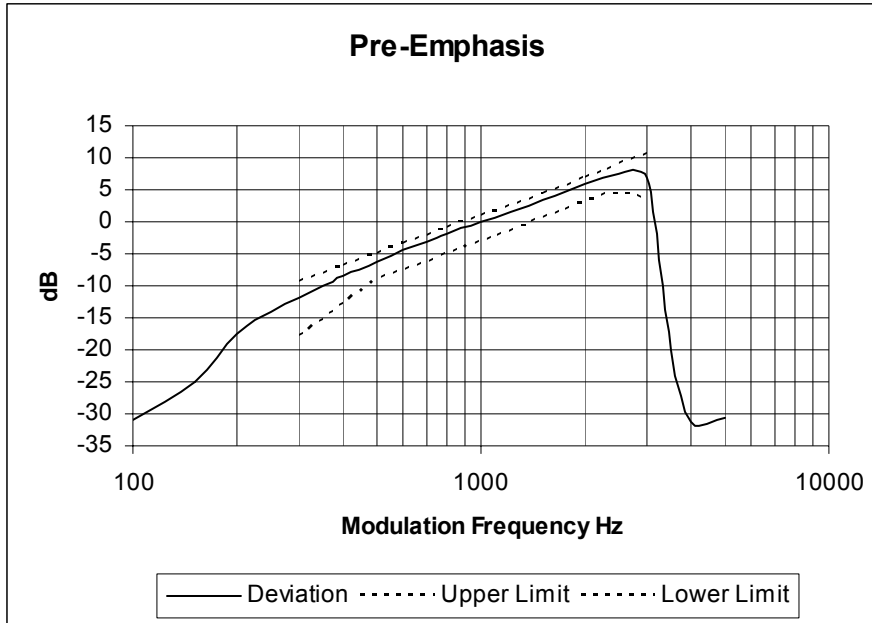
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

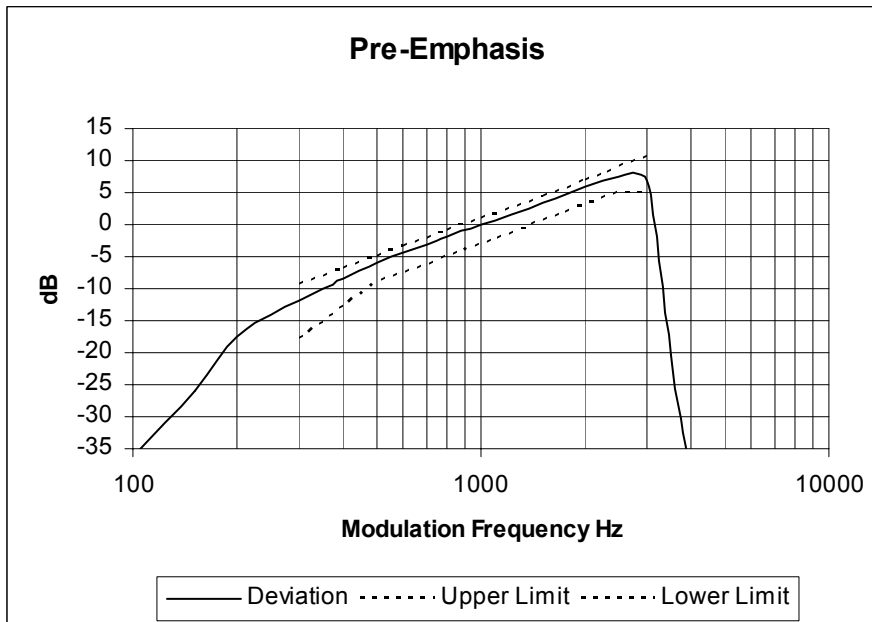
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 217.1 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 217.1 MHz 25.0 kHz Channel Spacing

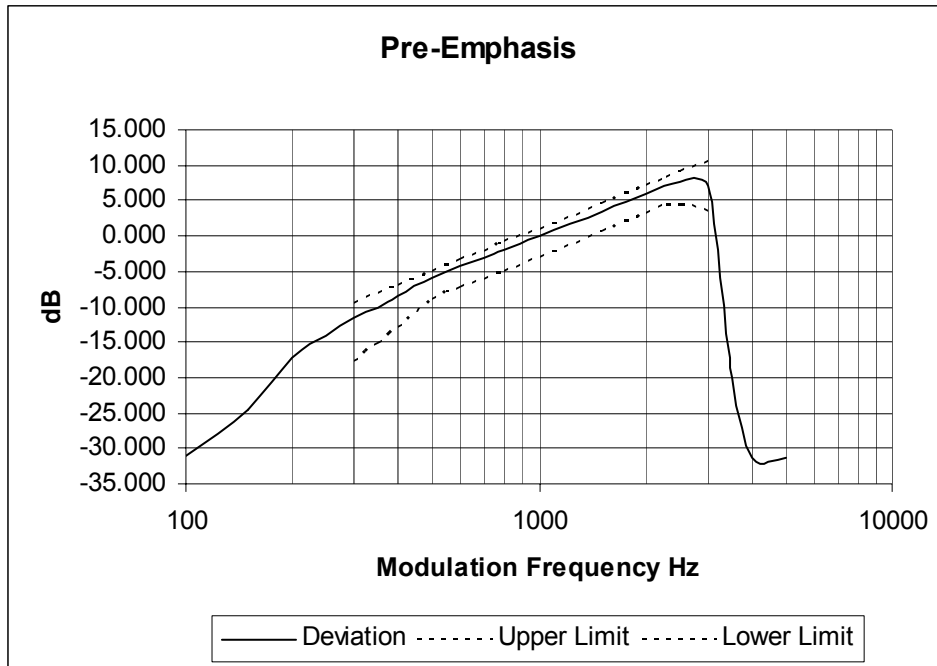




TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 221.975 MHz 12.5 kHz Channel Spacing



## TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

### MEASUREMENT PROCEDURE:

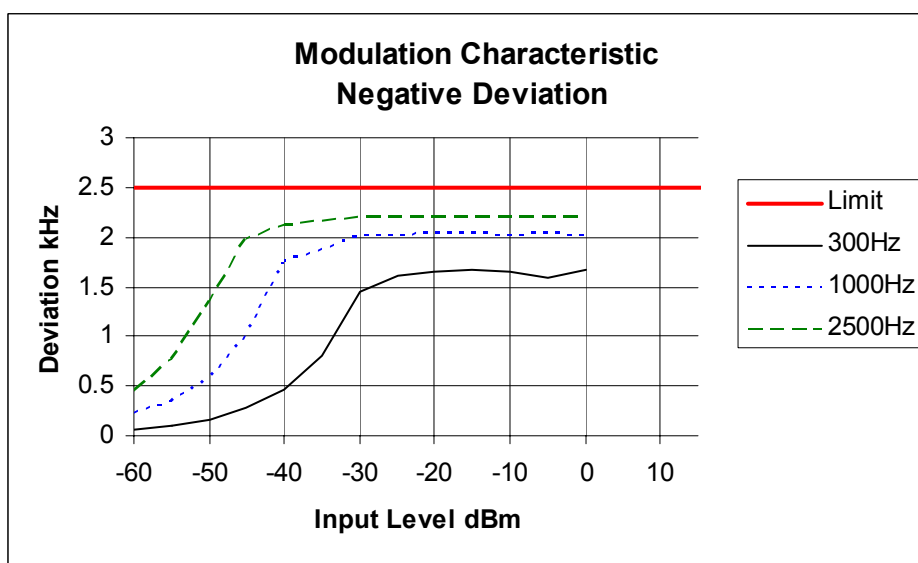
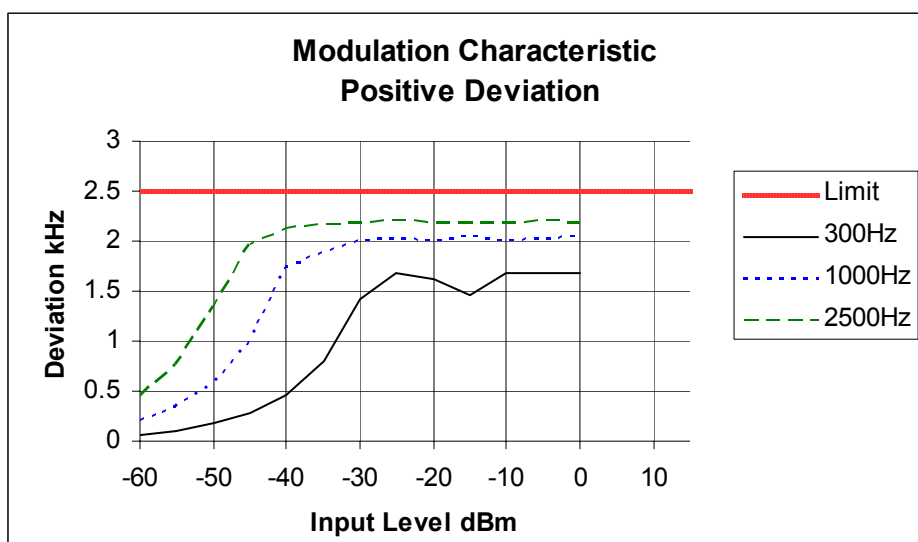
1. Refer Annex A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

### MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 1.3.4.4

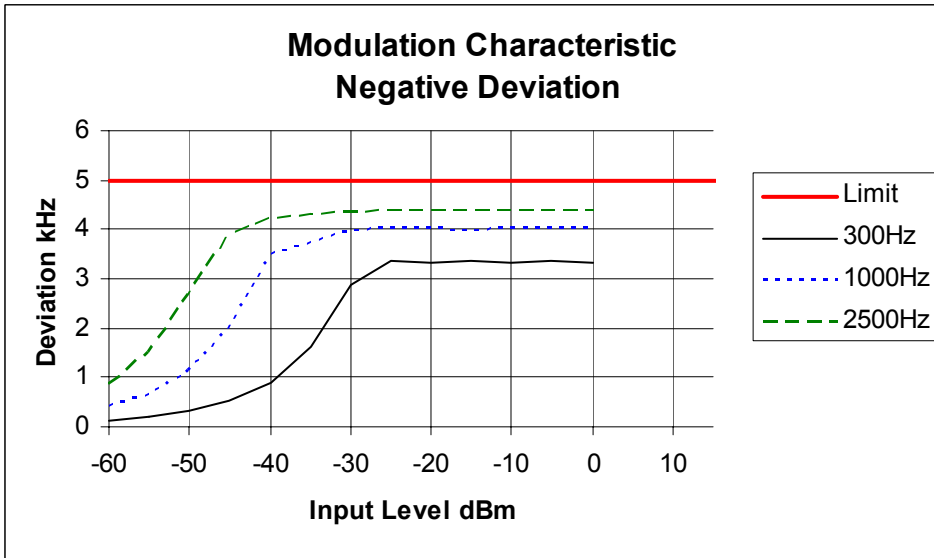
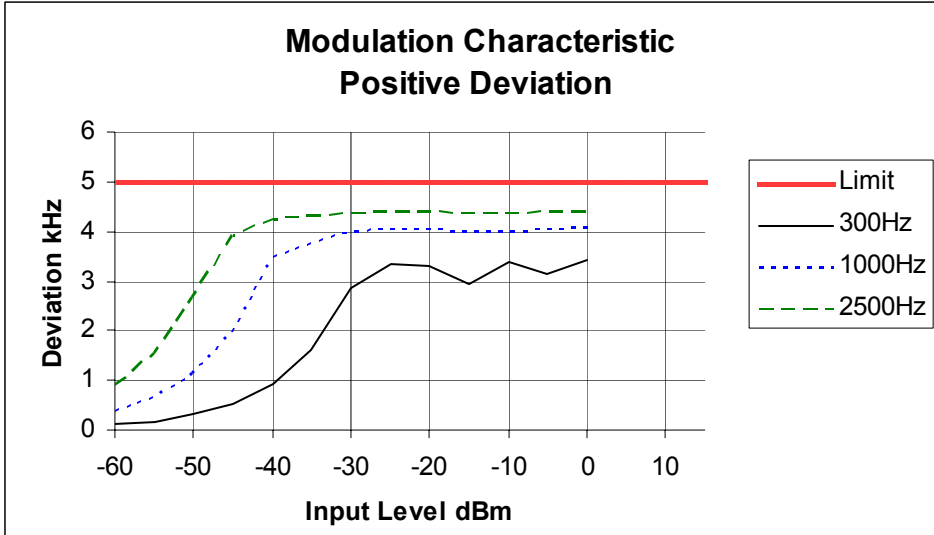
Tx FREQUENCY: 217.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

