REPORT NUMBER 2171 February 2005

RADIO PERFORMANCE MEASUREMENTS

On the TBAC0 Base Station Transceiver

FCC ID: CASTBAC0

Comprising of:

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBER
Reciter	TBA40C2-0B00	18005716
Power Amplifier	TBA90C0-0000 TBA80C0-0000 TBA70C0-0000	18004873 18005083 18005074
Power Management Unit	TBA30A1-1100 TBA30A0-0000	18004274 18004653
High Stability Oscillator	T801-20-000	13122298

In accordance with

FCC 47 CFR Parts 90T, and 90.259

PREPARED BY: Marcus Ludwig _____
Test Technician

CHECKED & APPROVED BY: Hamish Newton _____
Senior Technician

577
new zealand accredited
laboratory

TELTEST Laboratories
Tait Electronics Limited
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Christchurch
New Zealand
Phone : (64) (3) 3583399
Fax: (64) (3) 3580432

REPORT ON :

Type Approval Testing of the TBAC0 in accordance with:

FCC CFR 47 Parts 90T, and 90.259

FCC ID: CASTBAC0

PREPARED FOR :

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

DISTRIBUTION :

TELTest Laboratory	Mr S Crompton	Copy No 1
Tait Electronics Ltd	Mr. Des Fox	Copy No 2
Tait Electronics Ltd	Mr. Ian MacKay	Copy No 3

APPROVED :

Hamish Newton
Senior Technician

Date :

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

Copy No:

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DECLARATION OF CONFORMITY

We, TELTEST LABORATORIES of 558 Wairakei Road, Christchurch New Zealand, declare under our sole responsibility that the product:

Equipment: Base Station Transceiver

Type: TBAC0

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBER
Reciter	TBA40C2-0B00	18005716
Power Amplifier	TBA90C0-0000 TBA80C0-0000 TBA70C0-0000	18004873 18005083 18005074
Power Management Unit	TBA30A1-1100 TBA30A0-0000	18004274 18004653
High Stability Oscillator	T801-20-000	13122298

Quantity: 1 each

To which this declaration relates is in conformity with the following standards:

FCC CFR 47 Parts 90T, and 90.259

Signature:_____

S. A. Crompton
Compliance Laboratory Manager.

Date:_____

Test Conditions

All testing was performed at the following conditions.

Ambient Temperature	15°C to 30°C
Relative Humidity	20% to 75%
Standard Test Voltage	13.8Vdc

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.
This is calculated using the following formula.

Bn = 2M + 2DK Where: Bn = Necessary Bandwidth
M = Maximum modulation frequency
For Data transmission
M = B/2
Where: B = Modulation rate in Baud
D = Peak deviation
K = Constant
For Analogue transmission this is 1
For Data transmission this is typically 1.2

1. Analogue Voice 12.5kHz Bandwidth

Necessary bandwidth

M = 3kHz
D = 2.5kHz

Bn = 6 + 5 x 1
=11kHz

Emission Designator

11k0F3E

F3E represents a FM voice transmission

2. Analogue Voice 25kHz Bandwidth

Necessary bandwidth

M = 3kHz
D = 5kHz

Bn = 6 + 10 x 1
=16kHz

Emission Designator

16k0F3E

F3E represents a FM voice transmission

3. Fast Frequency Shift Keying (FFSK) 12.5kHz Bandwidth

Necessary bandwidth

M = 1.8 kHz
D = 1.5kHz (60% of peak deviation)

Bn = 3.6 + 3 x 1
= 6.6 kHz

Emission Designator

6k60F2D

F2D represents a FM data transmission with the use of a modulating sub carrier

4. Fast Frequency Shift Keying (FFSK) 25kHz Bandwidth

Necessary bandwidth

M = 1.8 kHz
D = 3kHz (60% of peak deviation)

Bn = 3.6 + 6 x 1
= 9.6 kHz

Emission Designator

9k60F2D

F2D represents a FM data transmission with the use of a modulating sub carrier

Test Results

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603B 2.2.1

MEASUREMENT PROCEDURE:
1. Refer Appendix 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 90.729

Power Amplifier: 100W		
221.5 MHz	100 W nominal	10 W nominal
POWER (W)	99.6	9.60
Variation from Nominal (%)	-0.40	-4.00
Measurement Uncertainty (dB)	+0.63 -0.68	

Power Amplifier: 50W		
221.5 MHz	50 W nominal	5 W nominal
POWER (W)	51.8	5.14
Variation from Nominal (%)	+3.60	+2.80
Measurement Uncertainty (dB)	+0.63 -0.68	

Power Amplifier: 5W		
221.5 MHz	5 W nominal	1 W nominal
POWER (W)	5.17	1.02
Variation from Nominal (%)	+3.40	+2.00
Measurement Uncertainty (dB)	+0.63 -0.68	

TRANSMITTER OUTPUT POWER (CONDUCTED)

FCC 47 CFR 90.259

Power Amplifier: 5W		
219.1 MHz	5 W nominal	1 W nominal
POWER (W)	5.12	1.01
Variation from Nominal (%)	+2.4	+1.0
Measurement Uncertainty (dB)	+0.63 -0.68	

Power Amplifier: 5W	
219.1 MHz	2 W nominal
POWER (W)	2.05
Variation from Nominal (%)	+2.5
Measurement Uncertainty (dB)	+0.63 -0.68

LIMIT CLAUSE: FCC 47 CFR 90.205 (r)

Radio Type: Base Station Transceiver
Frequency Band: 193 MHz ~ 225 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-603B 2.2.6

MEASUREMENT PROCEDURE:
1. Refer Appendix 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.
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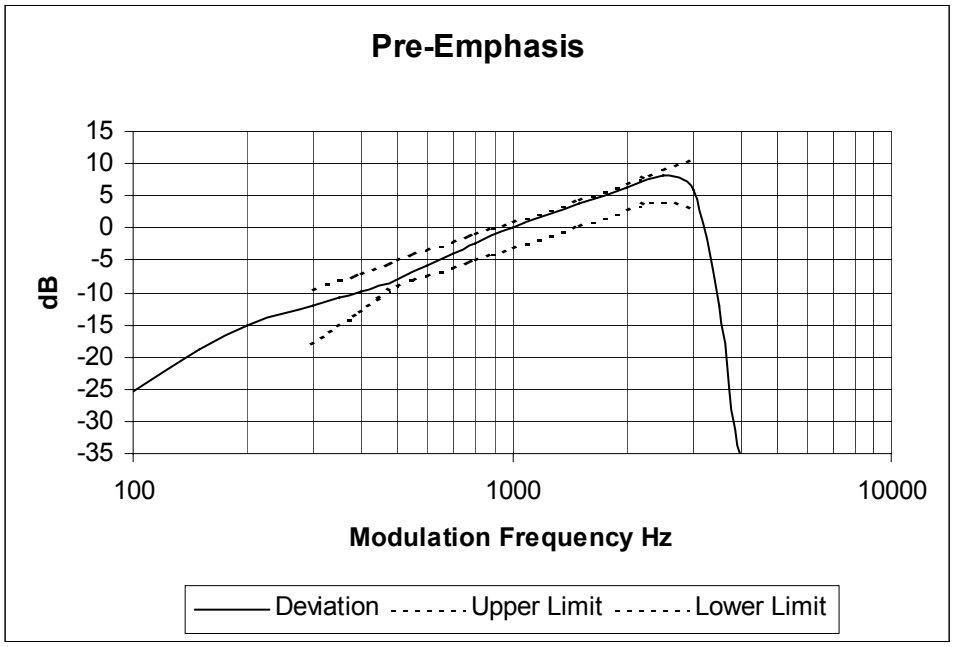
LIMIT CLAUSE: TIA/EIA-603B 3.2.6

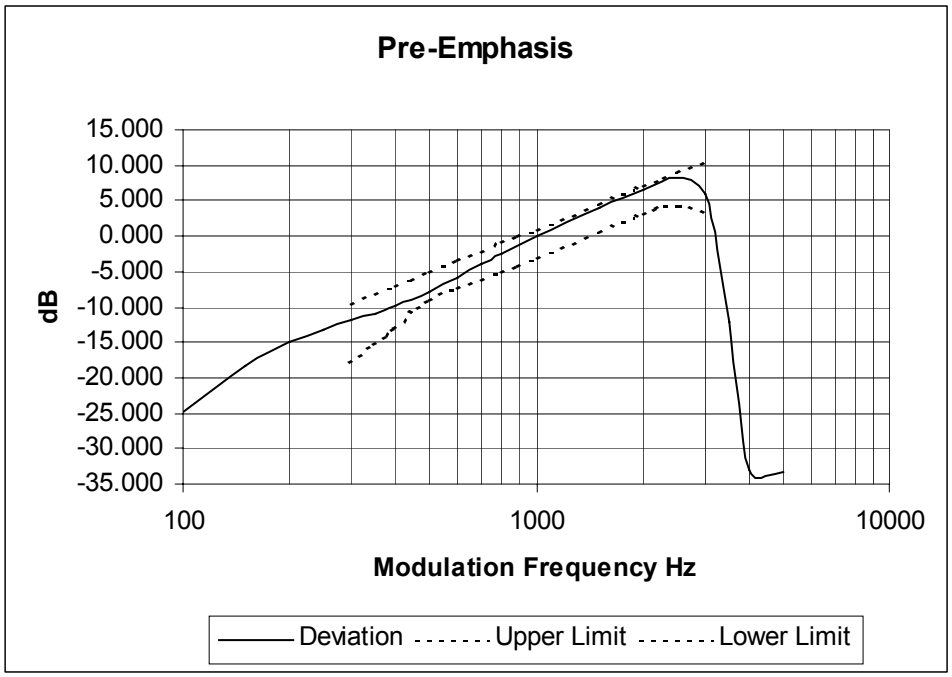
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 221.5 MHz 12.5 kHz Channel Spacing



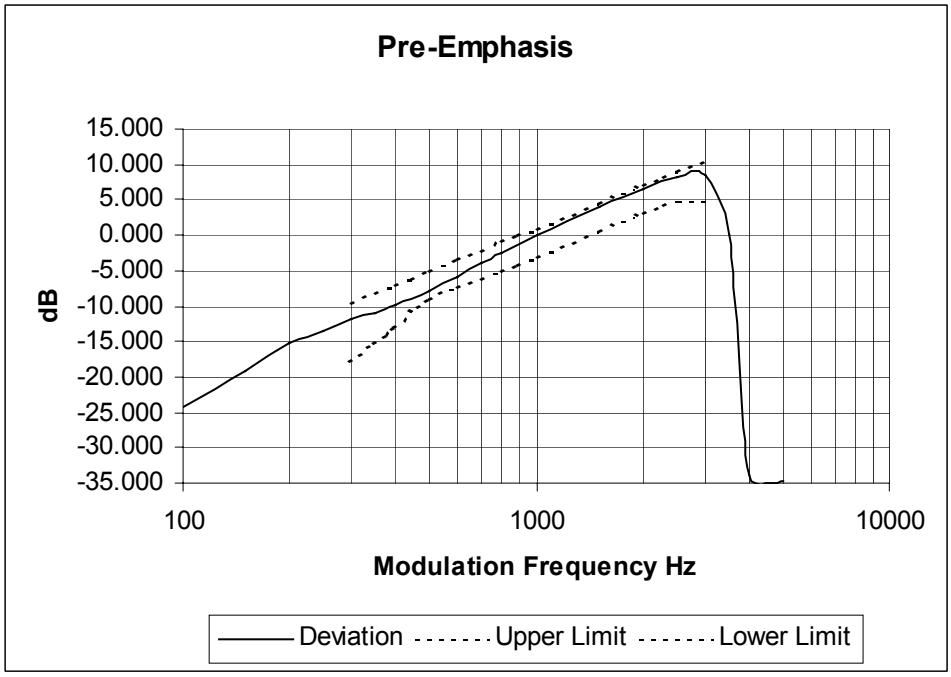
Tx FREQUENCY: 219.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 219.1 MHz 25 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

