C2PC Laboratory Test Report

For the

TBAC0 Base Station Transmitter
fitted with a TA2453-10 Utility Radio Modem

Tested In accordance with

FCC 47 CFR Parts 80 and 90T

Report Revision: 1
Issue Date: 10-Apr-2007
FCC ID: CASTBA8C0

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

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REVISION HISTORY

Date	Revision	Comments
10-Apr-2007	1	Initial test report

INTRODUCTION

The purpose of this report is to add C4FM modulation to the original test report 2470.

Type Approval Testing of the TBAC0 fitted with a TA2453-10 Utility Radio Modem, in accordance with:

FCC CFR 47 Parts 80 & 90T

REPORT PREPARED FOR

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

DESCRIPTION OF SAMPLE

Equipment: Base Station Transmitter
Type: TBAC0

Comprising of:

Module	*Type*	*Serial Number*
Power Management Unit	TBA30A4-4100	18028513
Power Amplifier (50 Watts)	TBA80C0-0000	18005083
Reciter	TBA40C2-0K00	18028416

STATEMENT OF COMPLIANCE

The TBAC0 Base Station Transmitter as tested in this report was found to conform to the following standards:

FCC CFR 47 Parts 80 & 90T

TEST CONDITIONS

All testing was performed at the following conditions.

Ambient Temperature	15°C → 30°C
Relative Humidity	20% → 75%
Standard Test Voltage	120 Vac

NECESSARY BANDWIDTH AND EMISSION DESIGNATORS

SPECIFICATION: FCC 47 CFR 2.202

The Necessary Bandwidth is the minimum value of the occupied bandwidth sufficient to ensure the transmission of information at the rate and with the quality required for the system employed.

99 % Bandwidth Measurement Results

219.1 MHz

Channel Spacing	Power	99% BW C4FM
12.5 kHz	50W	3.75 kHz
12.5 kHz	5W	3.72 kHz

221.5 MHz

Channel Spacing	Power	99% BW C4FM
12.5 kHz	50W	3.71 kHz
12.5 kHz	5W	3.70 kHz

TEST RESULTS

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 Fx5 – Resolution bandwidth = 300Hz, Video Bandwidth = 3 kHz

MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	C4FM
Emission Mask Fx5	12.5 kHz Channel Spacing	C4FM