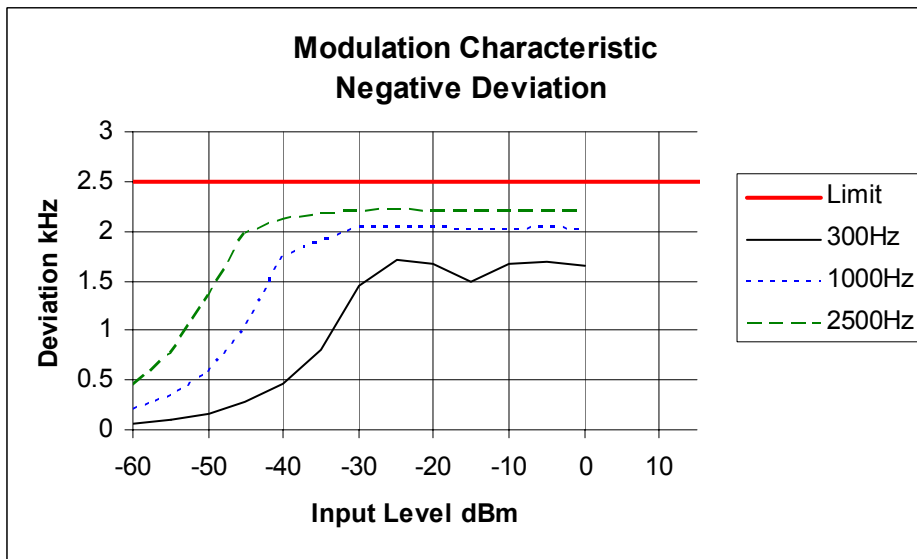
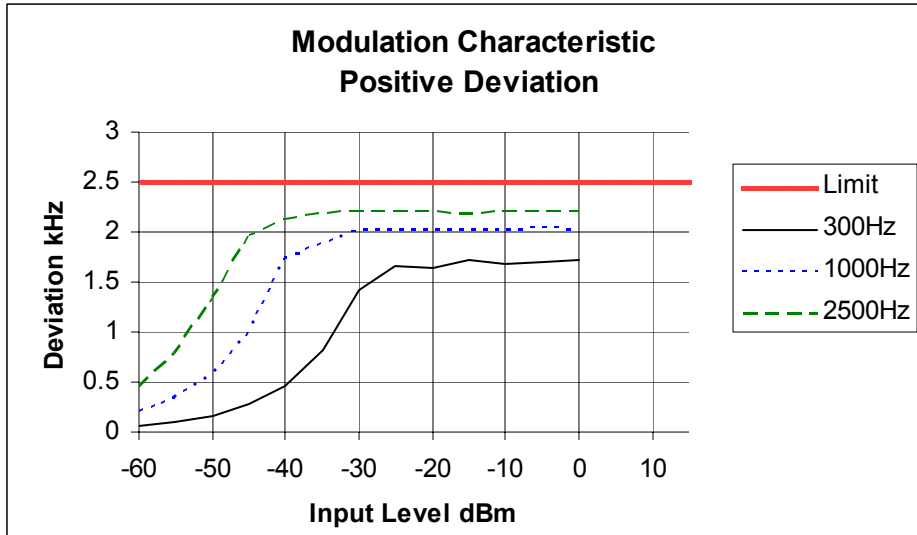
Tx FREQUENCY: 217.1 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 221.975 MHz 12.5 kHz Channel Spacing



**OCCUPIED BANDWIDTH**

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603C 2.2.11

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for Equipment Set up.
2. For analogue measurements: The EUT was modulated by a 2500Hz tone at an input level 16dB above a level that produced 50% deviation. The input level was established at the frequency of maximum response of the audio modulating circuit.  
For Data measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask D                    – Resolution Bandwidth = 100Hz, Video Bandwidth = 1 kHz  
Emission Mask B, and Fx5        – Resolution bandwidth = 300Hz, Video Bandwidth = 3 kHz

**MEASUREMENT RESULTS:**

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE:                    FCC 47 CFR 80.211 (f)  
  FCC 47 CFR 80.481  
  FCC 47 CFR 90.210  
  FCC 47 CFR 90.733 (d), (e)

**EMISSION MASKS**

Emission Mask D	12.5 kHz Channel Spacing	Analogue; FFSK
Emission Mask B	25.0 kHz Channel Spacing	Analog;
Emission Mask Fx5	12.5 kHz Channel Spacing	Analogue; FFSK

**DATA SPEED**

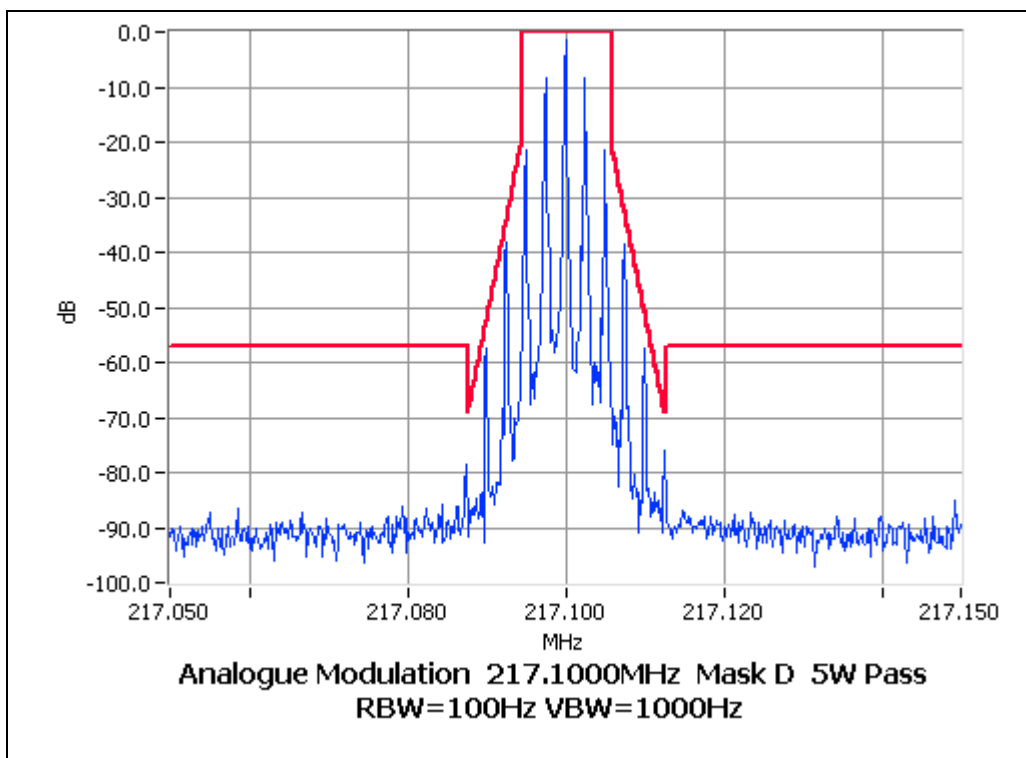
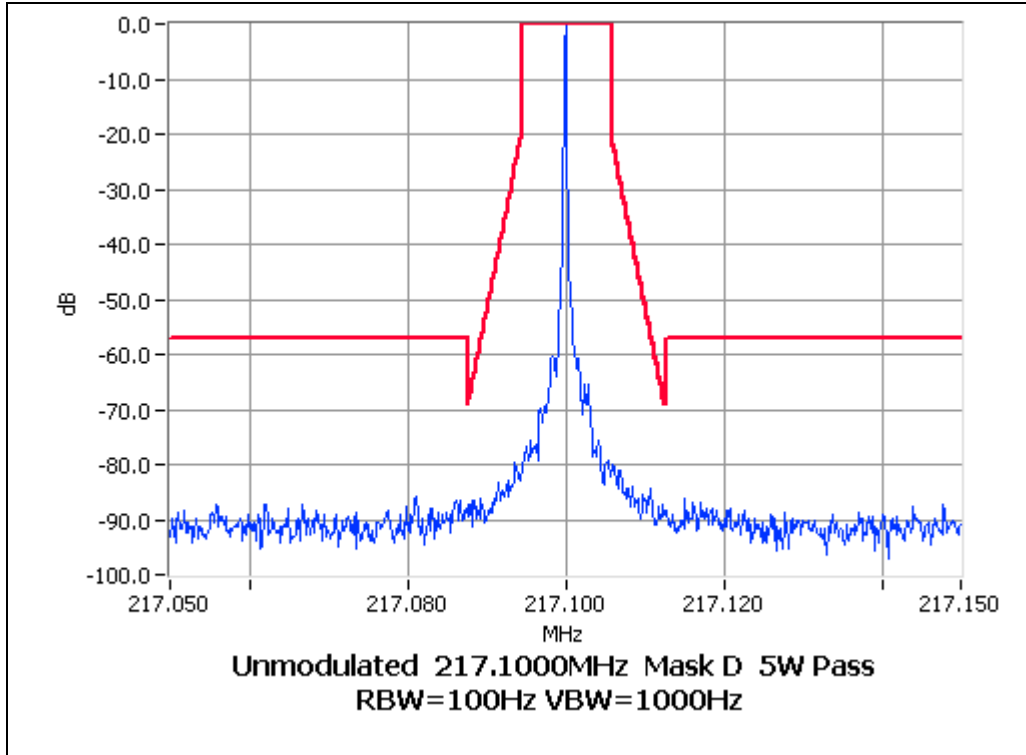
FFSK	12.5 kHz Channel Spacing	1200 bps
FFSK	25.0 kHz Channel Spacing	1200 bps

OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 5 W 12.5 kHz Channel Spacing