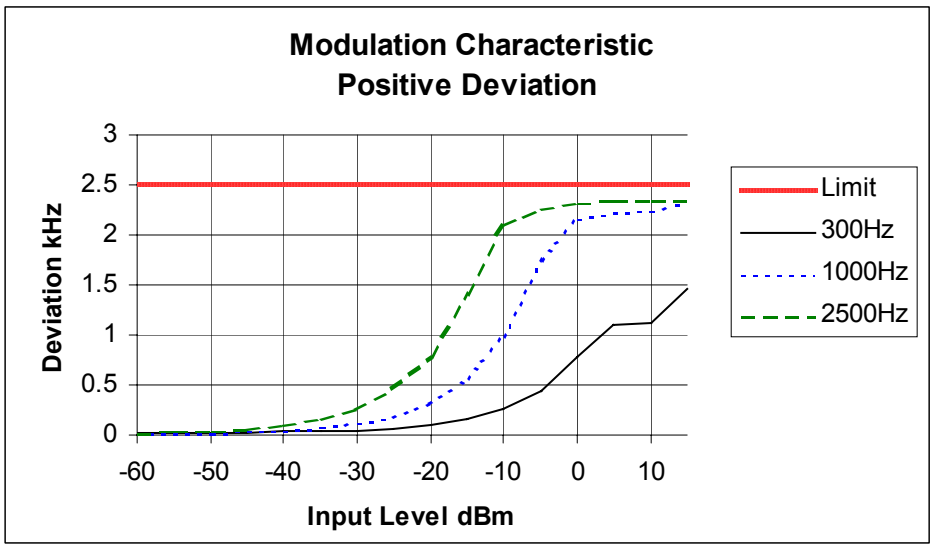
SPECIFICATION: FCC 47 CFR 2.1047 (b)

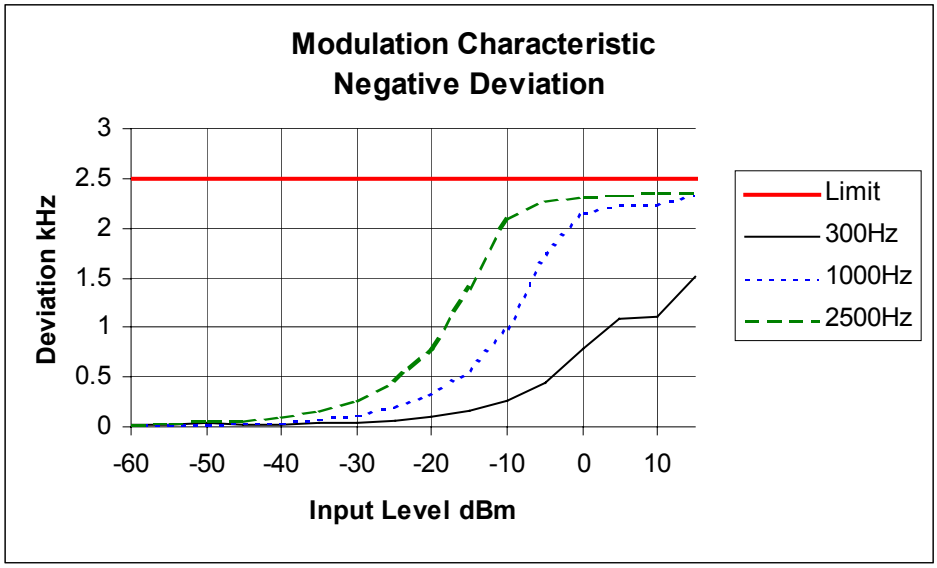
MEASUREMENT PROCEDURE:
1. Refer Appendix A for Equipment set up.
2. The modulation response was measured at three audio frequencies while varying the input level.
3. Measurements were made for both Positive and Negative Deviation.

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

LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

Tx FREQUENCY: 221.5 MHz 12.5 kHz Channel Spacing

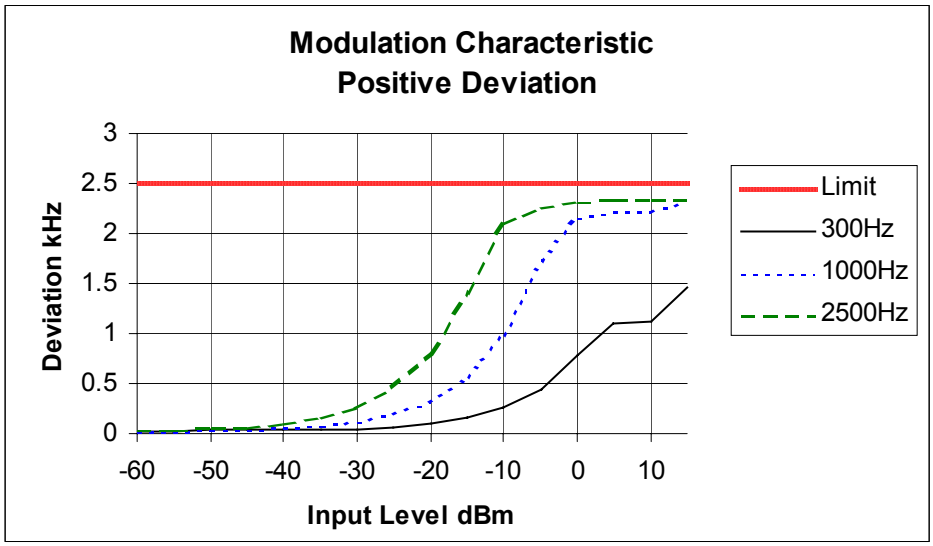


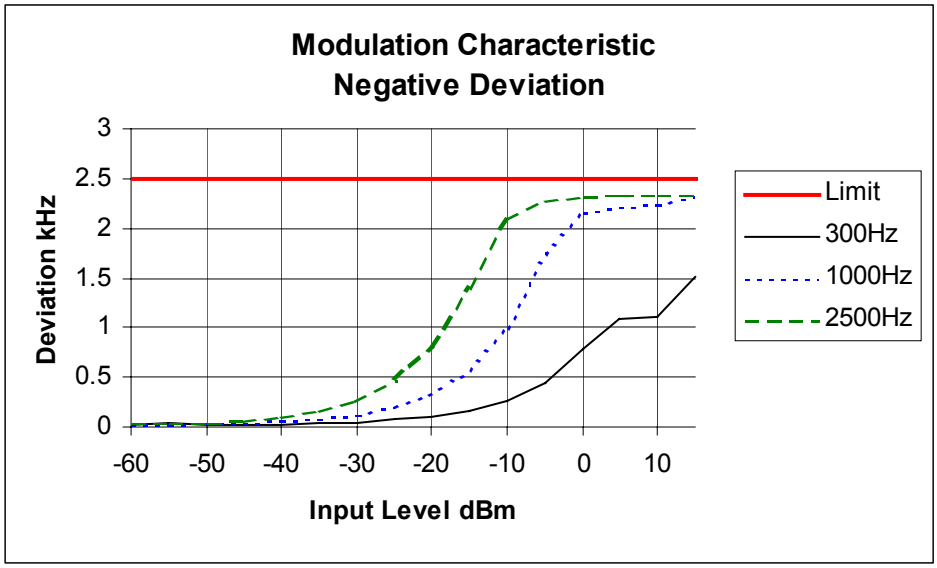


TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 219.1 MHz 12.5 kHz Channel Spacing

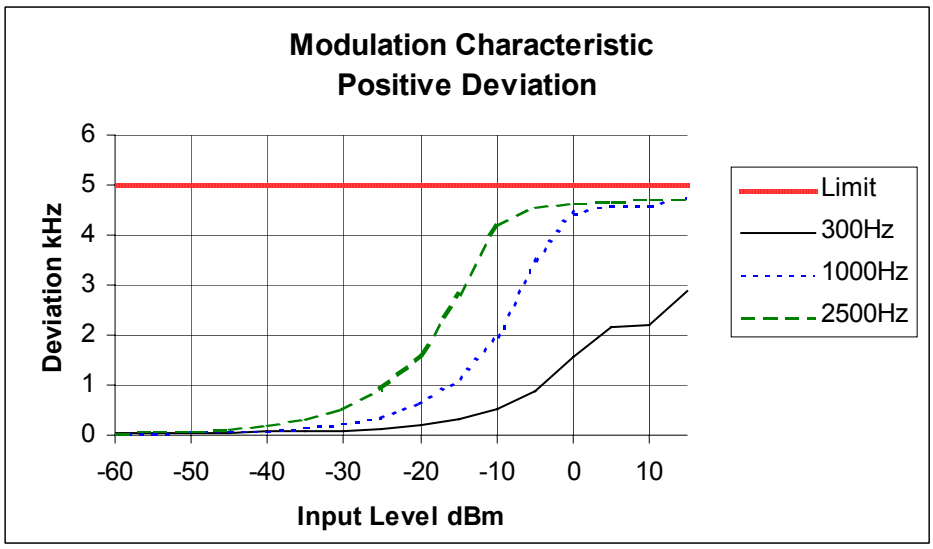


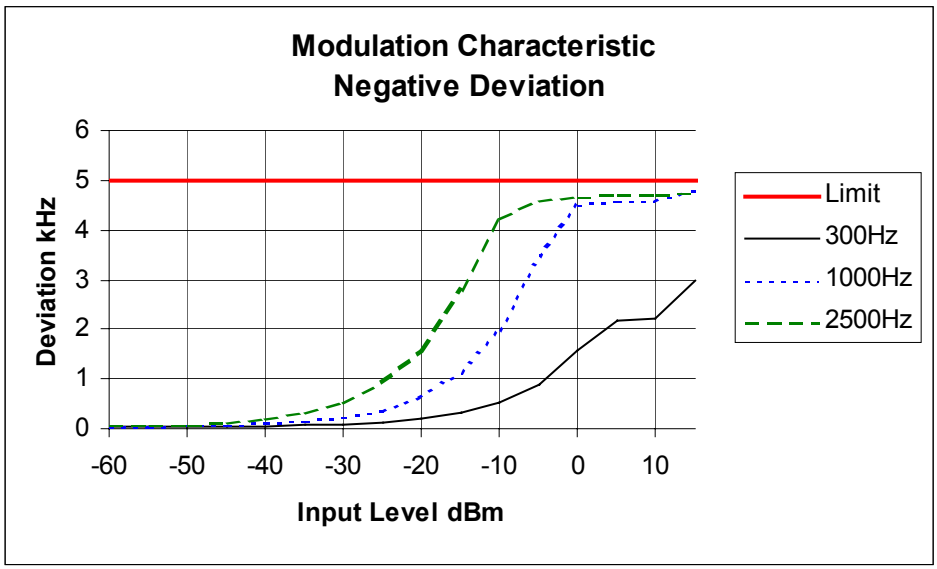


TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 219.1 MHz 25 kHz Channel Spacing





OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)
FCC 47 CFR 90.733 (d), (e)

GUIDE: TIA/EIA-603B 2.2.11

MEASUREMENT PROCEDURE:
1. Refer Appendix 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 externally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as shown on measurement graphs.