DATA SPEED

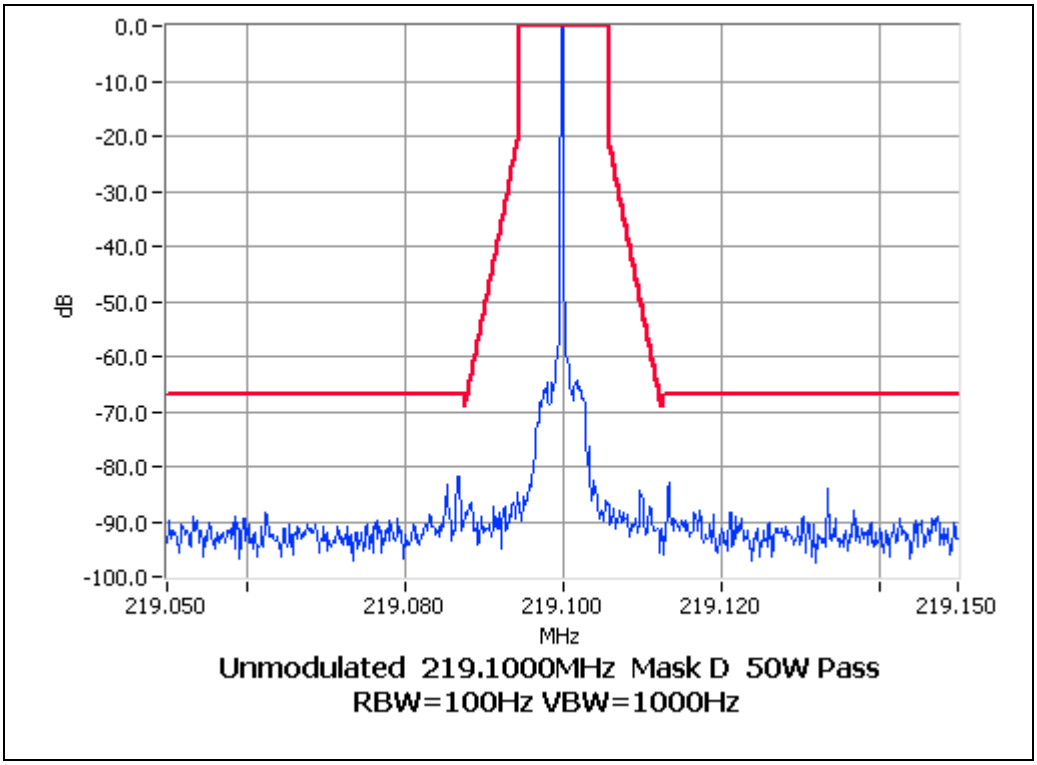
C4FM	12.5 kHz Channel Spacing	4800 bps

OCCUPIED BANDWIDTH

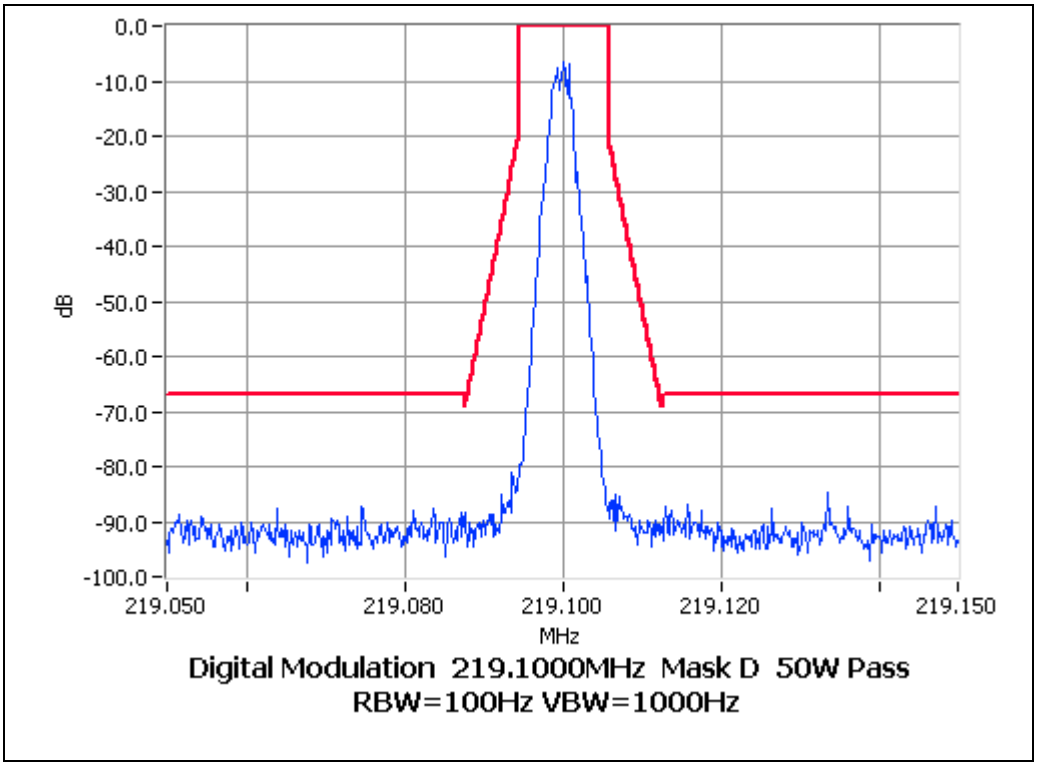
C4FM

SPECIFICATION: FCC CFR 2.1049 (h)

Tx FREQUENCY: 219.1 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 219.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz