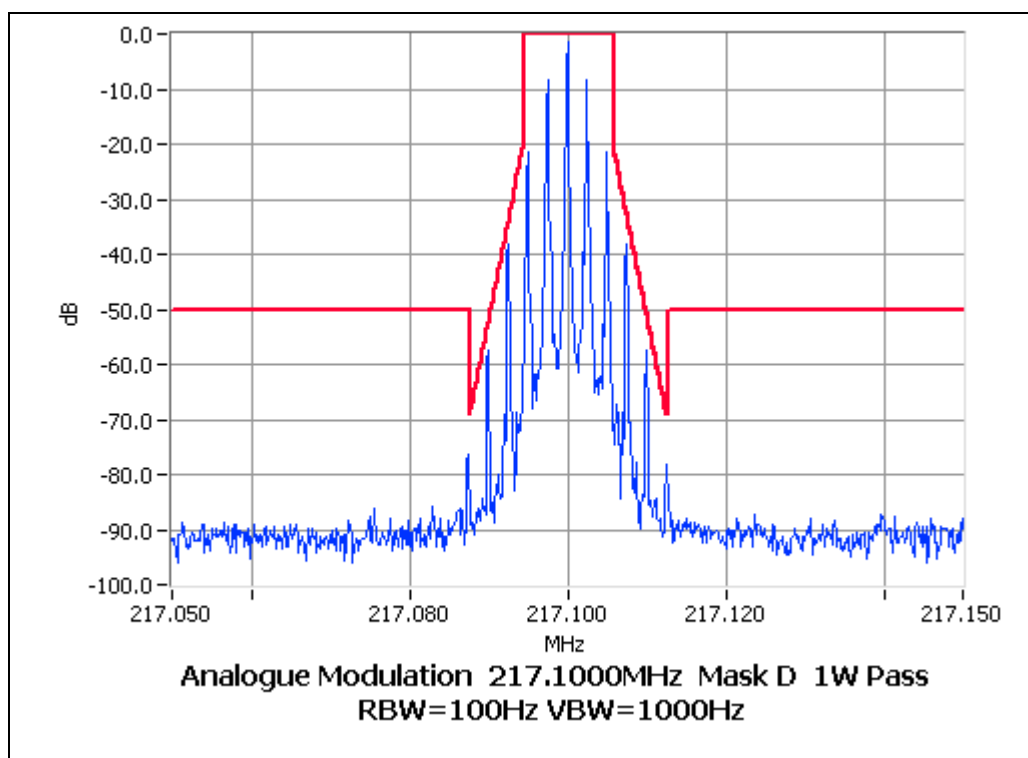
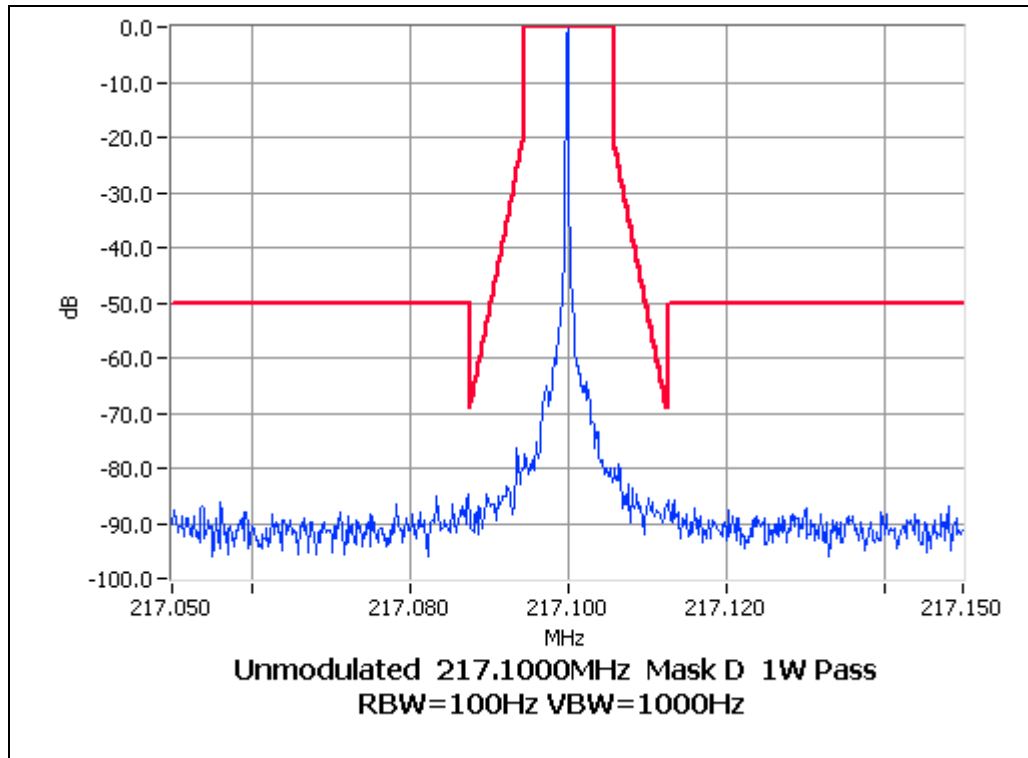


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing

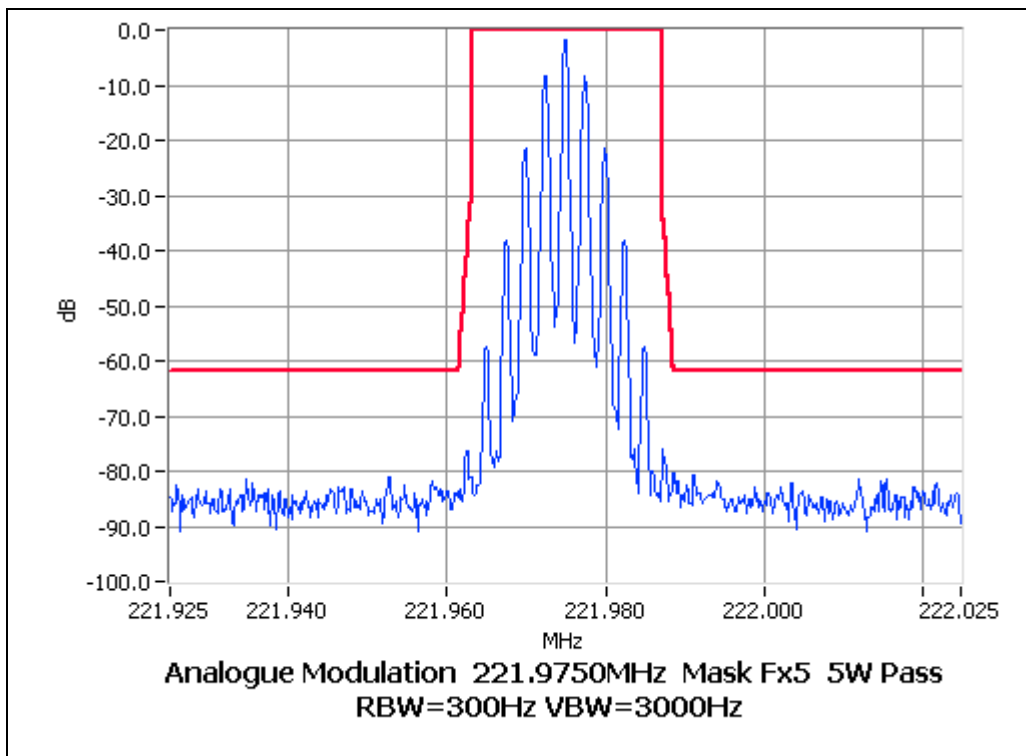
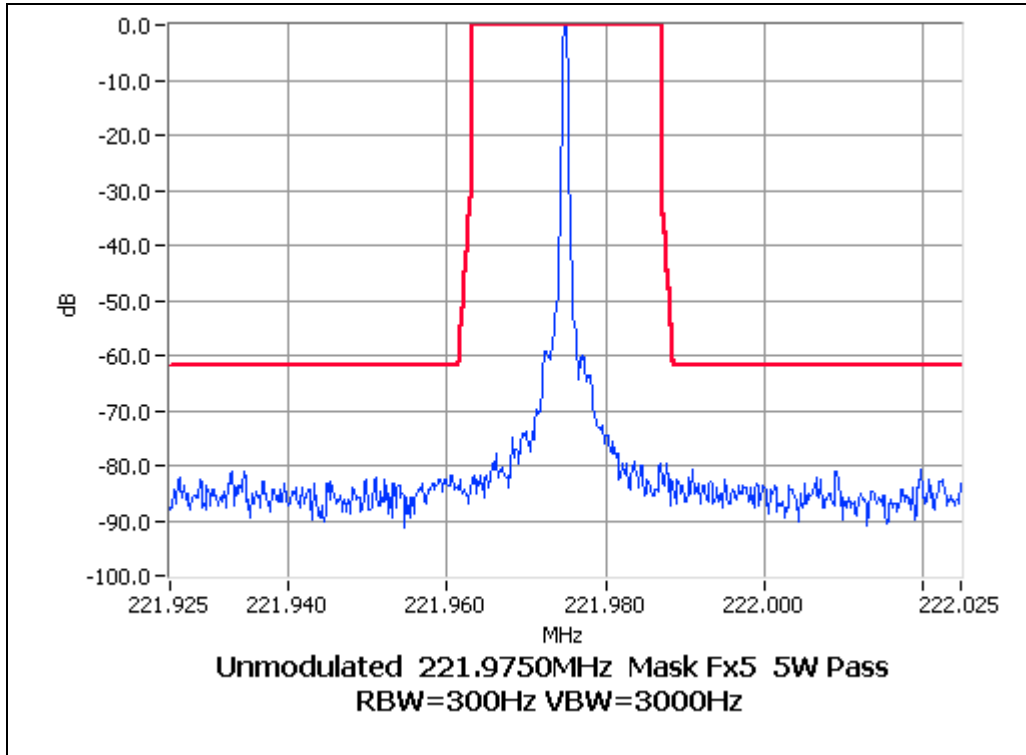


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 221.975 MHz 5 W 12.5 kHz Channel Spacing



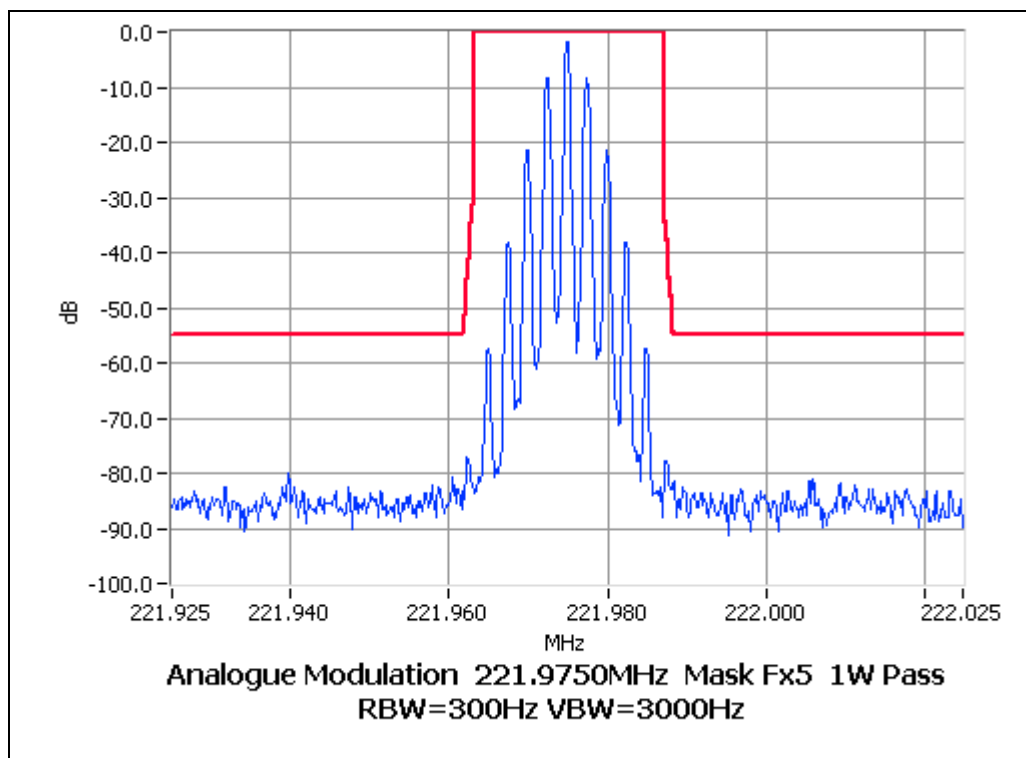
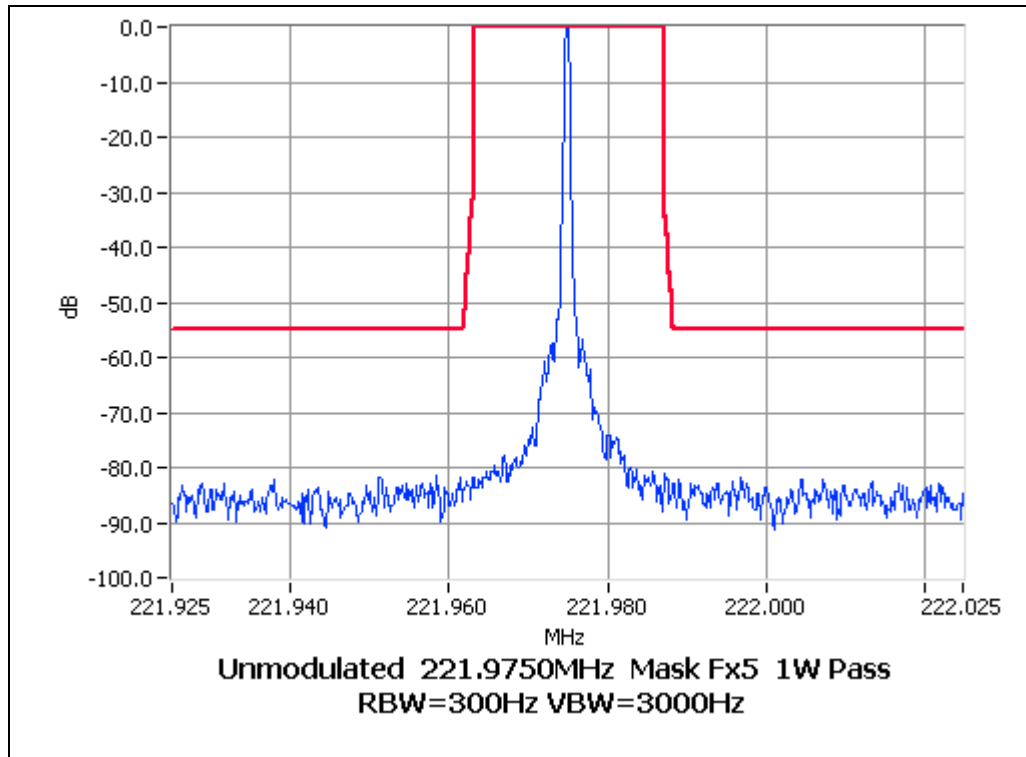