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

LIMIT CLAUSE: FCC 47 CFR 90.210

216 – 220 MHz		
Emission Mask D	12.5 kHz Channel Spacing	Analog; FFSK
Emission Mask B	25.0 kHz Channel Spacing	Analog
Emission Mask C	25.0 kHz Channel Spacing	FFSK
220 – 222 MHz		
FCC 47 CFR 90.210(f)		
Emission Mask F x 5 (5 contiguous channels)	12.5 kHz Channel Spacing	Analog; FFSK

DATA SPEED

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

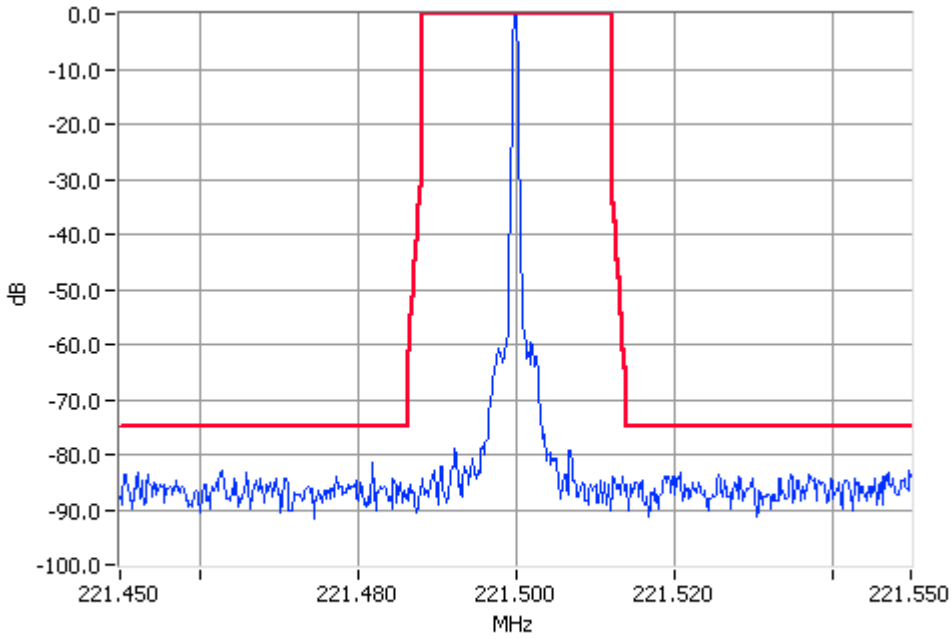
OCCUPIED BANDWIDTH

ANALOGUE VOICE

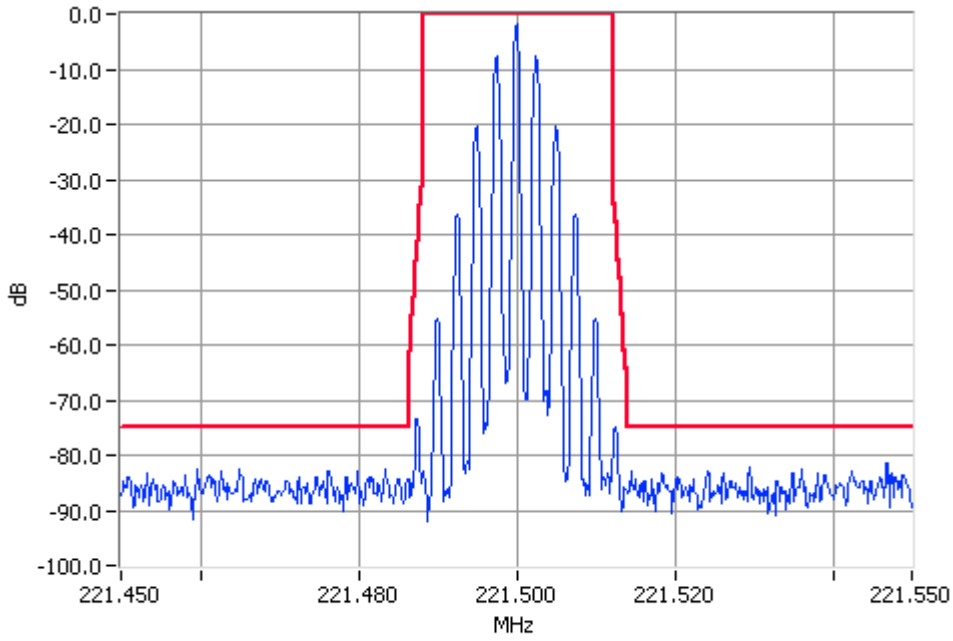
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 221.5 MHz 100 W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 100W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 221.5000MHz Mask Fx5 100W Pass
RBW=300Hz VBW=3000Hz

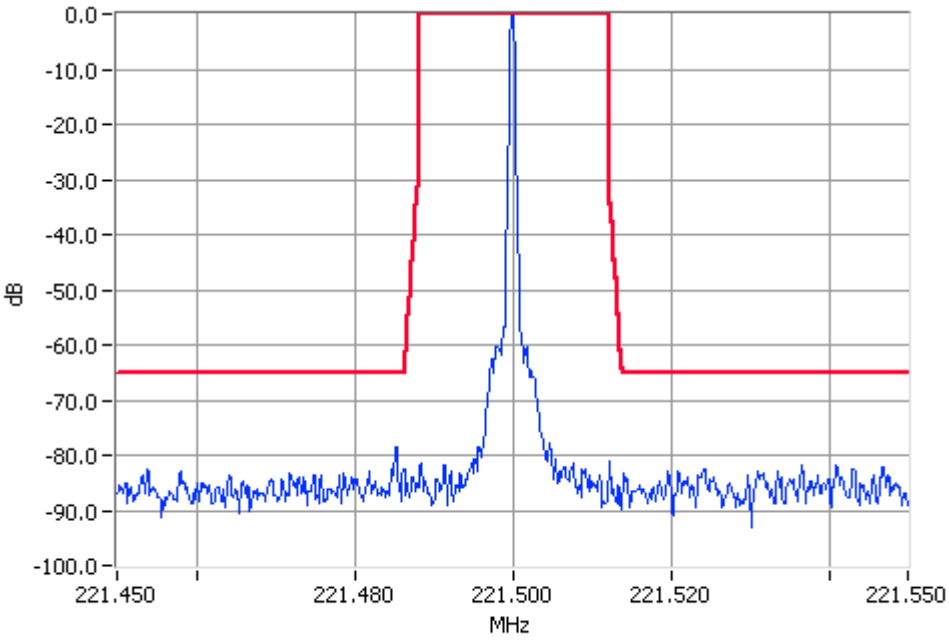
OCCUPIED BANDWIDTH

ANALOGUE VOICE

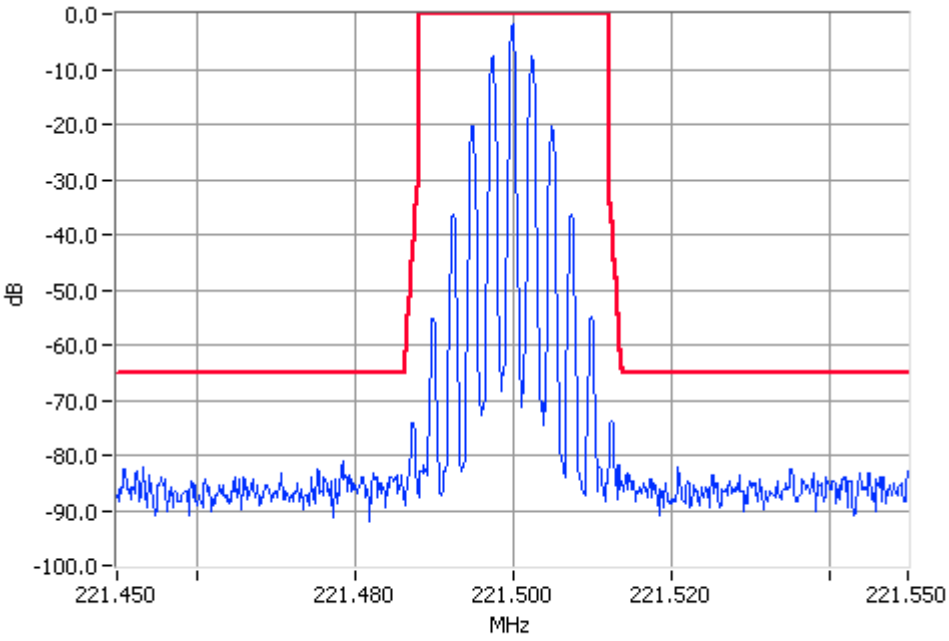
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 221.5 MHz 10W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 10W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 221.5000MHz Mask Fx5 10W Pass
RBW=300Hz VBW=3000Hz