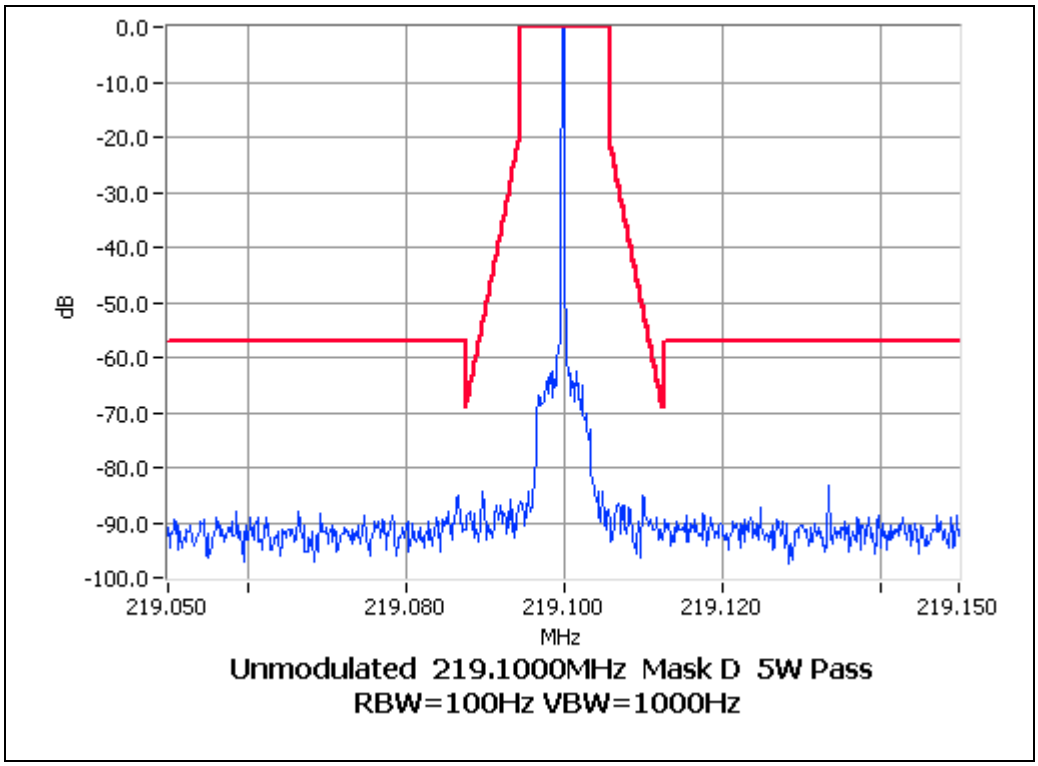
Digital Modulation 219.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz

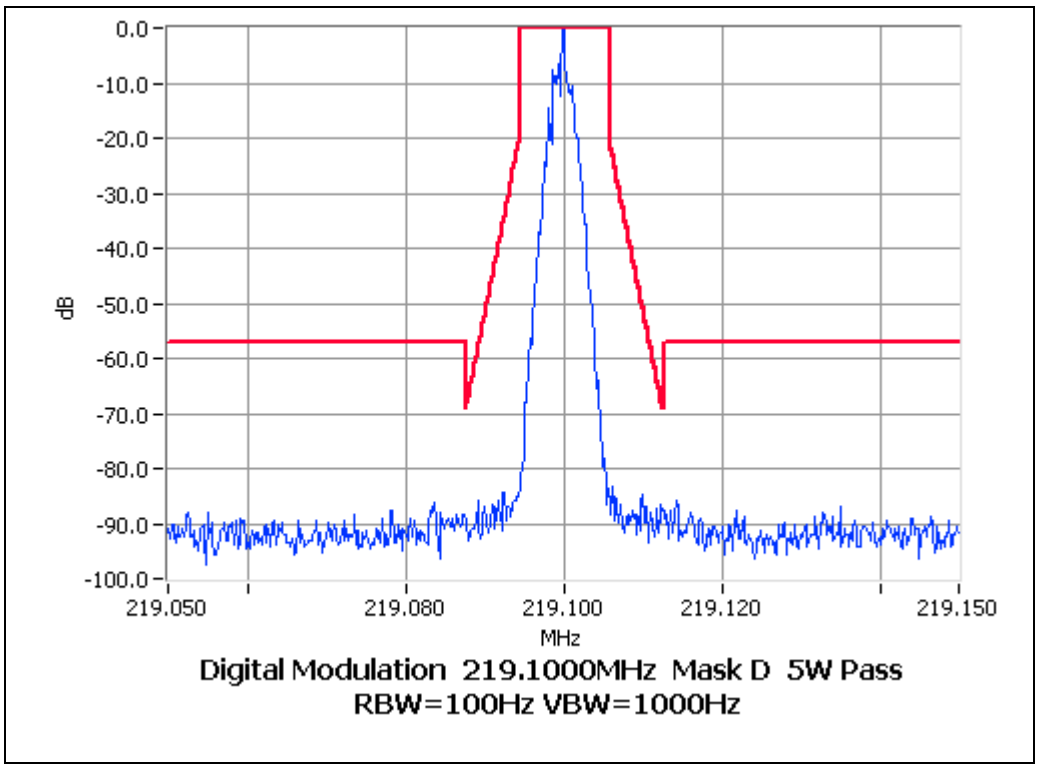
OCCUPIED BANDWIDTH

C4FM

SPECIFICATION: FCC CFR 2.1049 (h)