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing

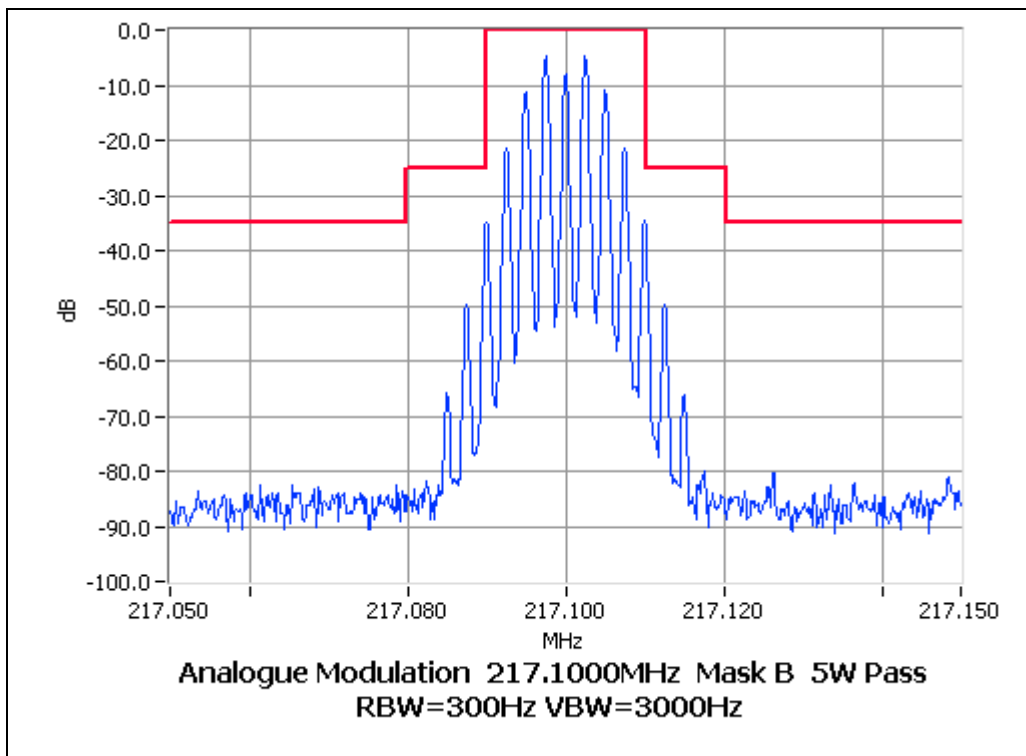
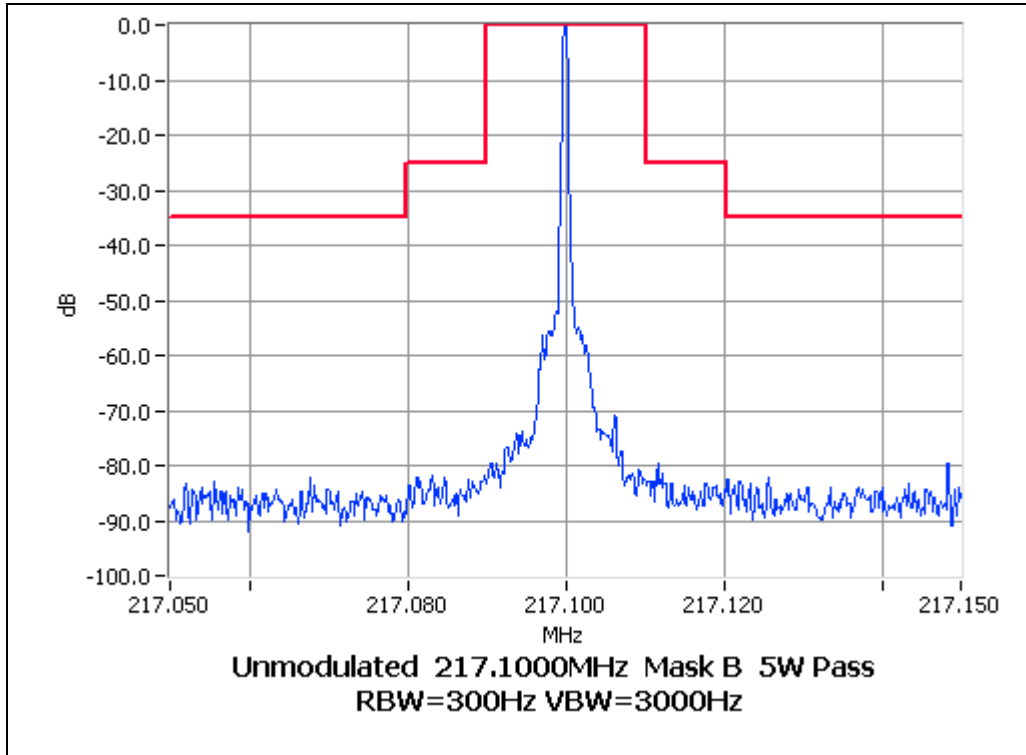


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 5 W 25.0 kHz Channel Spacing

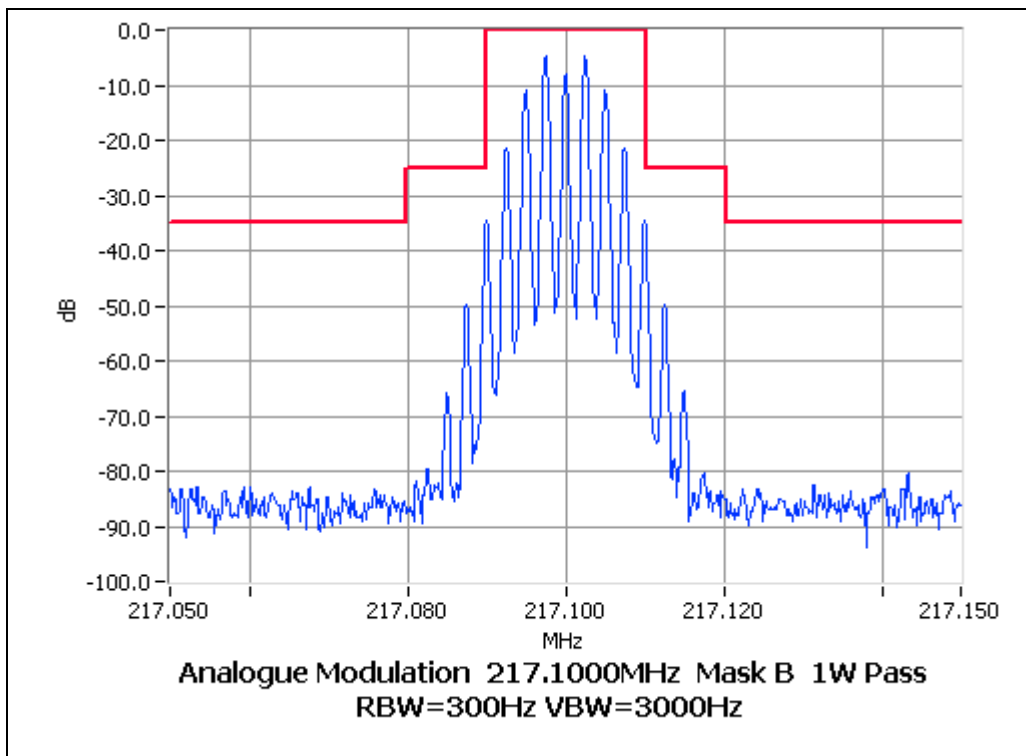
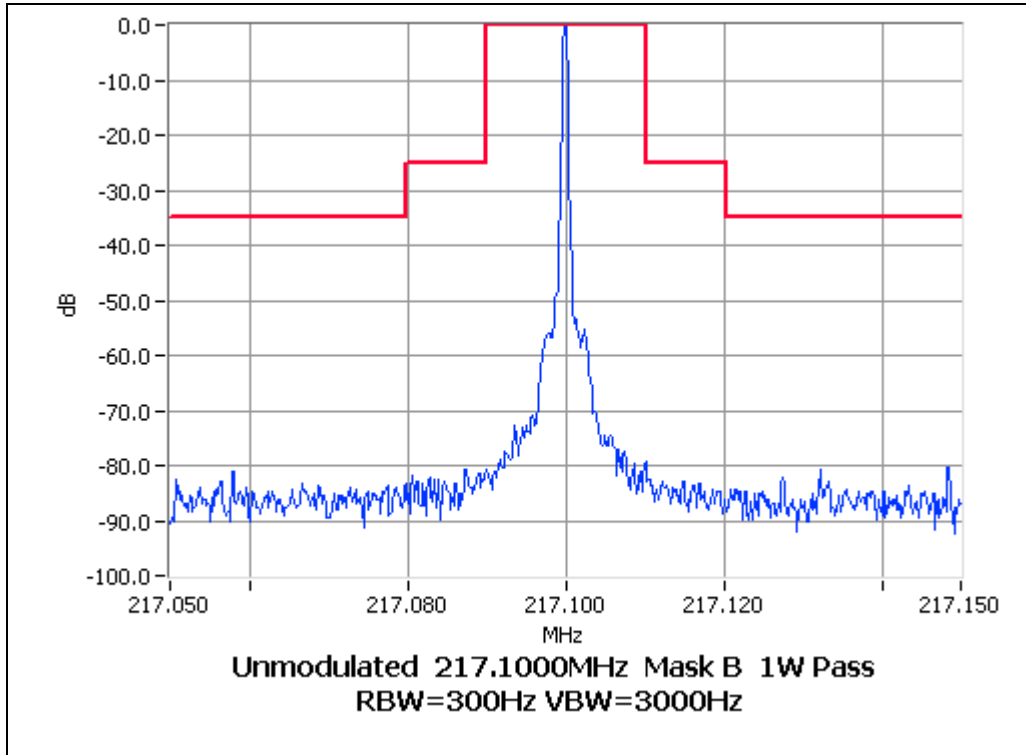


OCCUPIED BANDWIDTH

ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 1 W 25.0 kHz Channel Spacing