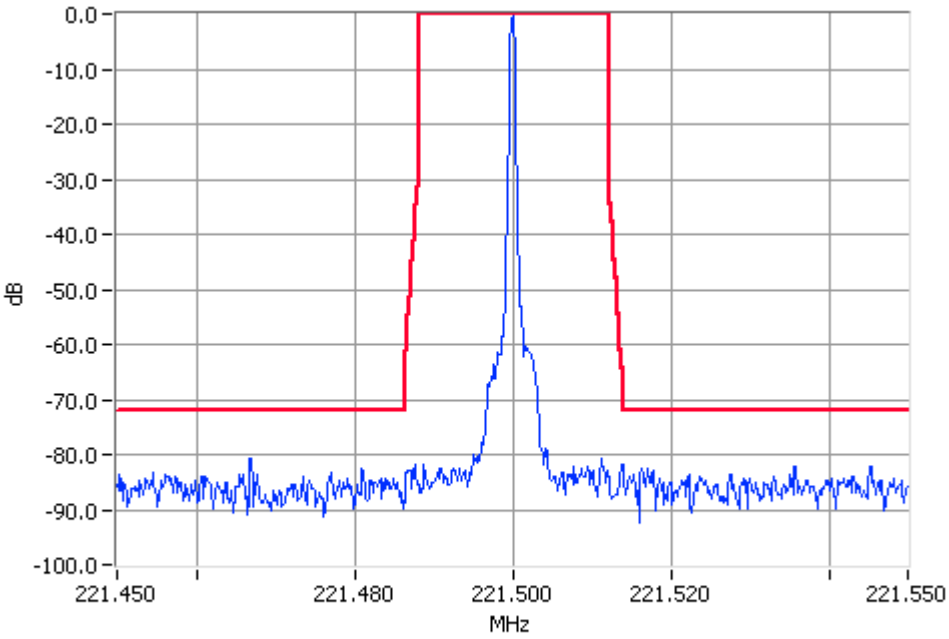
OCCUPIED BANDWIDTH

ANALOGUE VOICE

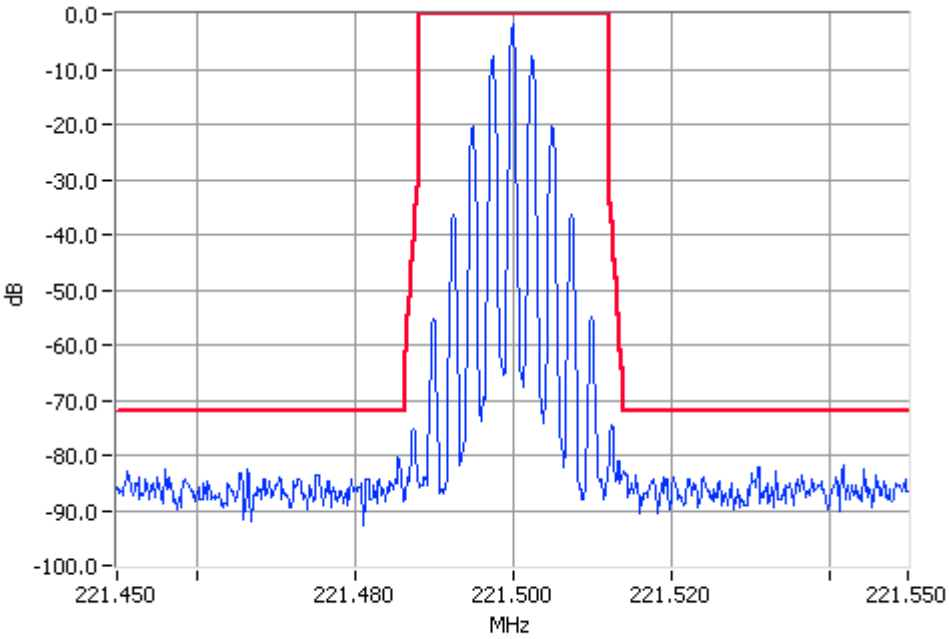
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 221.5 MHz 50 W 12.5 kHz Channel Spacing



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



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

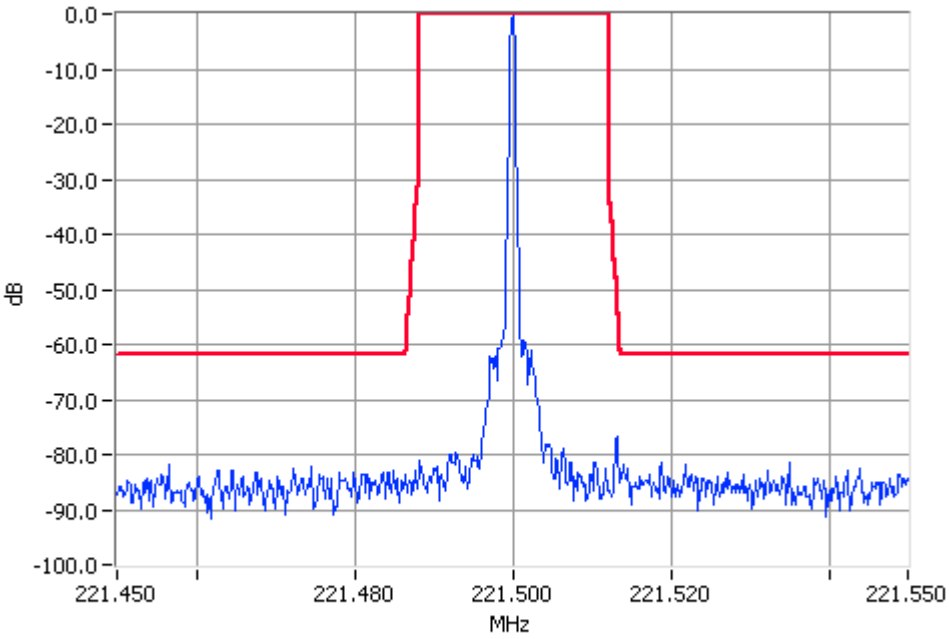
OCCUPIED BANDWIDTH

ANALOGUE VOICE

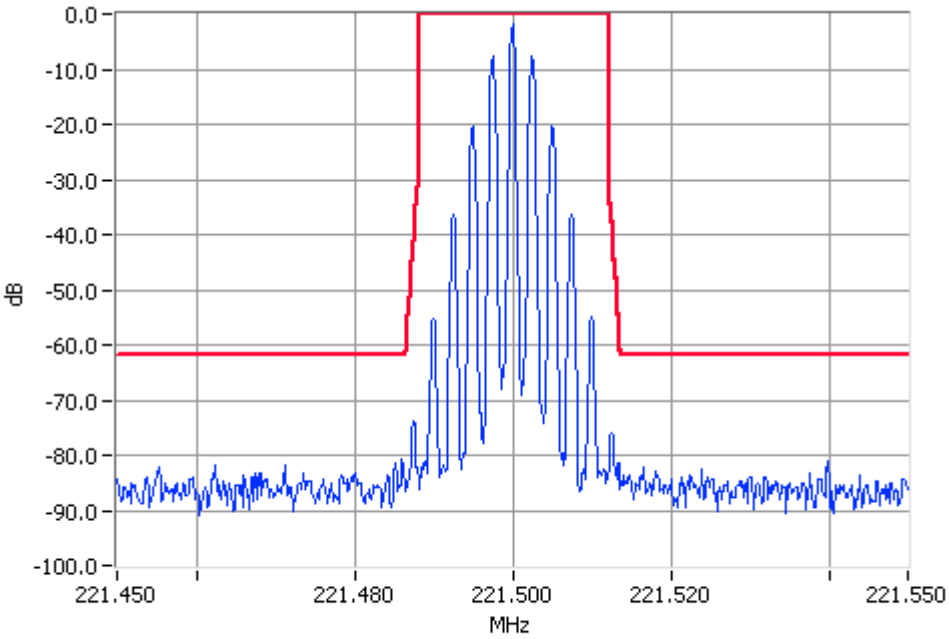
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 221.5 MHz 5W 12.5 kHz Channel Spacing



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



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

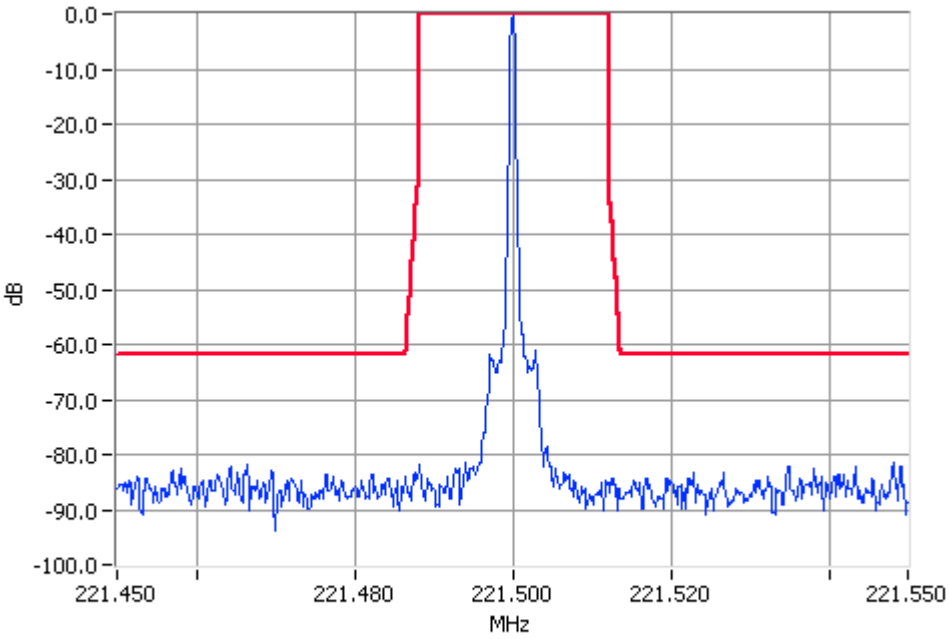
OCCUPIED BANDWIDTH

ANALOGUE VOICE

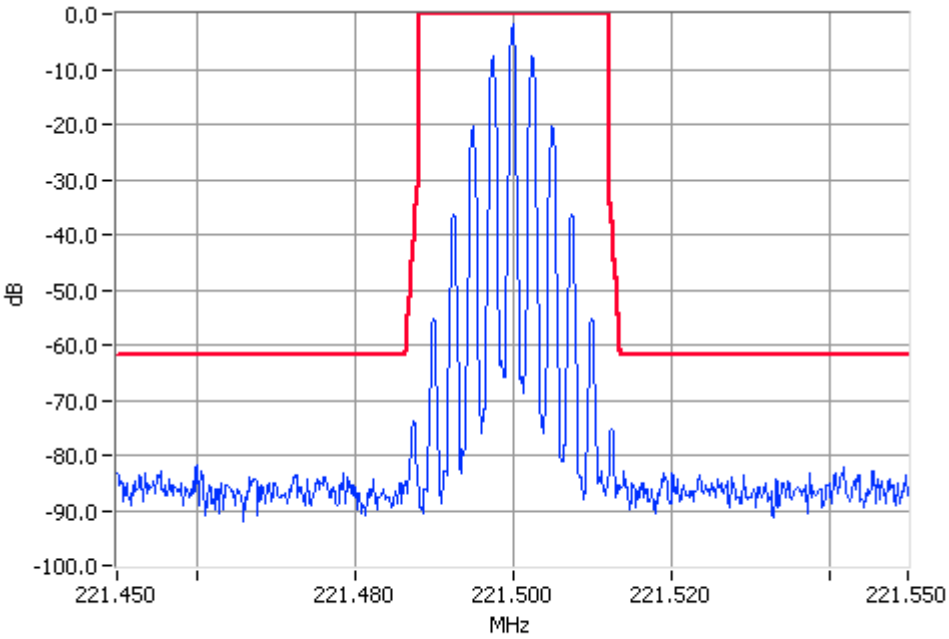
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 221.5 MHz 5 W 12.5 kHz Channel Spacing