Tx FREQUENCY: 219.1 MHz 5 W 12.5 kHz Channel Spacing



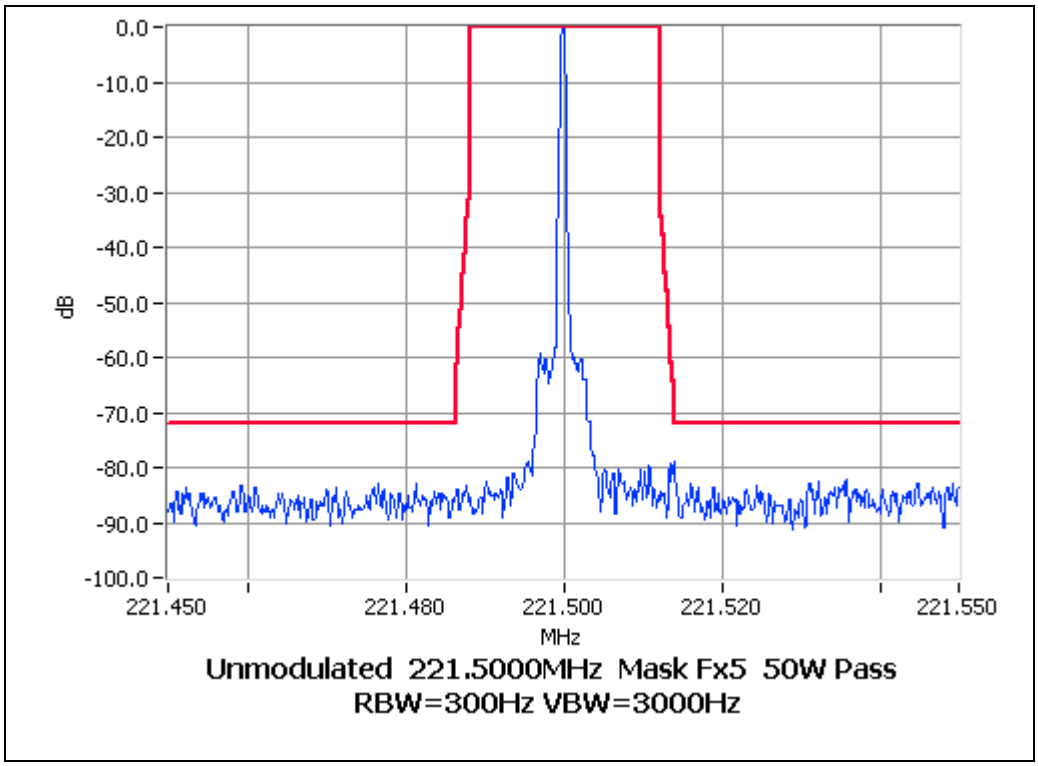


OCCUPIED BANDWIDTH

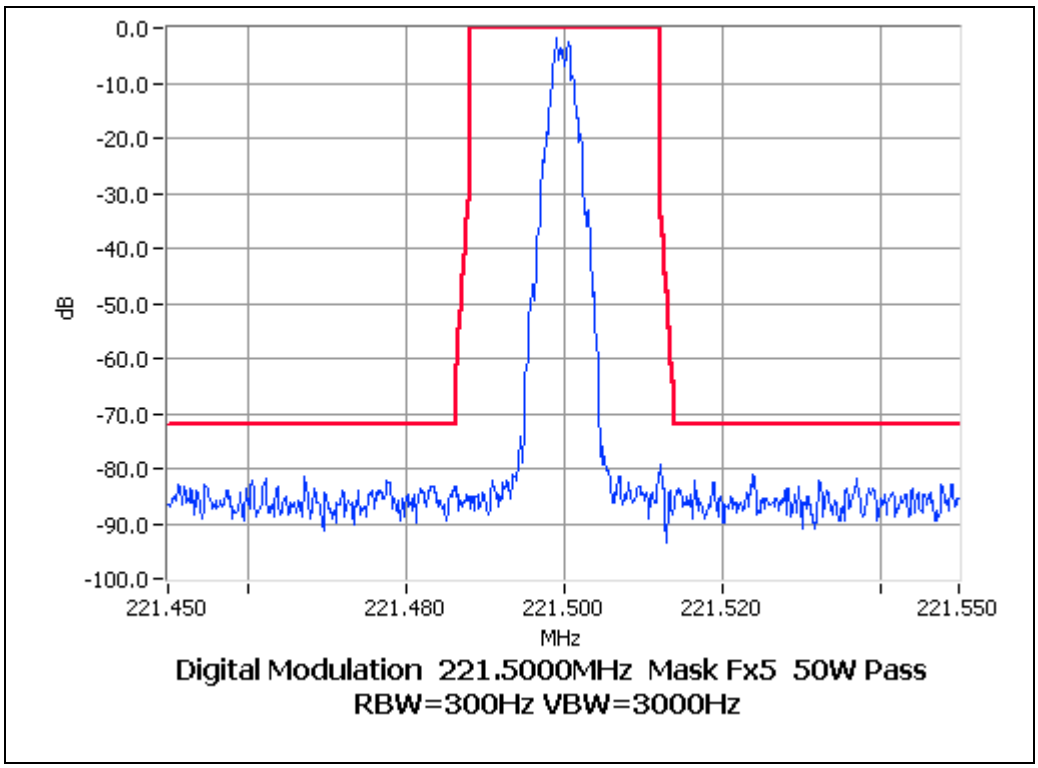
C4FM

SPECIFICATION: FCC CFR 2.1049 (h)