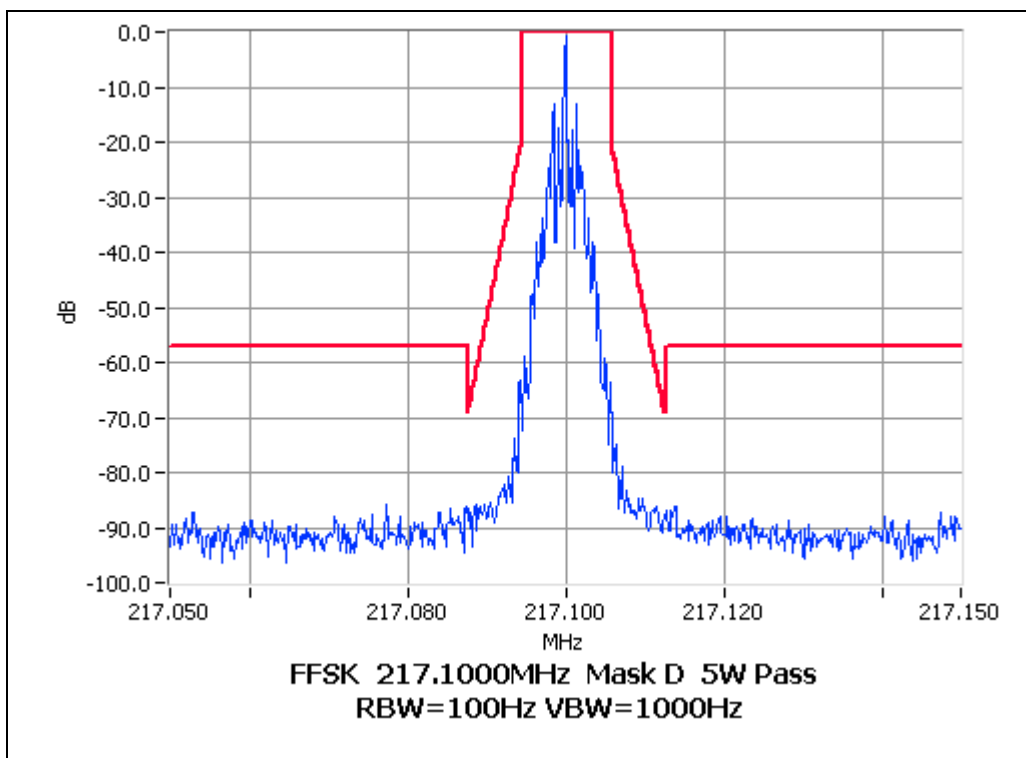
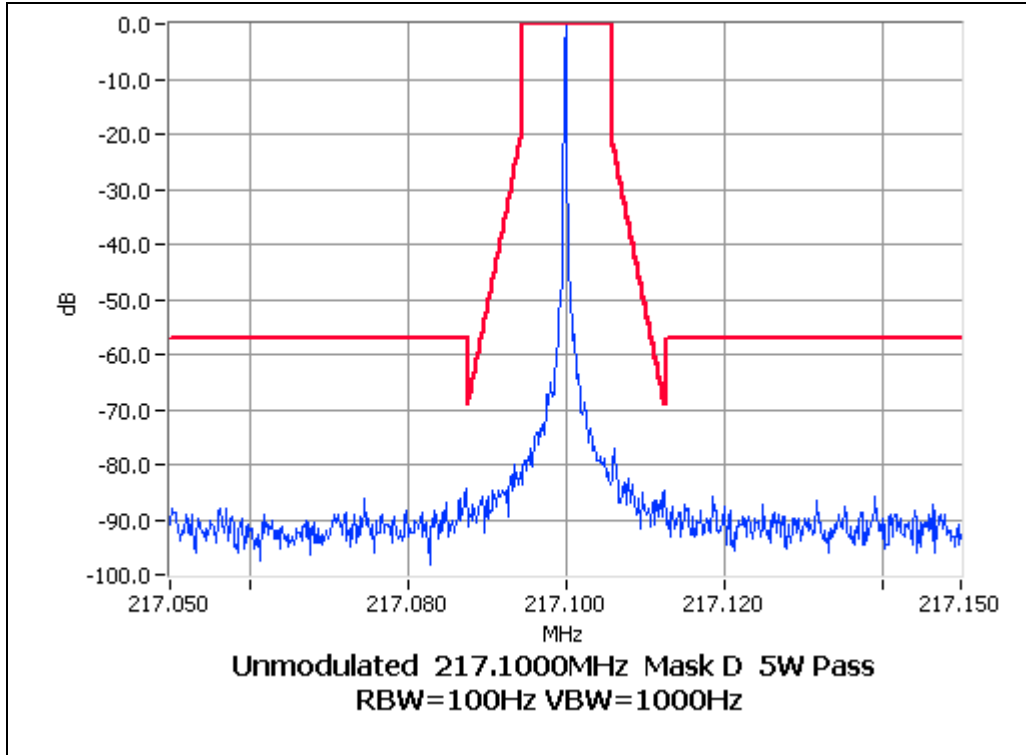


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 5 W 12.5 kHz Channel Spacing

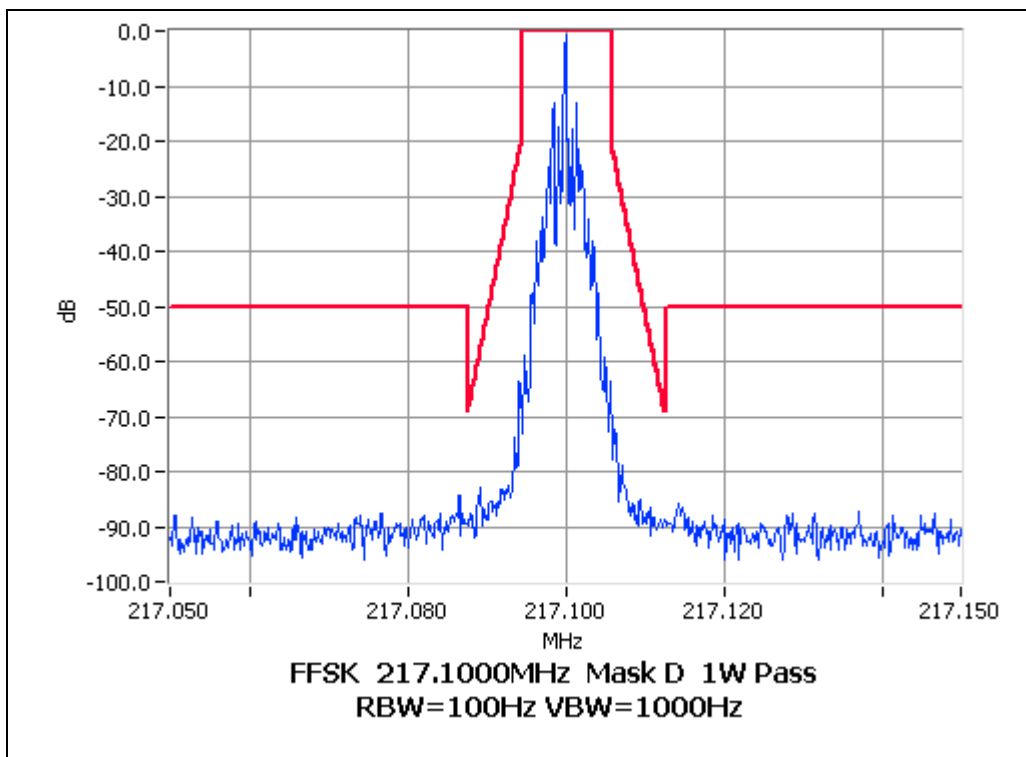
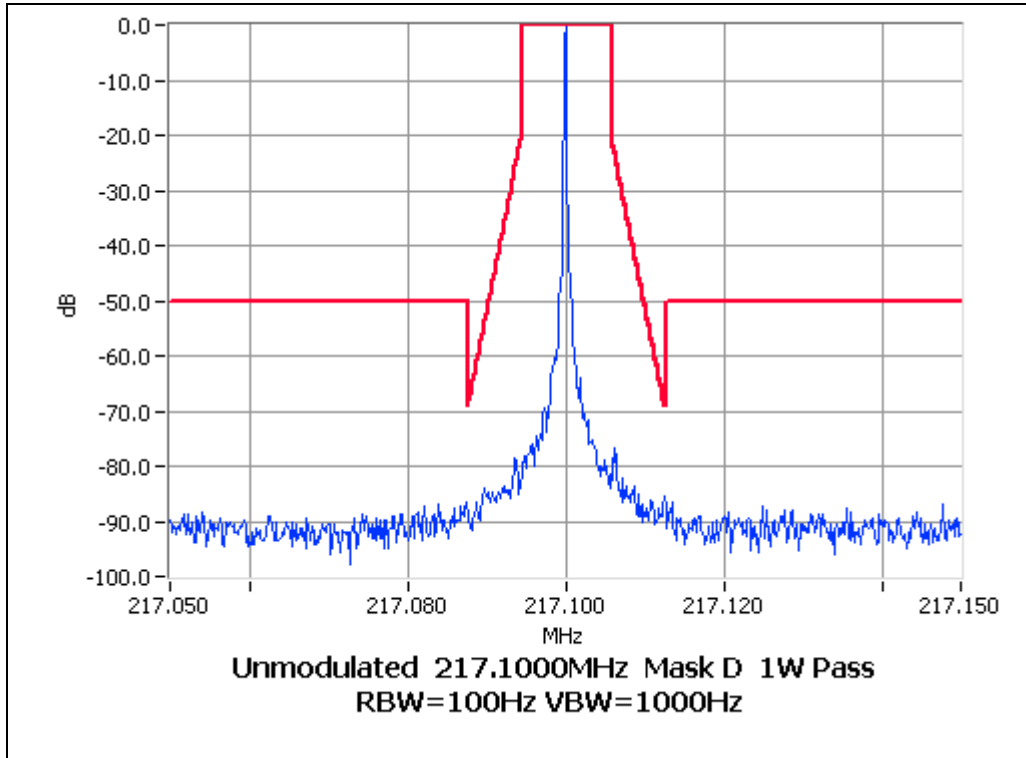