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



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

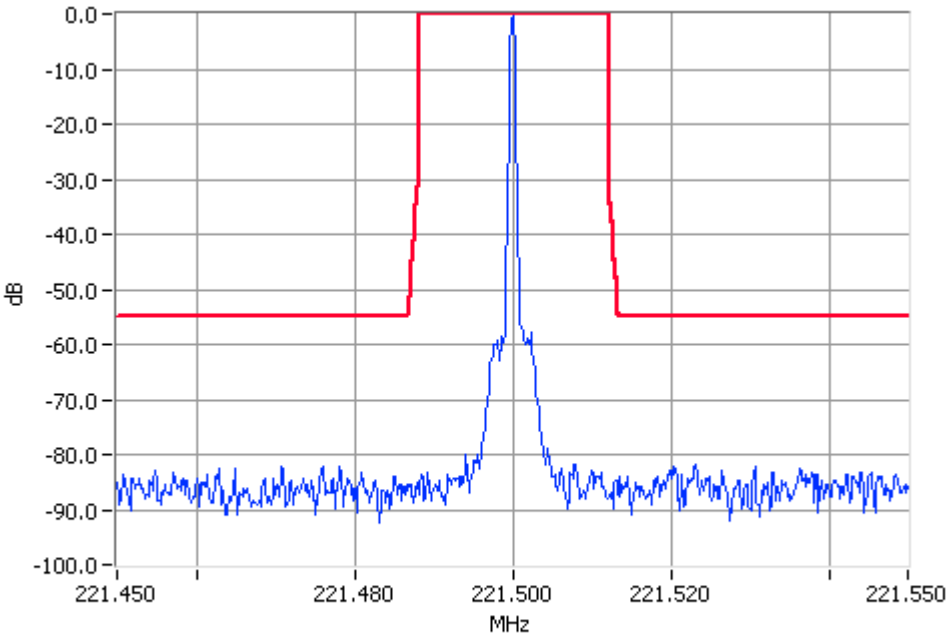
OCCUPIED BANDWIDTH

ANALOGUE VOICE

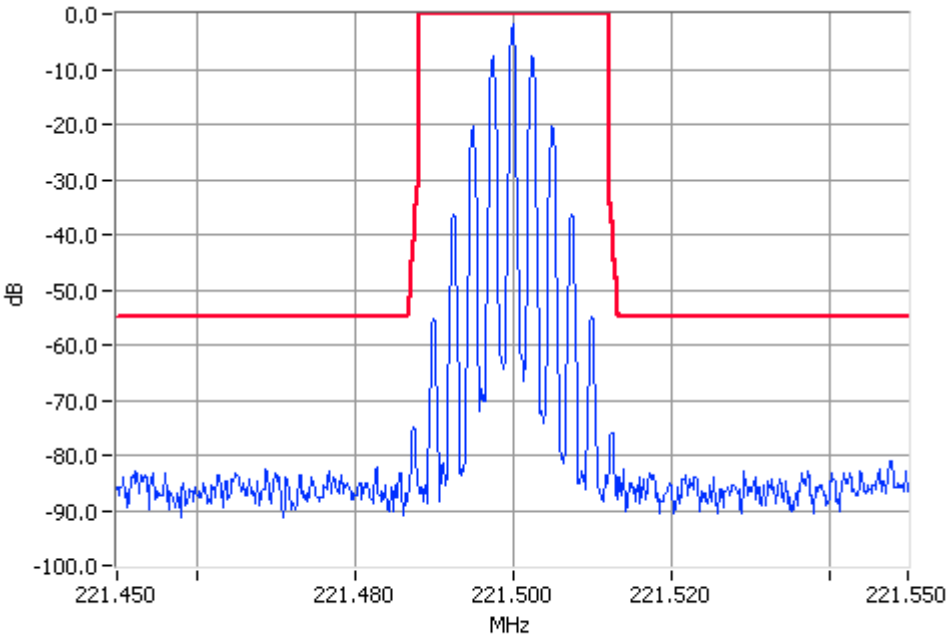
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 1W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 221.5000MHz Mask Fx5 1W Pass
RBW=300Hz VBW=3000Hz

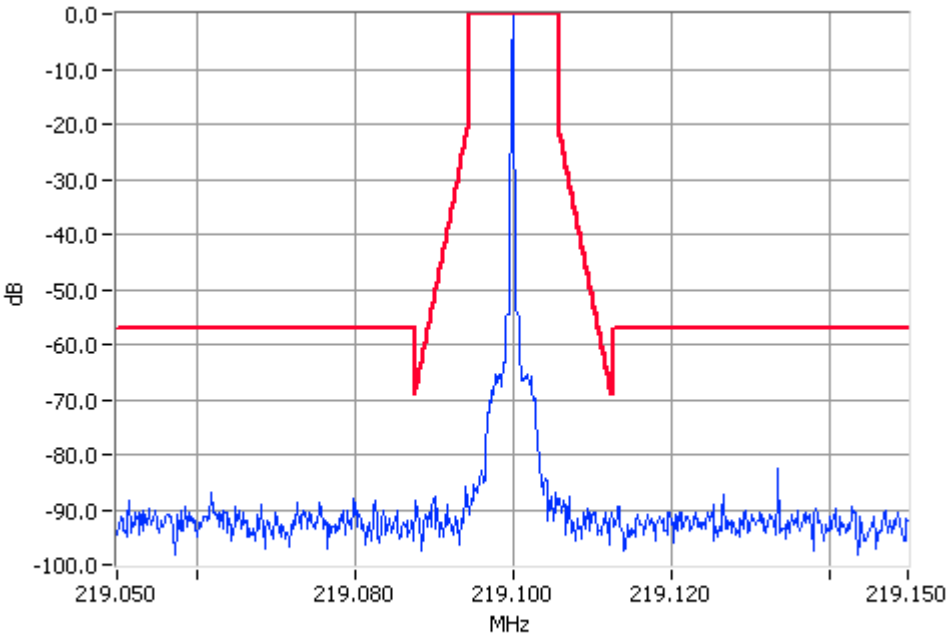
OCCUPIED BANDWIDTH

ANALOGUE VOICE

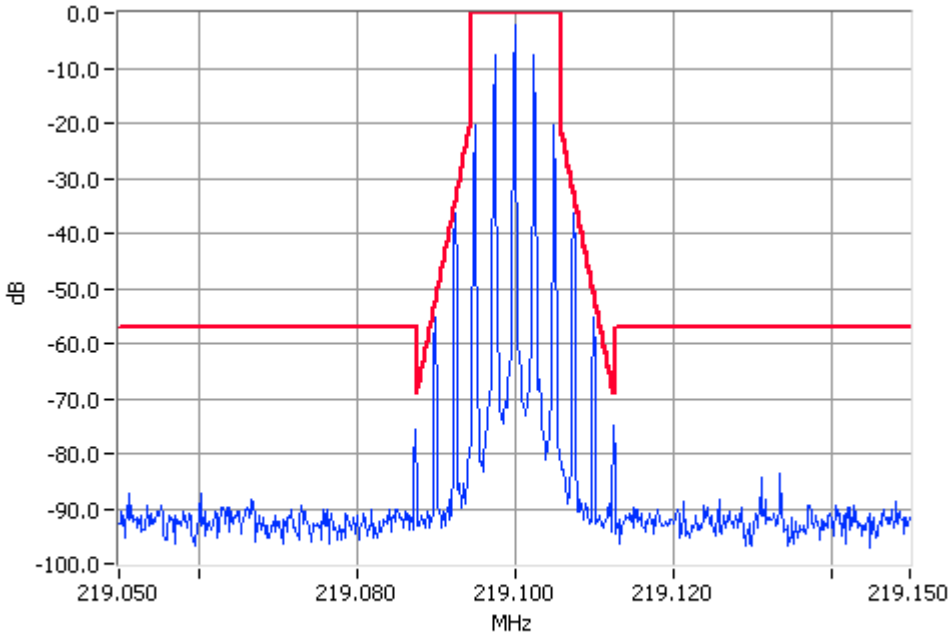
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 5 W 12.5 kHz Channel Spacing



Unmodulated 219.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 219.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

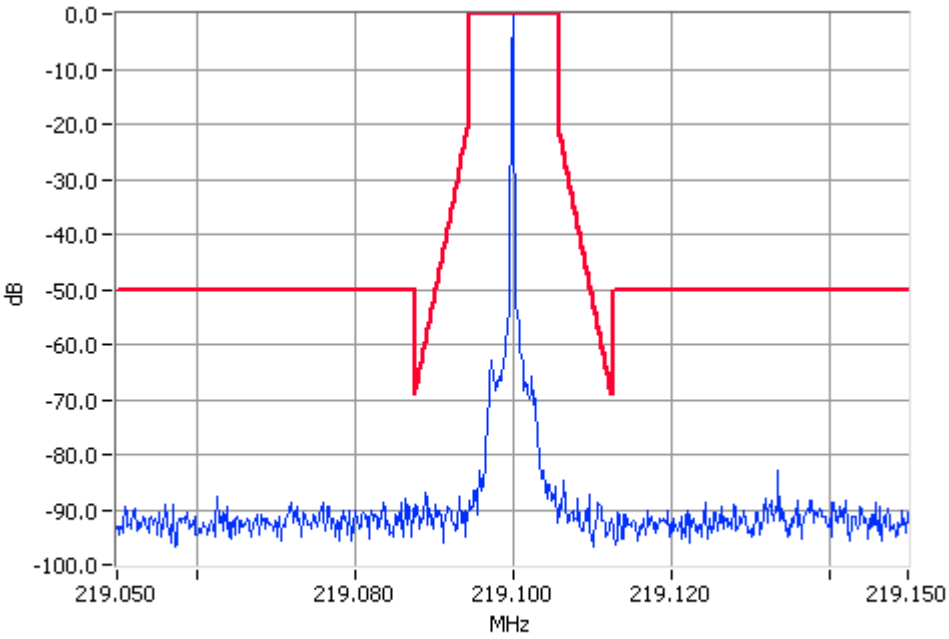
OCCUPIED BANDWIDTH

ANALOGUE VOICE

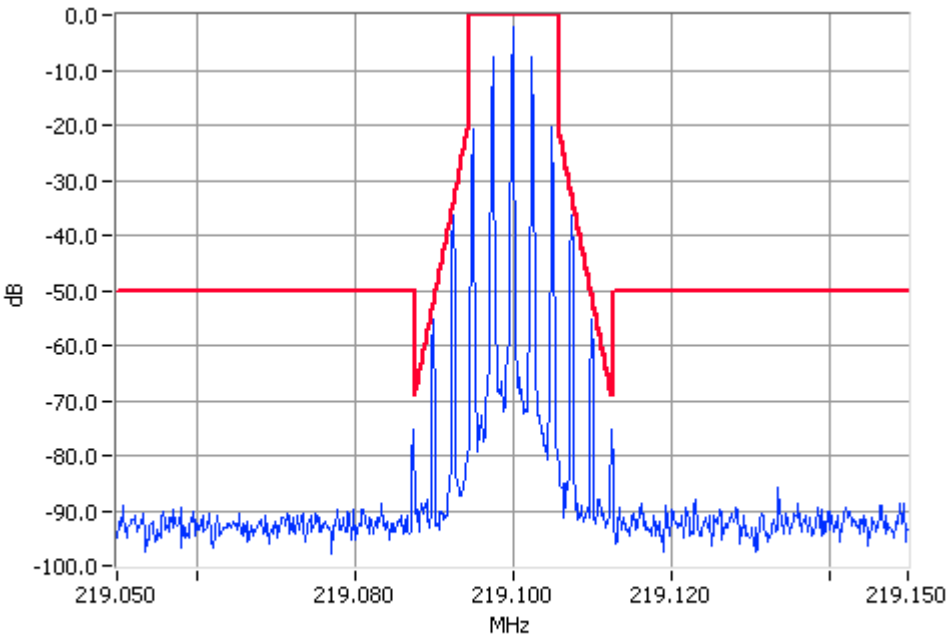
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