Tx FREQUENCY: 221.5 MHz 50 W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 50W Pass
RBW=300Hz VBW=3000Hz



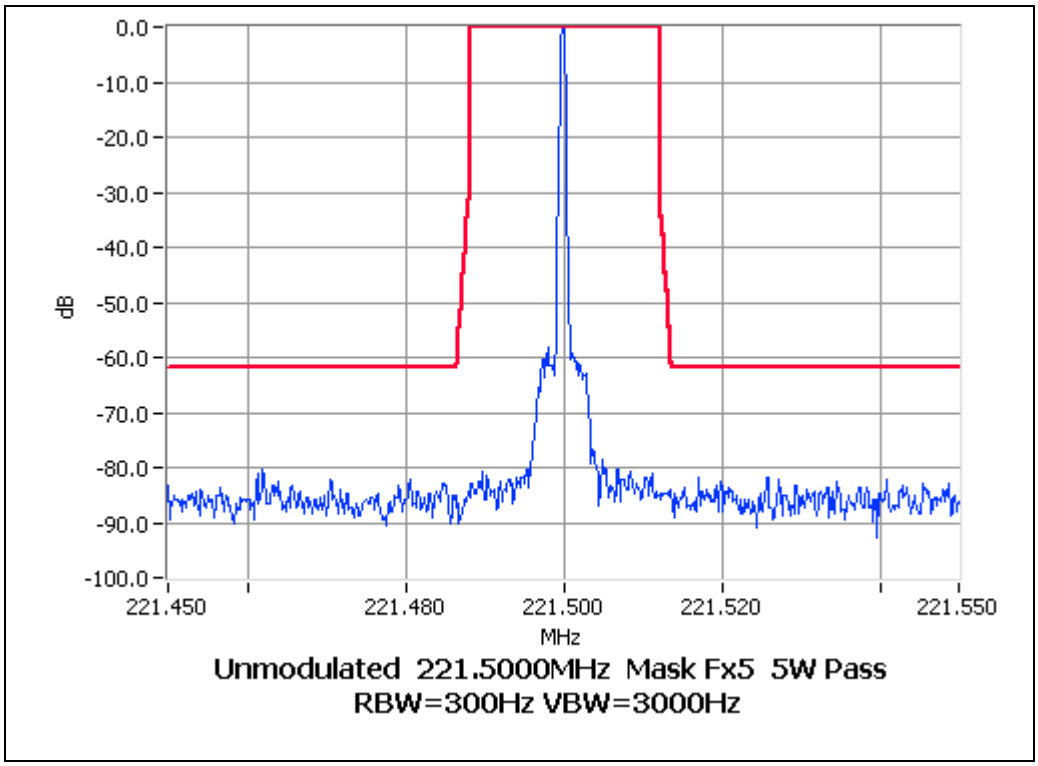
Digital Modulation 221.5000MHz Mask Fx5 50W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