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing

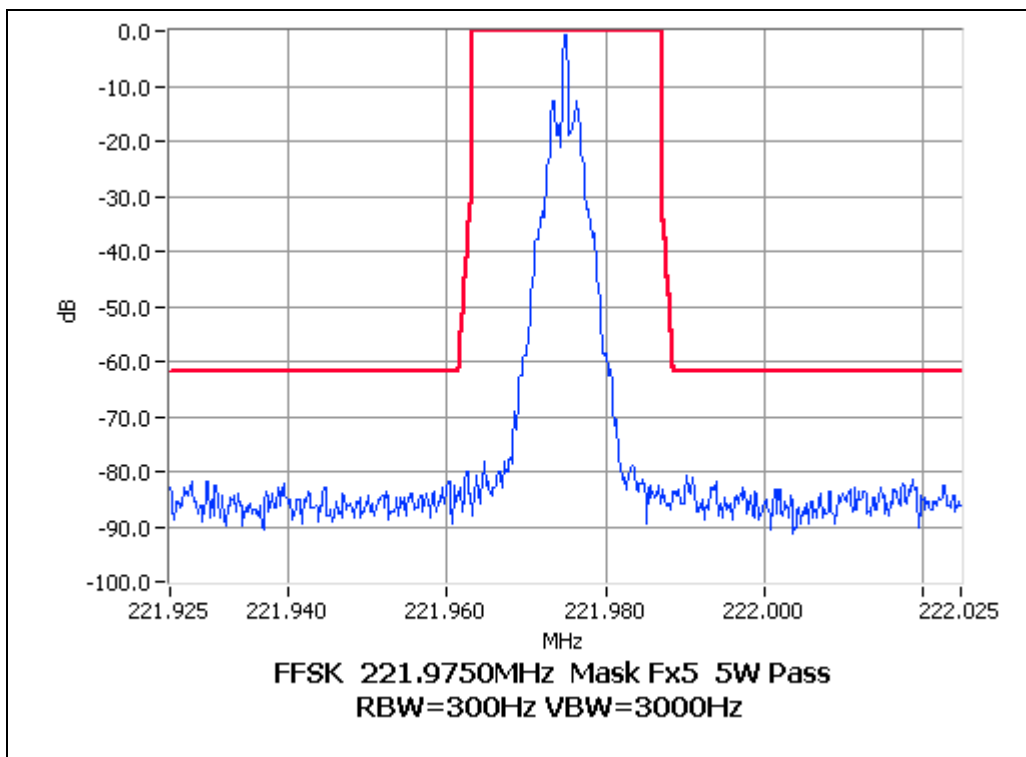
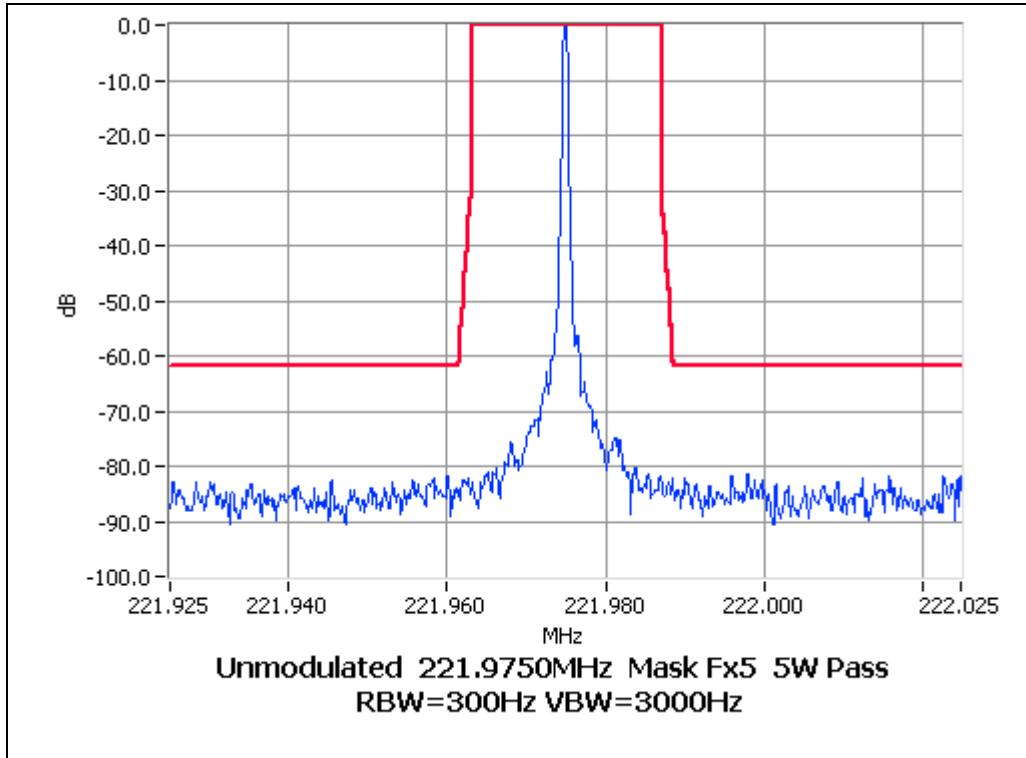


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 221.975 MHz 5 W 12.5 kHz Channel Spacing

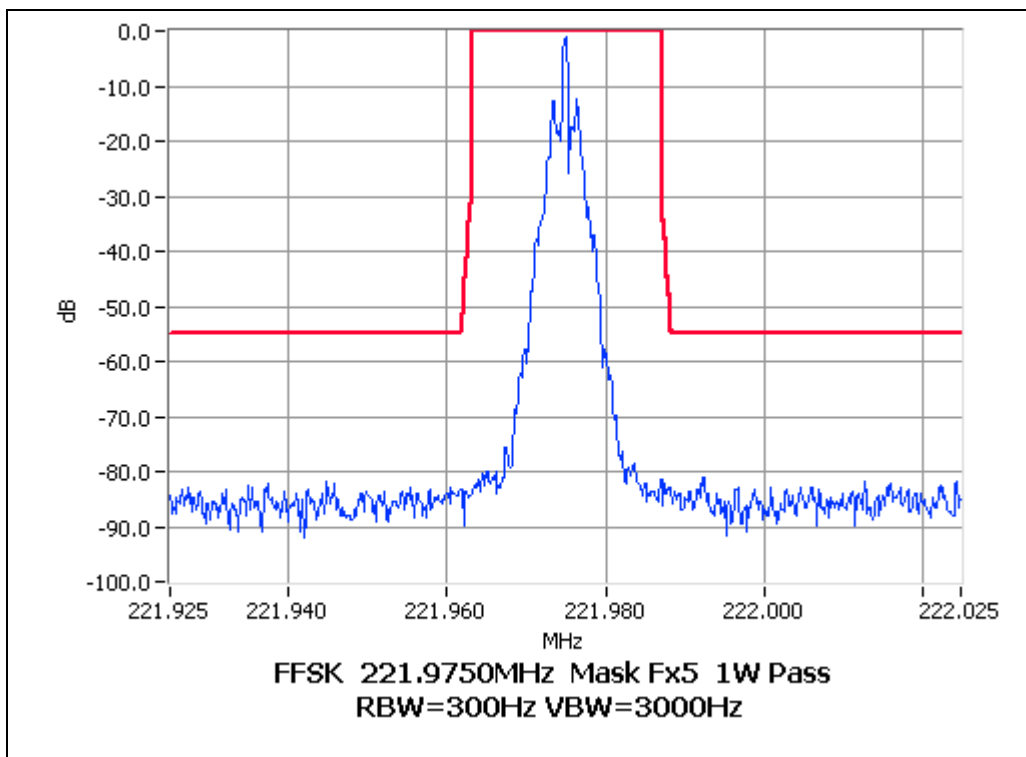
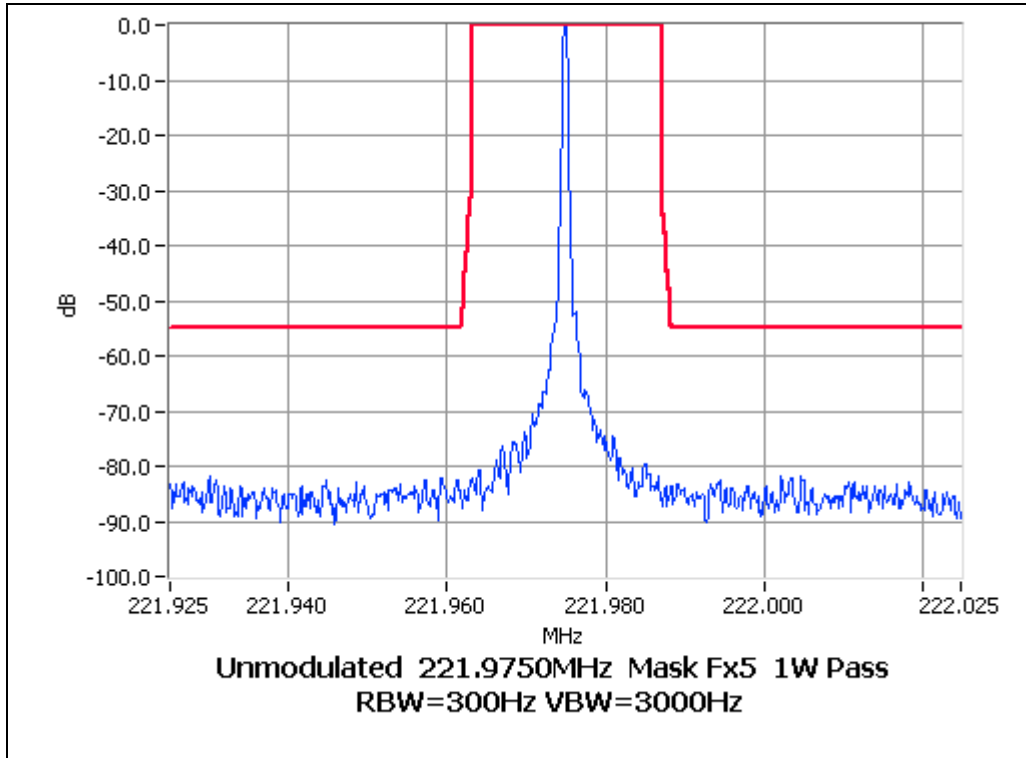


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing

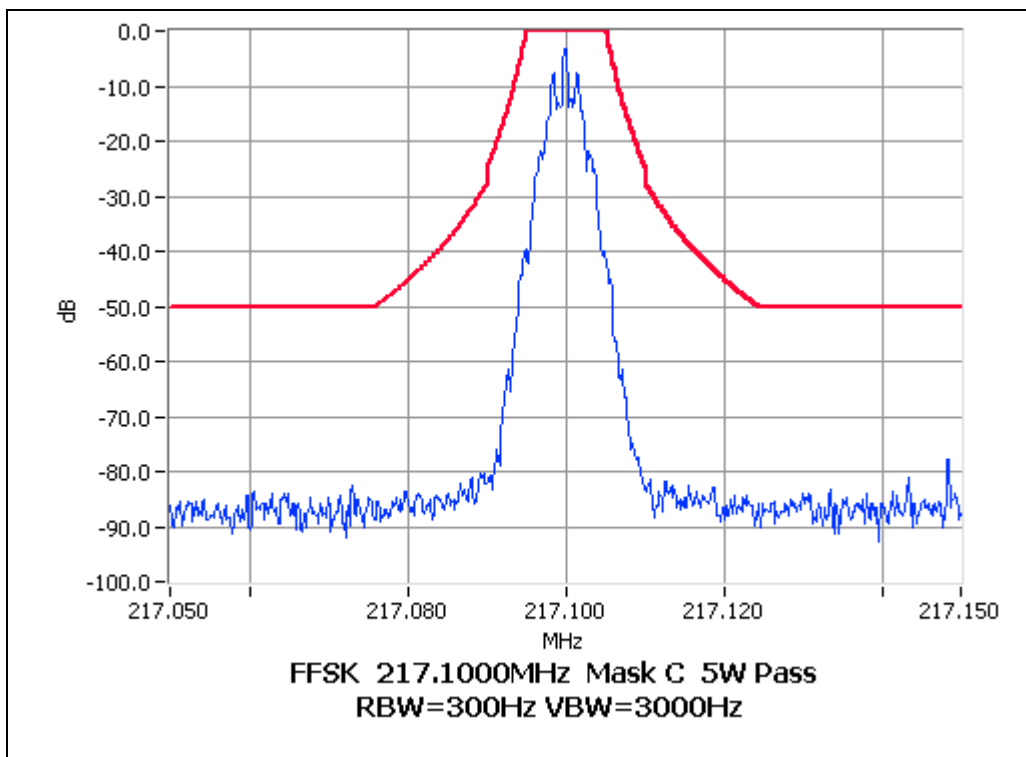
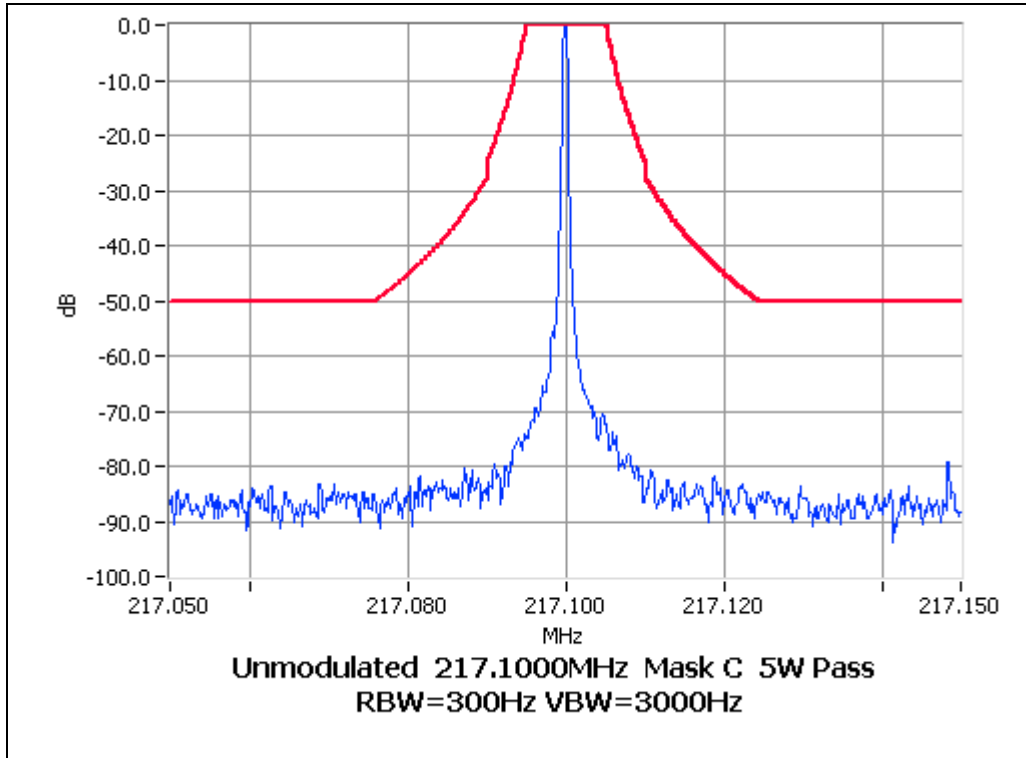