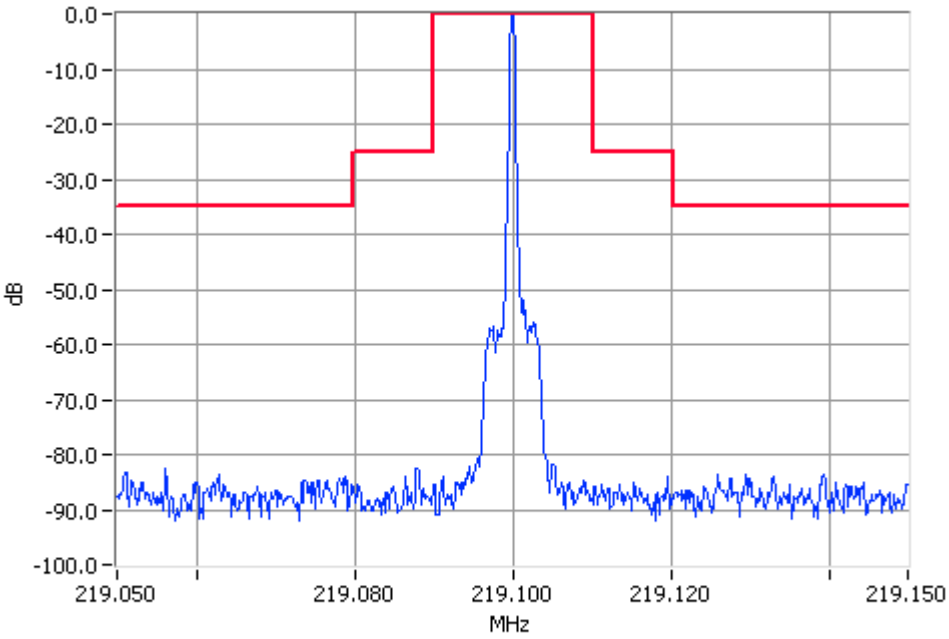
OCCUPIED BANDWIDTH

ANALOGUE VOICE

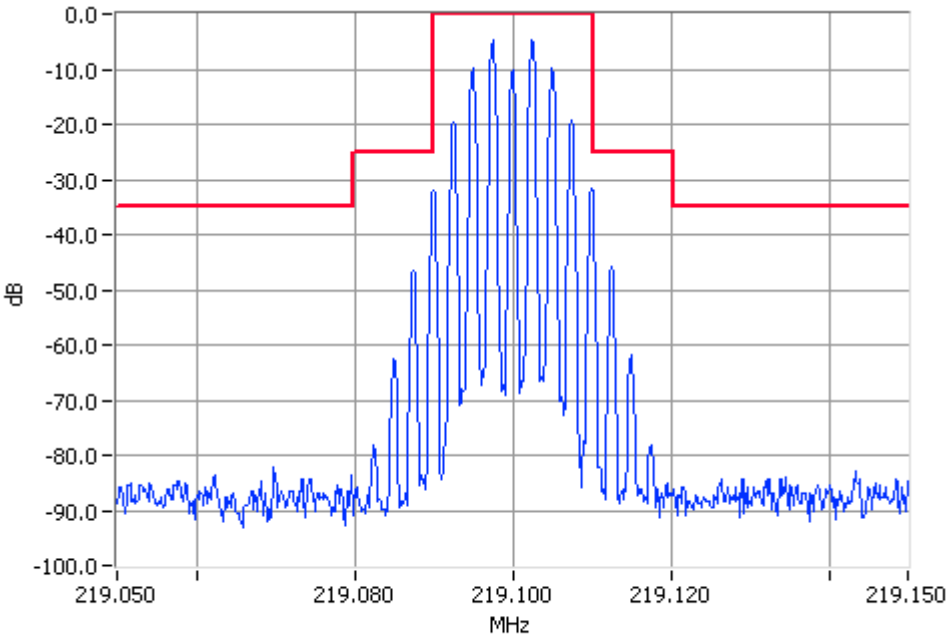
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 5 W 25 kHz Channel Spacing



Unmodulated 219.1000MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 219.1000MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz

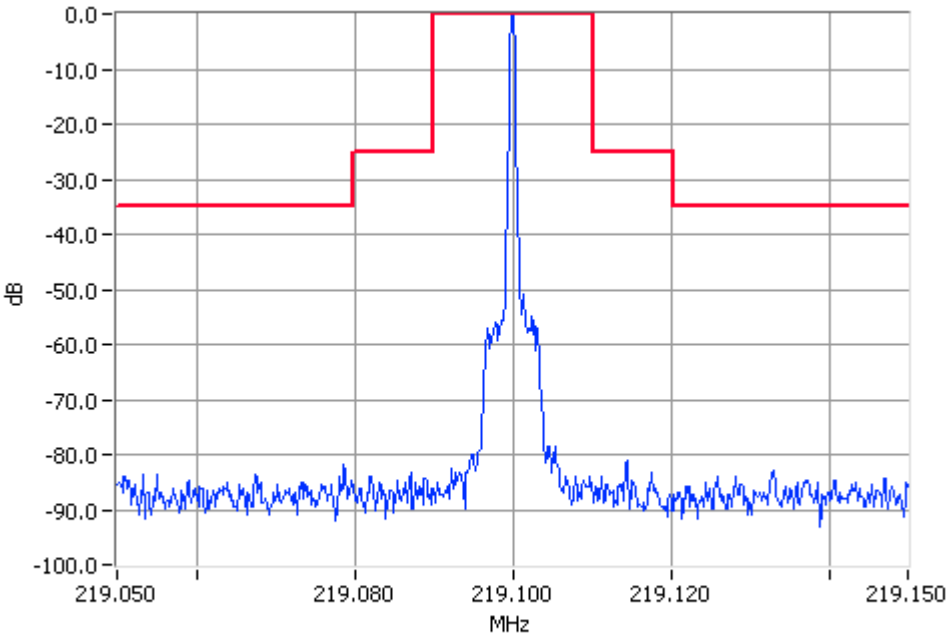
OCCUPIED BANDWIDTH

ANALOGUE VOICE

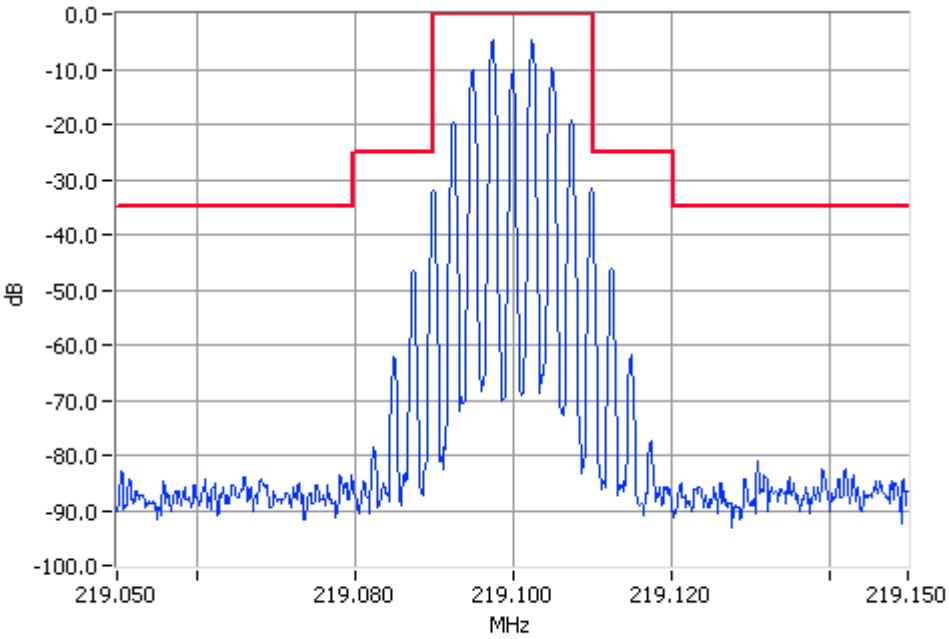
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 1W 25 kHz Channel Spacing



Unmodulated 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

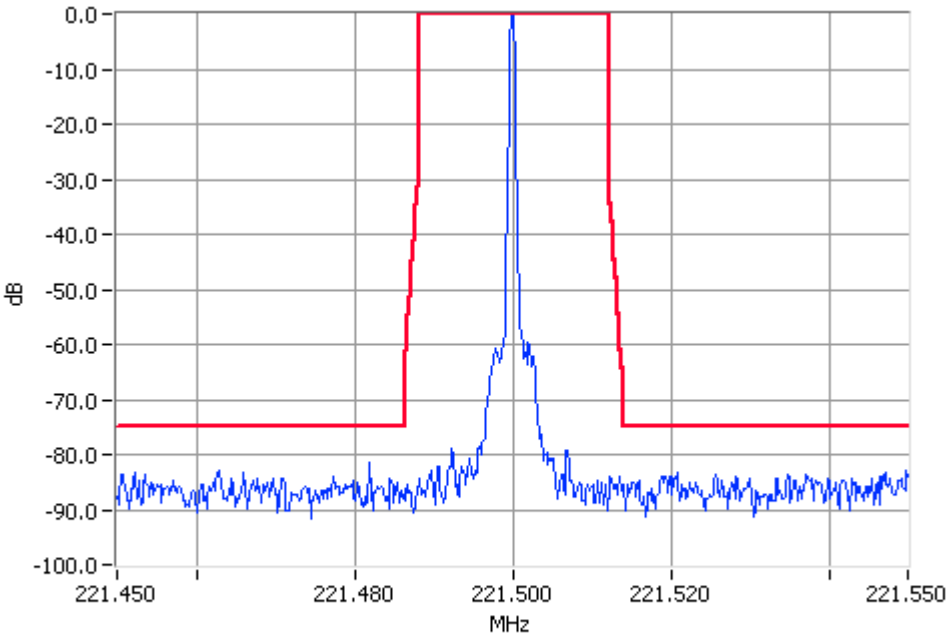
OCCUPIED BANDWIDTH

FFSK

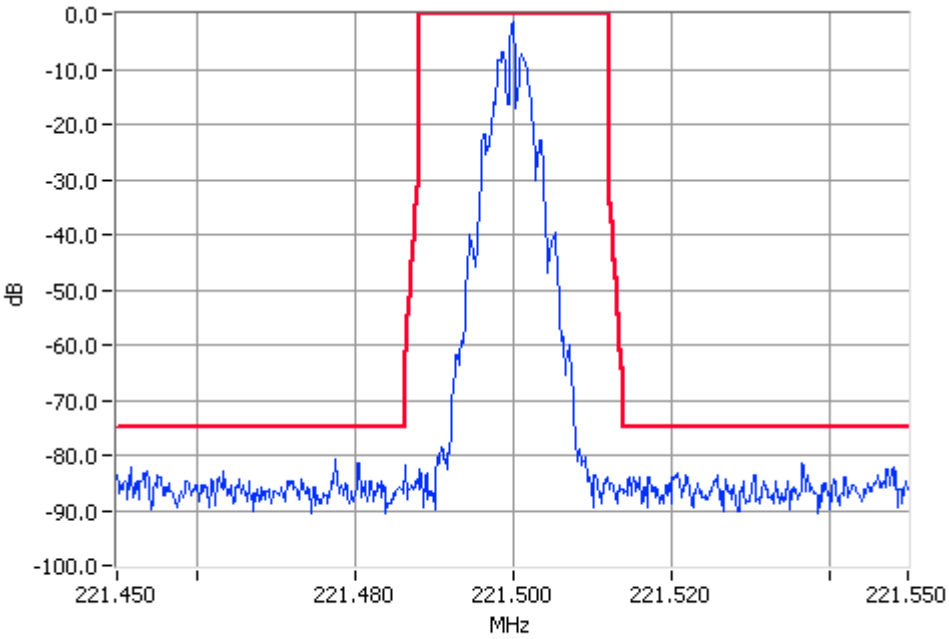
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 221.5 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 100W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 221.5000MHz Mask Fx5 100W Pass
RBW=300Hz VBW=3000Hz