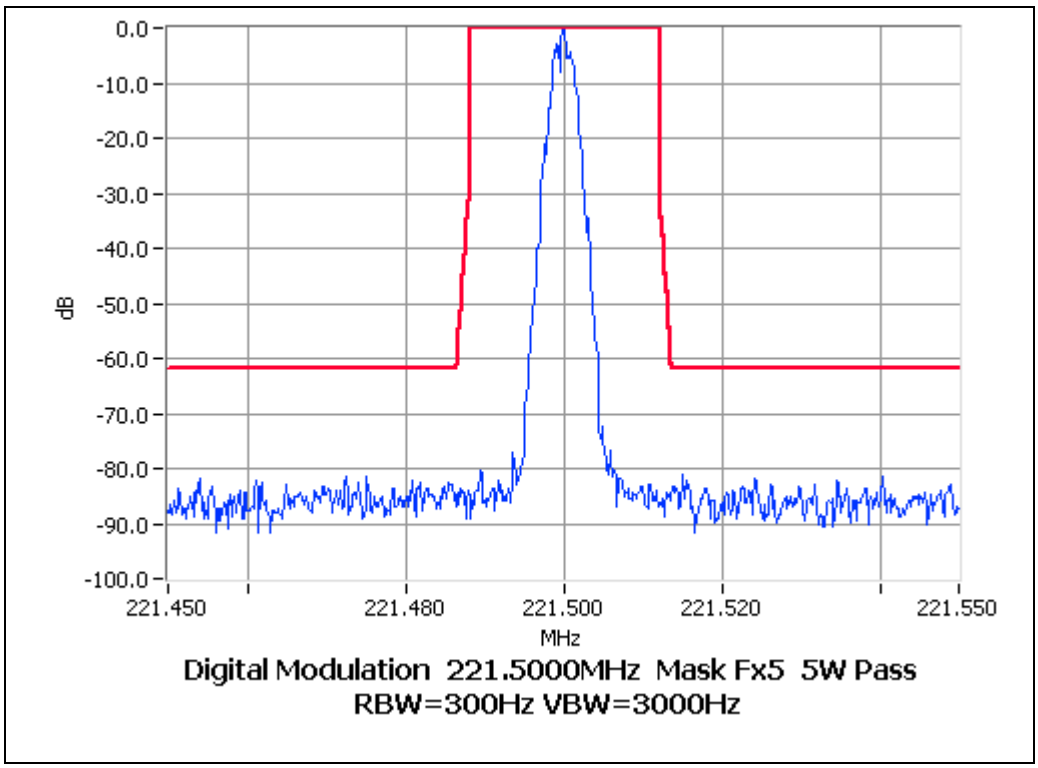
C4FM

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 221.5 MHz 5 W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 5W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 221.5000MHz Mask Fx5 5W Pass
RBW=300Hz VBW=3000Hz

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 10th 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 channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 219.1 MHz

12.5 kHz Channel Spacing	219.1 MHz @ 50 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	219.1 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.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{Watts})$	
50 W	-20 dBm	67.0 dBc
5 W	-20 dBm	57.0 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

12.5 kHz Channel Spacing	221.5 MHz @ 50 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	221.5 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.		

LIMITS:

Carrier Output Power Watts	Emission Mask F 12.5 kHz Channel Spacing $55 + 10 \text{ Log}_{10} (P_{Watts})$	
50 W	-25 dBm	72.0 dBc
5 W	-25 dBm	62.0 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603C 2.2.12

MEASUREMENT PROCEDURE:
Refer Annex A for Equipment set up.

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^{th} 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^{o} 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: 219.1 MHz

12.5 kHz Channel Spacing	219.1 MHz @ 50 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	219.1 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.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \text{ Log}_{10} (P_{Watts})$	
50 W	-20 dBm	67.0 dBc
5 W	-20 dBm	57.0 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

12.5 kHz Channel Spacing	221.5 MHz @ 50 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	221.5 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.		