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 5 W 25.0 kHz Channel Spacing



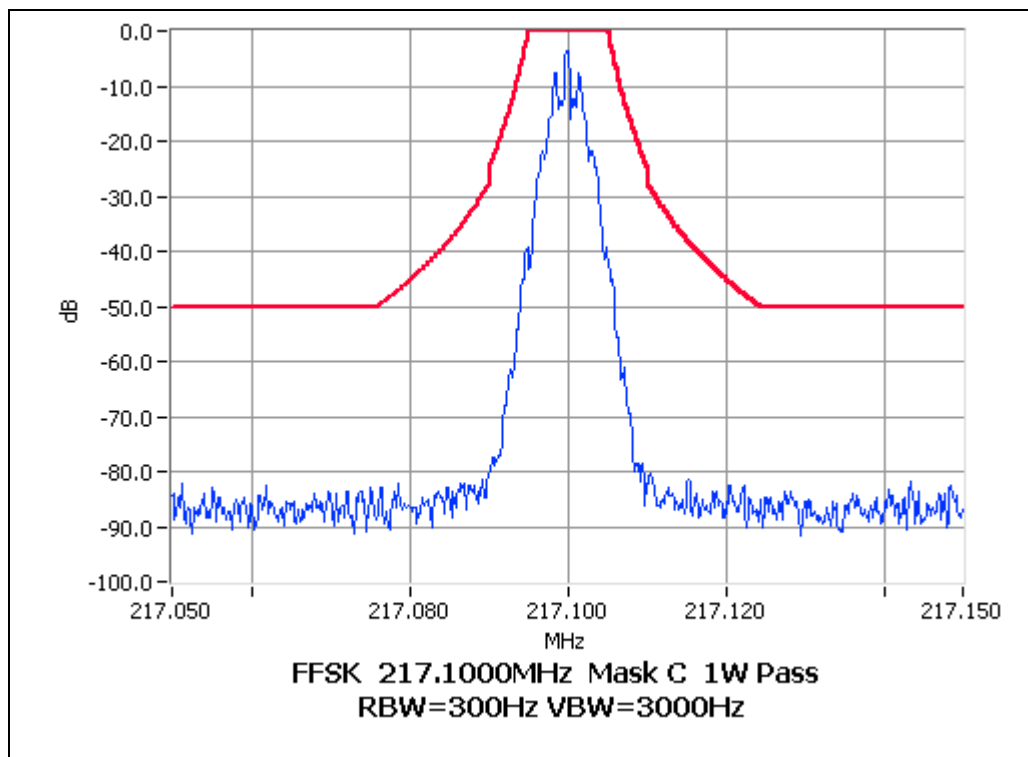
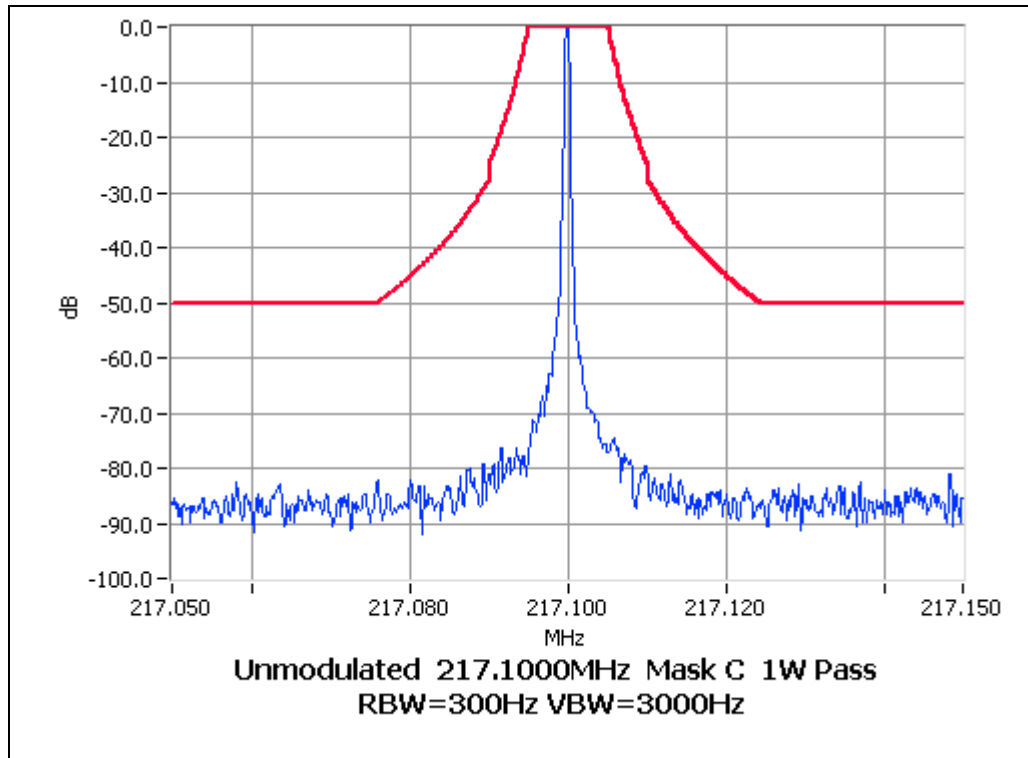


OCCUPIED BANDWIDTH

FFSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 1W 25.0 kHz Channel Spacing



**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION: FCC 47 CFR 2.1051

GUIDE: TIA/EIA-603C 2.2.13

**MEASUREMENT PROCEDURE:**

1. Refer Annex A for equipment set up.
2. The frequency range examined was from the lowest frequency generated within the EUT, to a frequency higher than the 10<sup>th</sup> Harmonic: 100kHz to Fc-BW  
Fc+BW to 10Fc GHz
3. A Pre-scan is performed with a resolution bandwidth of 1 kHz, and a video bandwidth of 3 kHz. If any emissions are found to be within 20dB of the limit a second measurement is made with the carrier modulated, and a resolution bandwidth of 10 kHz, and a video bandwidth of 30 kHz.

Spurious emissions which were attenuated by more than 20 dB below the limit were not recorded.

**MEASUREMENT RESULTS:**

See the tables on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 90.210

**TELTEST Laboratories**  
Tait Electronics Limited  
Report Number 2830

**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 217.1 MHz

12.5 kHz Channel Spacing		217.1 MHz @ 5 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

12.5 kHz Channel Spacing		217.1 MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

**TELTEST Laboratories**  
Tait Electronics Limited  
Report Number 2830

**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.975 MHz

12.5 kHz Channel Spacing		221.975 MHz @ 5 W	Emission Mask F
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

12.5 kHz Channel Spacing		221.975 MHz @ 1 W	Emission Mask F
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 20 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask F 12.5 kHz Channel Spacing $55 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
5 W	-25 dBm	62 dBc
1 W	-25 dBm	55 dBc

**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

**MEASUREMENT PROCEDURE:**

**Initial Scan:**

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30MHz to 1000MHz. Any emission within 10dB of the limit is then re-tested on the OATS along with measurements from 1000MHz to the 10<sup>th</sup> harmonic of the fundamental frequency.
2. The EUT is then placed on a wooden turntable at a distance of 0.5 metres from the test antenna and emissions are measured from 1000MHz to the upper frequency required. Any emission within 10 dB of the limit is then re-tested on the OATS.

**OATS Measurement:**

1. The EUT is placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal is connected to an RF dummy load.
2. The test antenna is raised from 1m to 4m to obtain a maximum reading, the turntable is then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
3. The EUT is then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

**MEASUREMENT RESULTS:**

See the tables on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.210

**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 217.1 MHz

12.5 kHz Channel Spacing	217.1 MHz @ 5 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 10 dB below the limit.		

12.5 kHz Channel Spacing	217.1 MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 10 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.975 MHz

12.5 kHz Channel Spacing		221.975 MHz @ 5 W	Emission Mask F
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 10 dB below the limit.			

12.5 kHz Channel Spacing		221.975 MHz @ 1 W	Emission Mask F
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
No emissions were detected at a level greater than 10 dB below the limit.			

LIMITS:

Carrier Output Power Watts	Emission Mask F 12.5 kHz Channel Spacing $55 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
5 W	-25 dBm	62 dBc
1 W	-25 dBm	55 dBc

**TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)**

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 80.209  
FCC 47 CFR 90.213

Frequency Range: 216 MHz ~ 222 MHz

217.100 MHz	
Channel Spacing (kHz)	Frequency Error (ppm)
12.5	5.0
25.0	5.0

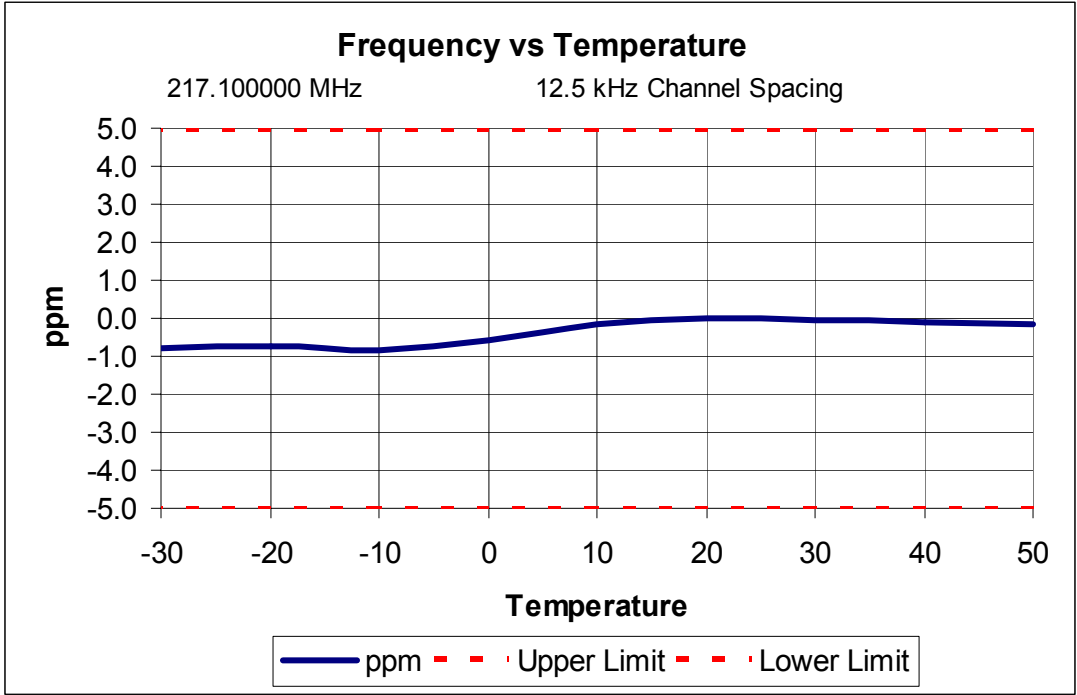
221.975 MHz	
Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5