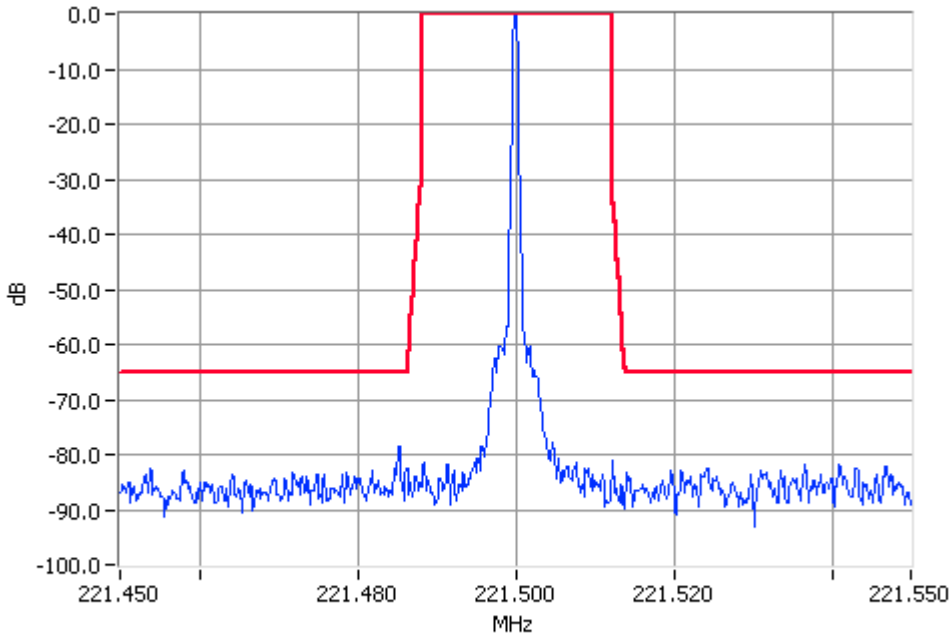
OCCUPIED BANDWIDTH

FFSK

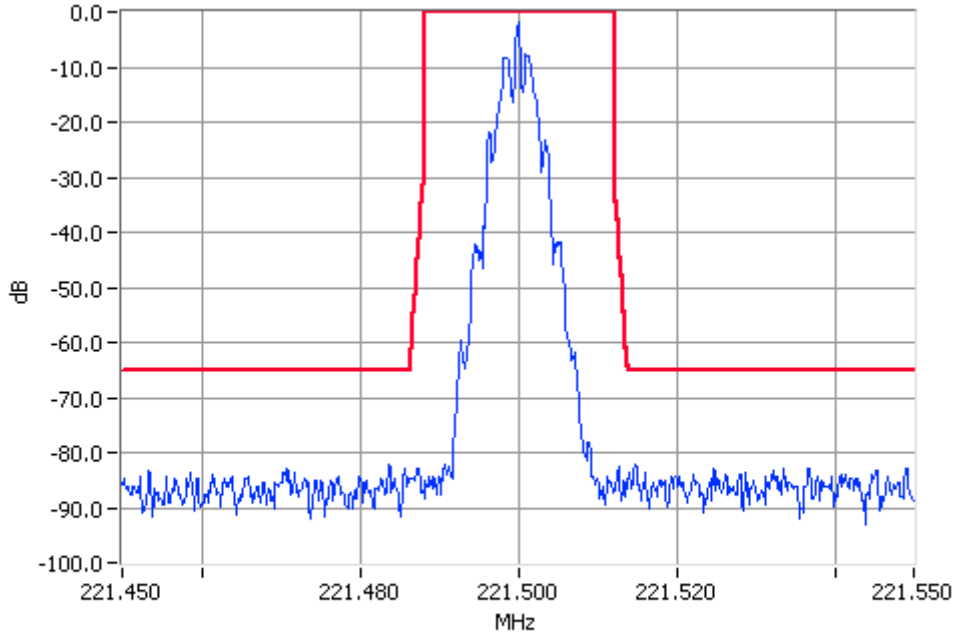
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 221.5 MHz 10W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 10W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 221.5000MHz Mask Fx5 10W Pass
RBW=300Hz VBW=3000Hz

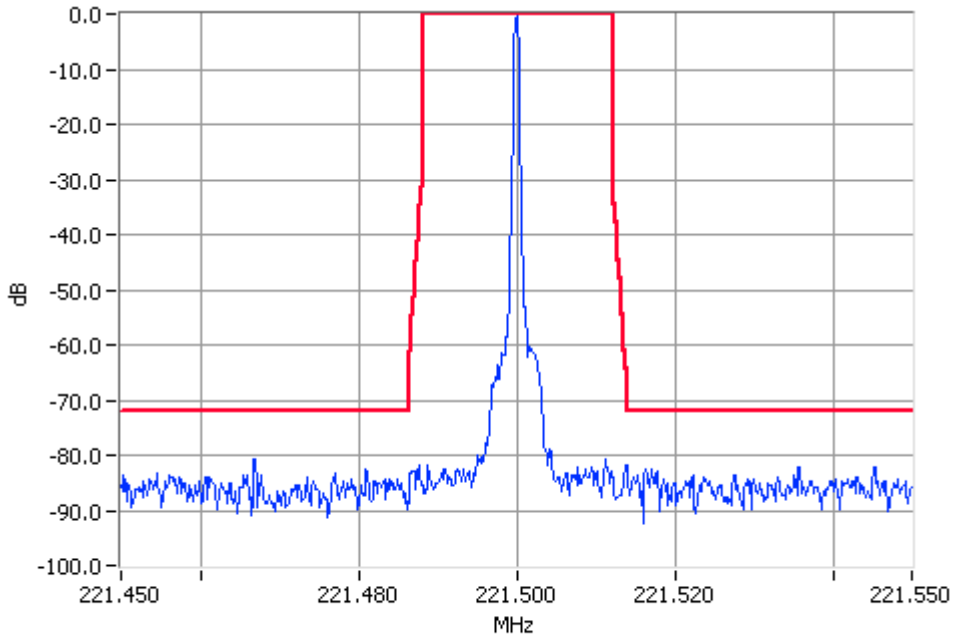
OCCUPIED BANDWIDTH

FFSK

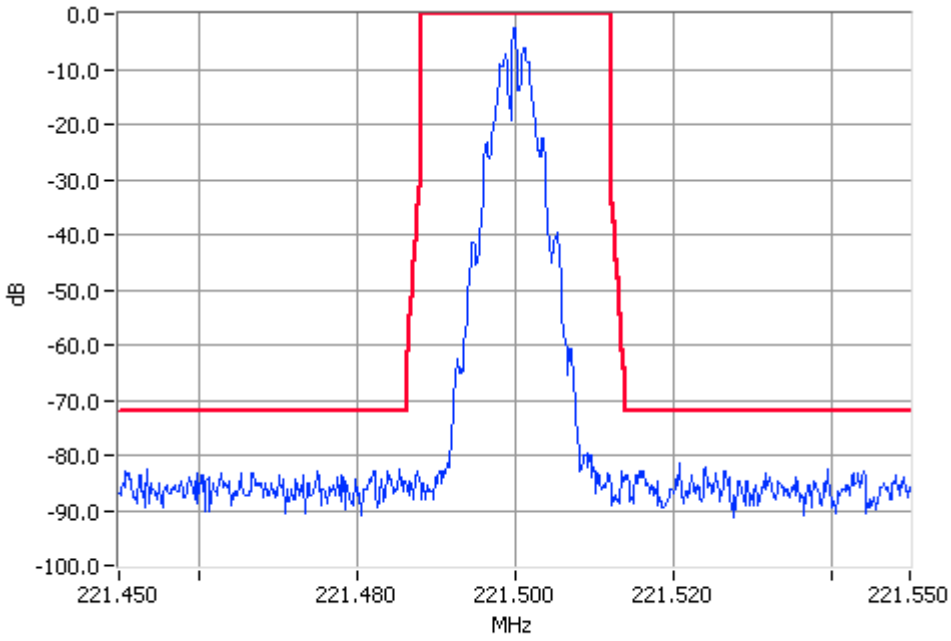
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 221.5 MHz 50W 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

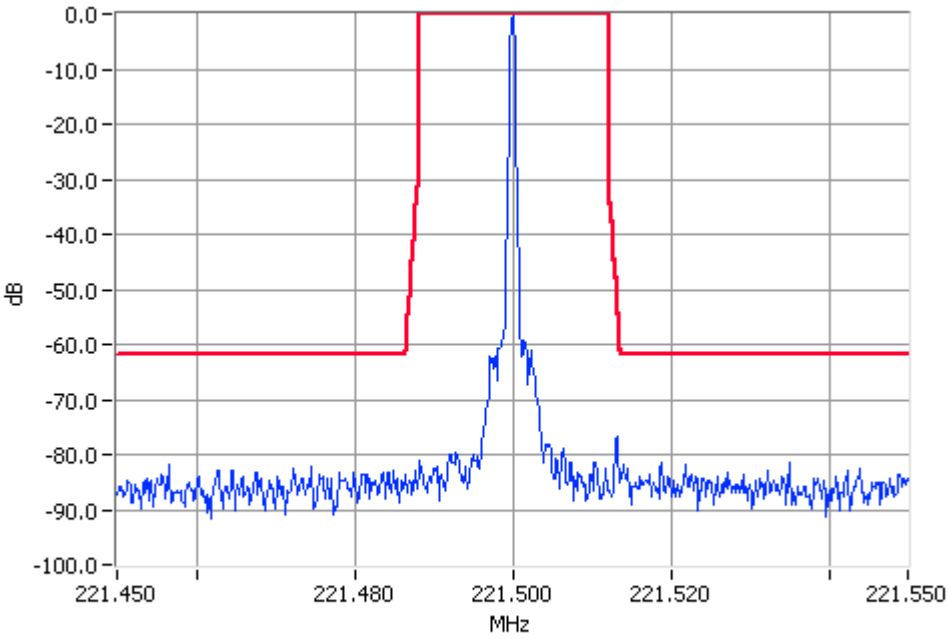
OCCUPIED BANDWIDTH

FFSK

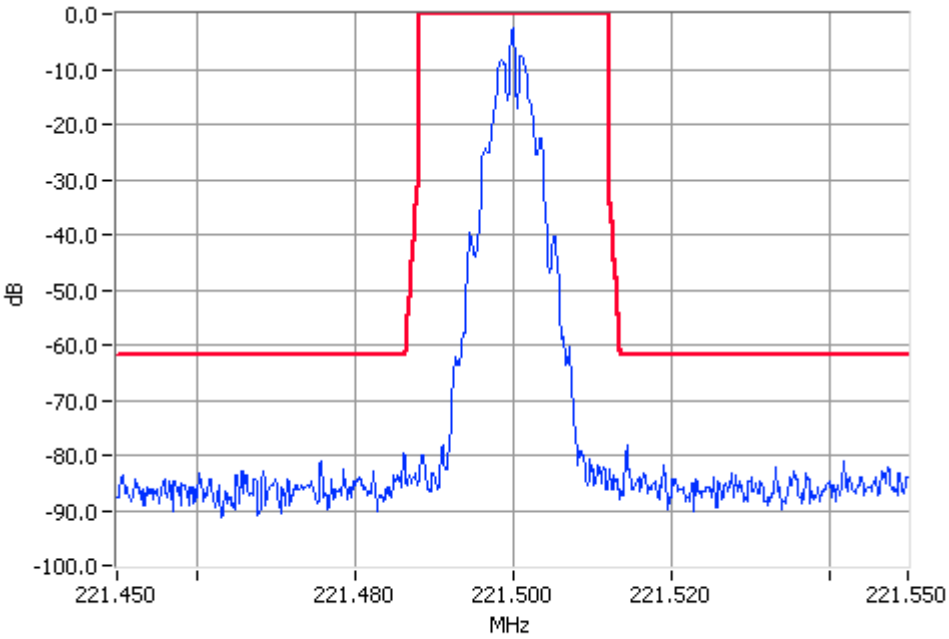
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 221.5 MHz 5W 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