LIMITS:

Carrier Output Power Watts	Emission Mask F 12.5 kHz Channel Spacing $55 + 10 \text{ Log}_{10} (P_{Watts})$	
50 W	-25 dBm	72.0 dBc
5 W	-25 dBm	62.0 dBc

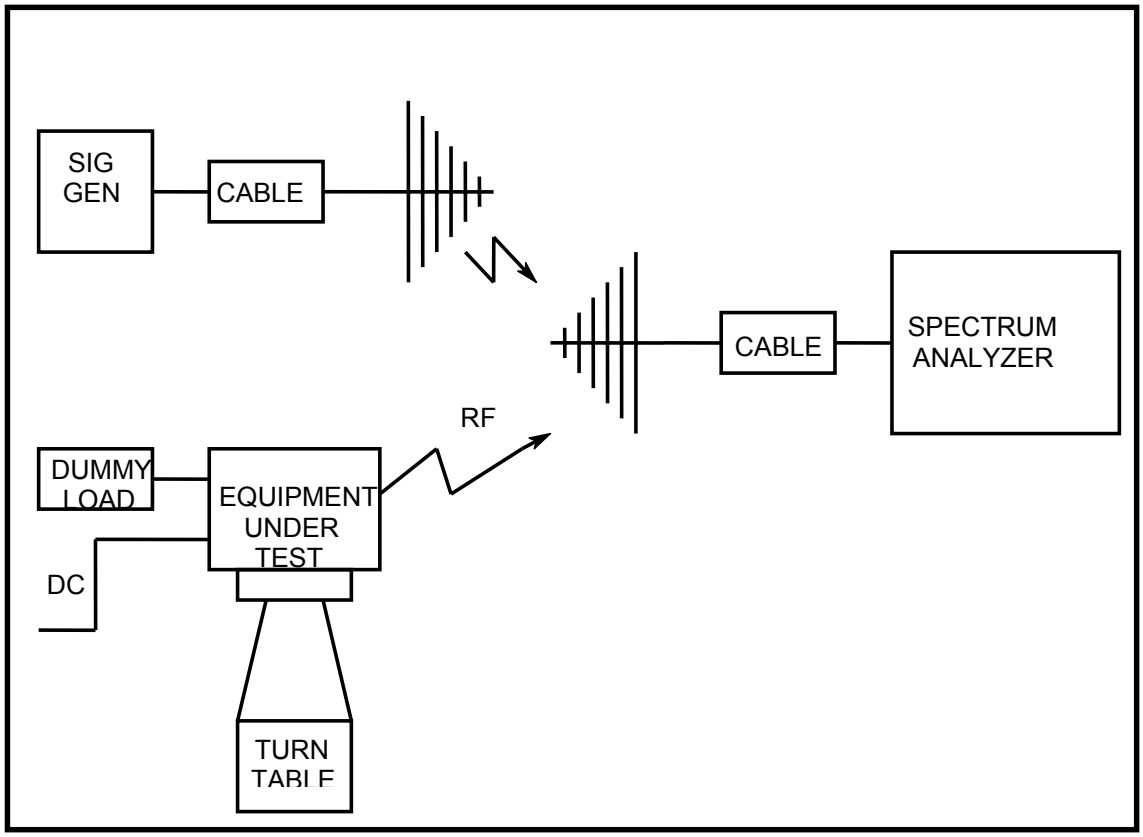
TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	02-Nov-07
37	Variac	Yamabishi	S-260-5	TX-533	E1737	
42	Reference Horn 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
52	Amplifier +21.7 dB	Tait	ZFL-1000LN	E3660	E3360	
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	31-Oct-07
70	RF Load 150W	Bird	8166	524	E3625	31-Oct-07
83	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25006/4A	E3693	30-Oct-07
85	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25004/4A	E3691	30-Oct-07
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	31-Oct-07
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	04-Jul-07
132	RF Termination 2W	MCL	NTRM-50	01		15-Jun-07
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	10-Jan-08
137	1m Multiflex Cable	Suhner	MF141	TT007	E4443	30-Oct-07
138	1m Multiflex Cable	Suhner	MF141	TT086	E4444	30-Oct-07

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



All other testing is performed using the **T**eltest **R**adio **EVA**luation 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.