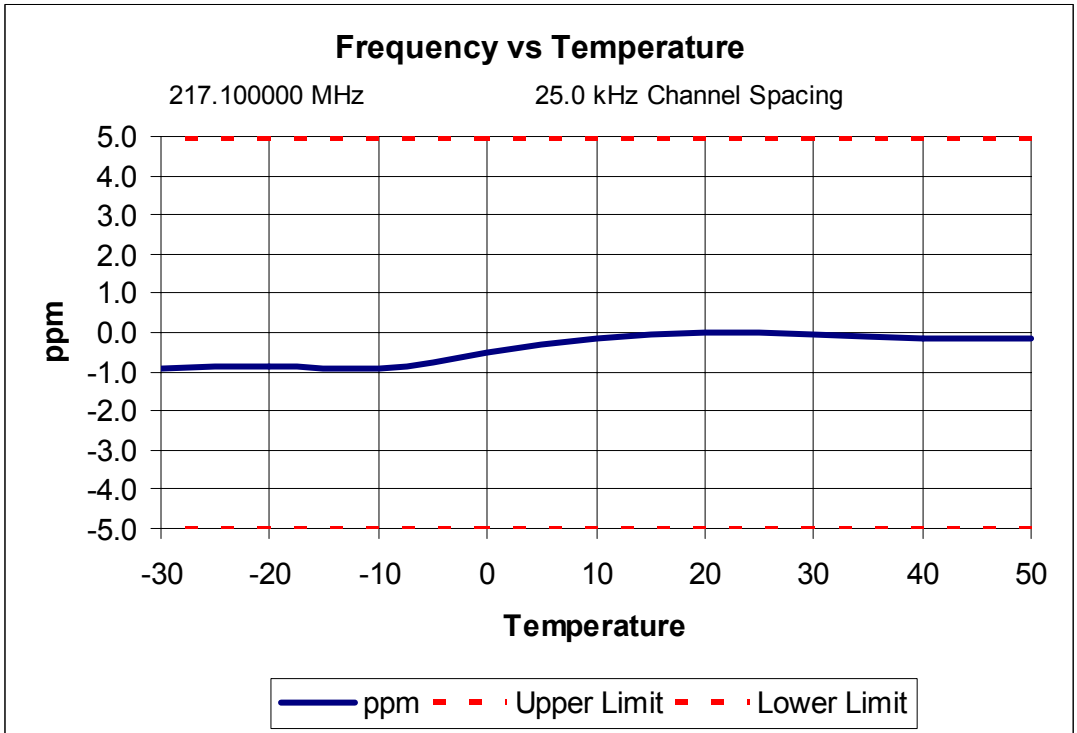
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

Tx FREQUENCY: 217.1 MHz 5 W 12.5 kHz channel Spacing



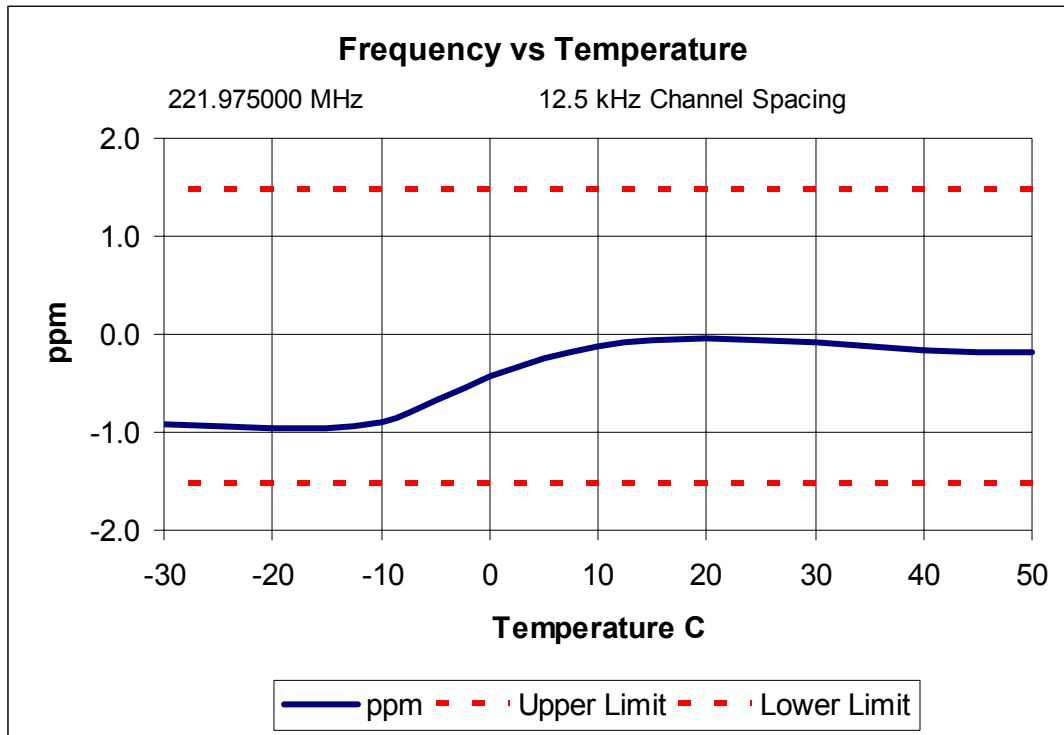
Tx FREQUENCY: 217.1 MHz 5 W 25.0 kHz channel Spacing



TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

Tx FREQUENCY: 221.975 MHz 5 W 12.5 kHz channel Spacing



**TRANSMITTER FREQUENCY STABILITY (VOLTAGE)**

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1)

GUIDE: TIA/EIA-603C 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS: Frequency Range: 216 MHz ~ 222 MHz

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz		
	217.1 MHz	221.975 MHz	
7.5 V <sub>DC</sub>	-0.05	-0.12	
6.0 V <sub>DC</sub>	-0.05	-0.09	
~	~	~	

Voltage (V)	FREQUENCY ERROR (ppm) for 25.0 kHz		
	217.1 MHz	221.975 MHz	
7.5 V <sub>DC</sub>	-0.05	~	
6.0 V <sub>DC</sub>	-0.06	~	
~	~	~	

LIMIT CLAUSE: FCC 47 CFR 80.209

217.100 MHz	
Channel Spacing (kHz)	Frequency Error (ppm)
12.5	5.0
25.0	5.0

FCC 47 CFR 90.213

221.975 MHz	
Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5

**TELTEST Laboratories**  
Tait Electronics Limited  
Report Number 2830

---

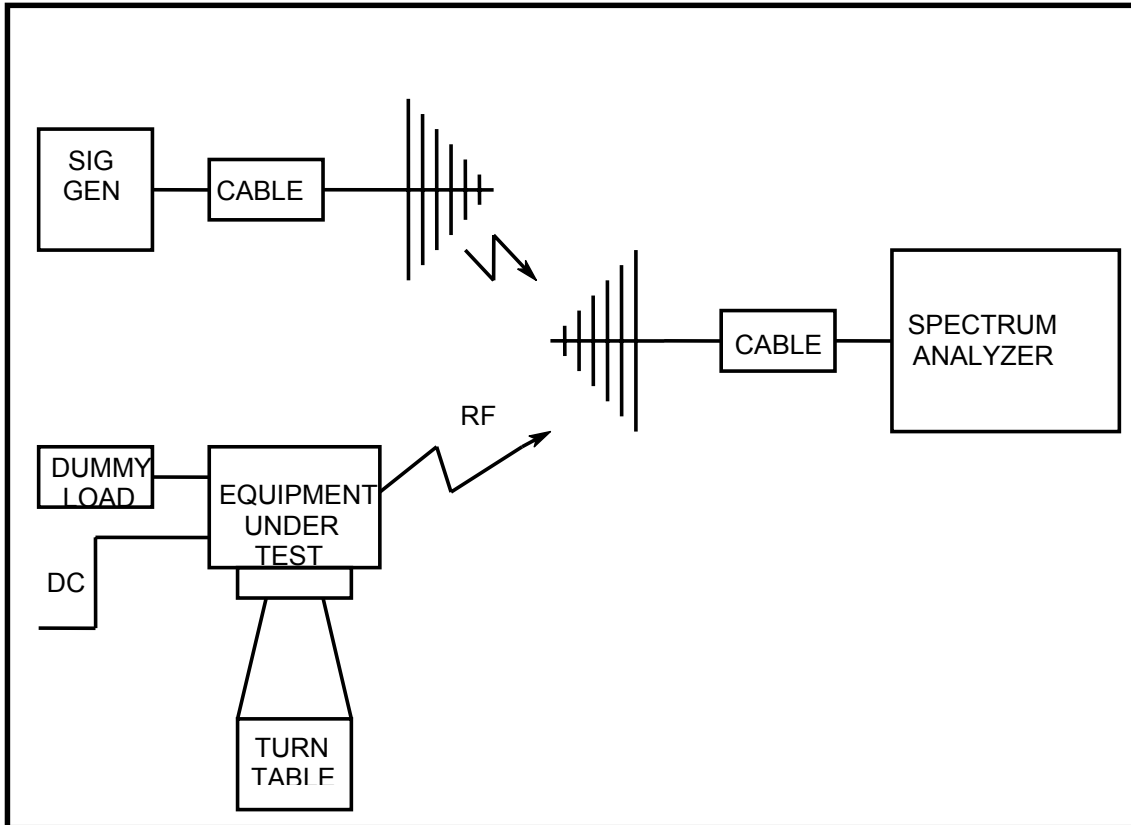
**TEST EQUIPMENT USED**

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	16-Nov-08
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	16-Nov-08
20	Power Supply	Hewlett Packard	HP6032A	2441A00412	E3075	16-Nov-08
21	Power Supply	Rohde & Schwarz	NGS M32/10 192.0810.31	Fnr 434	E3556	17-Oct-08
24	Environ. Chamber	Contherm	Spatial Cal	E3397	E3397	12-Jul-08
24	Environ. Chamber	Contherm	Temp Control	E3397	E3397	12-Jul-08
40	Reference Dipoles Reference Horn	Emco	3121C DB1	9510-1164	E3559	23-Nov-09
42	Antenna	Emco	DRG3115	9512-4638	E3560	16-Nov-09
46	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	20-Mar-09
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	11-Dec-08
72	RF Load 50W	Weinschel	F1426	AE2490	E3624	11-Dec-08
81	2m Coax Cable S- Line (Black1)	Intelcom	RG213/U-50 RG214HF/Nm/Nm	Black1	E3658	16-Nov-08
83	2m Coax (Black2) 1m Coax Cable	Suhner	/2000	Black2	E4623	16-Nov-08
85	(BLUE)	Suhner	Sucoflex 104A	44611/4A	E4620	06-Sep-08
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	25-Feb-09
88	Spectrum Analyser Modulation	Hewlett Packard	HP8562E HP8901B	3821A00779	E3715	13-Nov-08
111	Analyser	Hewlett Packard	(Opt 002)	3704A05837	E3786	16-Nov-08
123	Spectrum Analyser Log Periodic	Agilent	E4445A	MY42510072	E4139	17-Jul-08
149	Antenna	Schwarzbeck	VUSLP	9111-219	E4617	

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



**TELTEST Laboratories**  
Tait Electronics Limited  
Report Number 2830

All other testing is performed using the Teltest Radio **EVAL**uation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