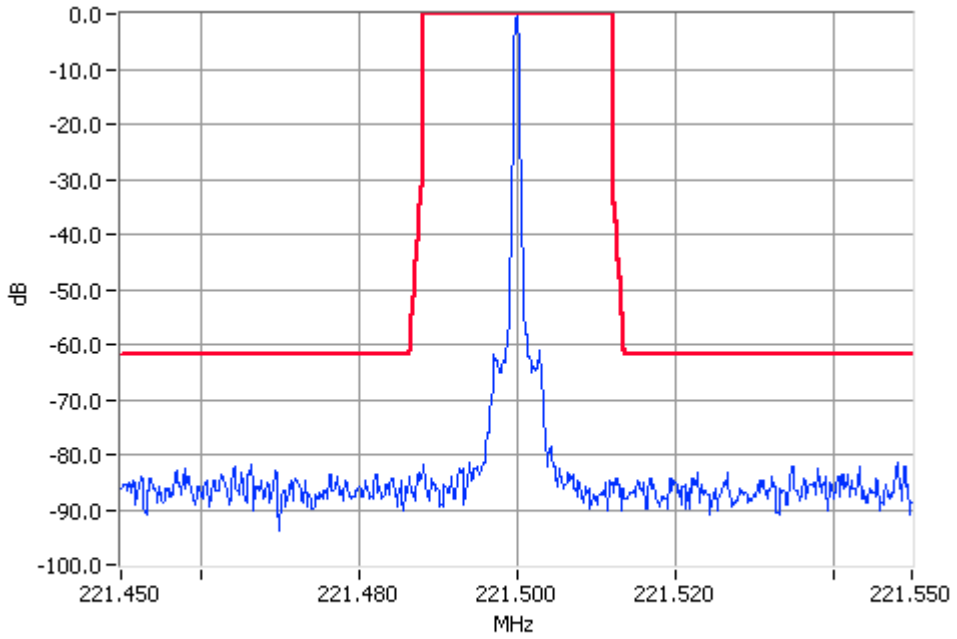
OCCUPIED BANDWIDTH

FFSK

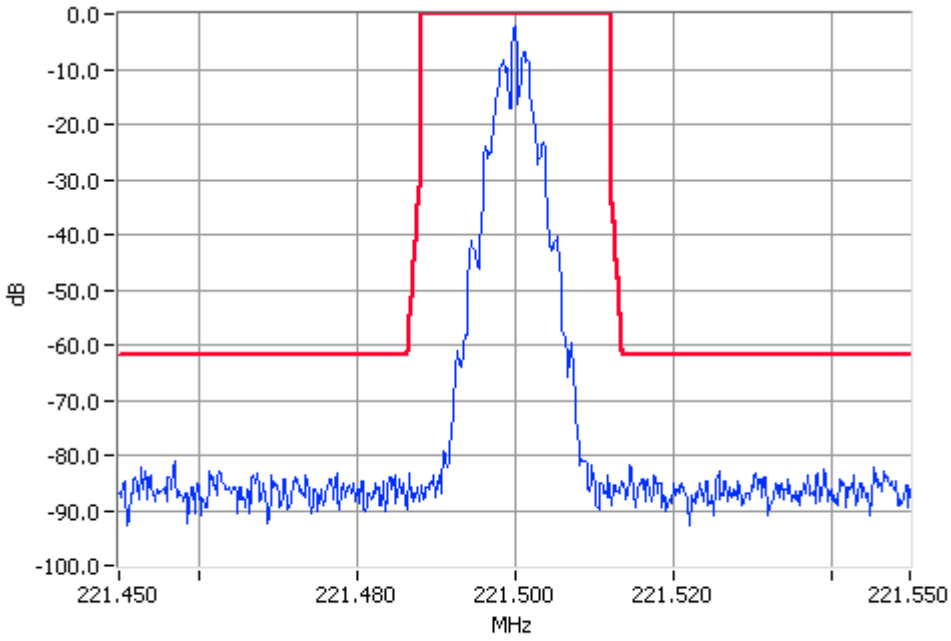
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

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

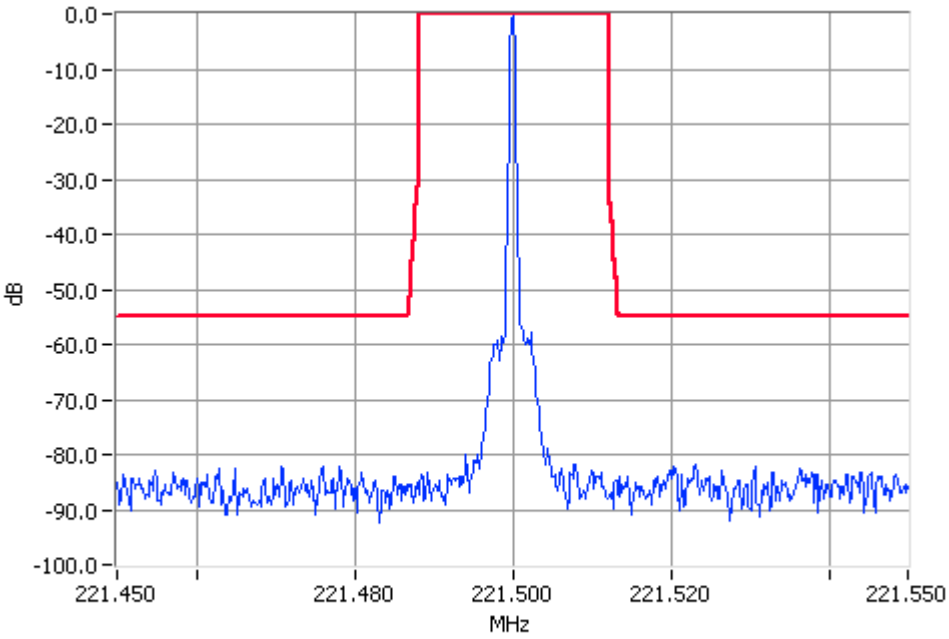
OCCUPIED BANDWIDTH

FFSK

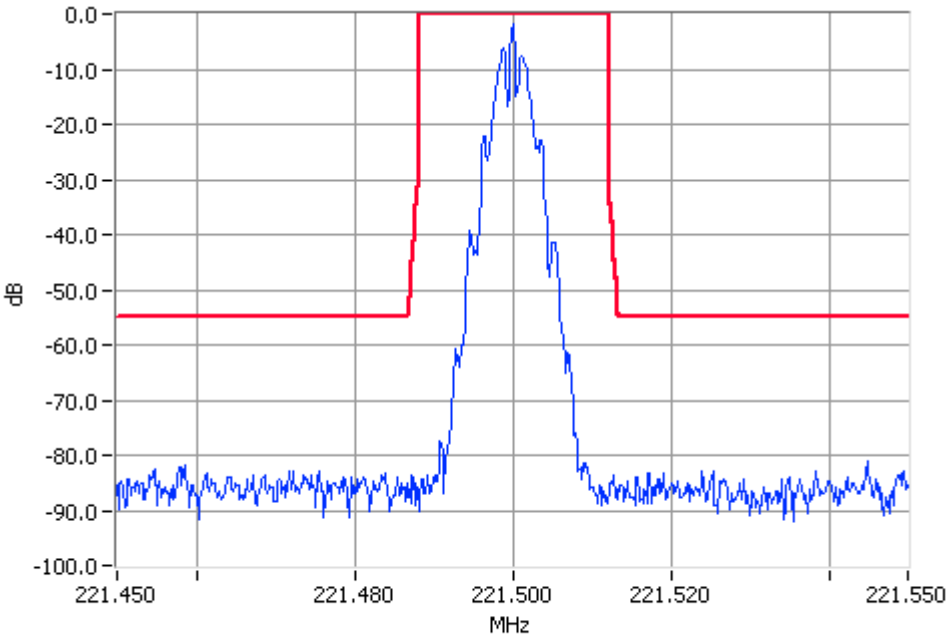
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 221.5000MHz Mask Fx5 1W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 221.5000MHz Mask Fx5 1W Pass
RBW=300Hz VBW=3000Hz

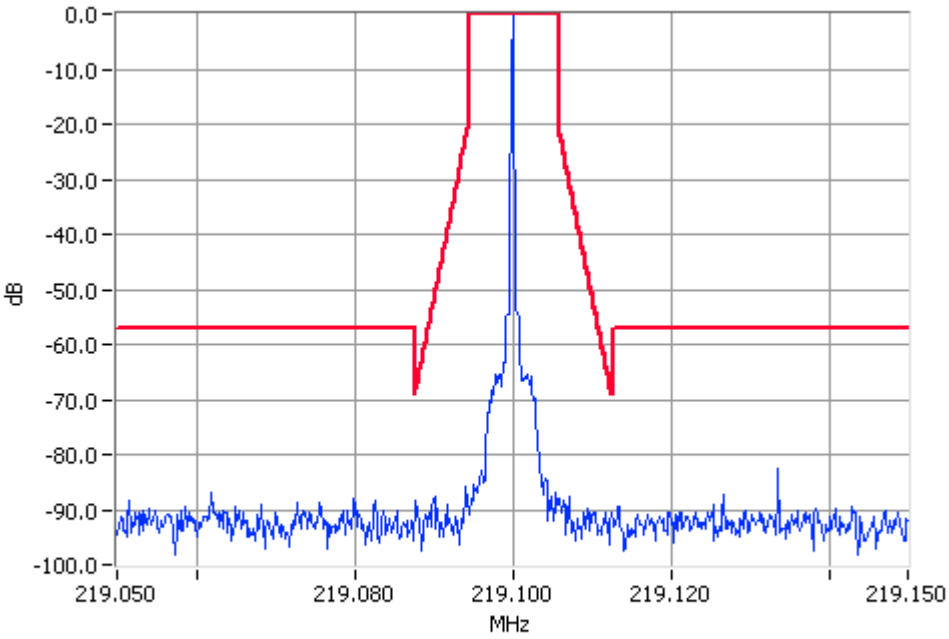
OCCUPIED BANDWIDTH

FFSK

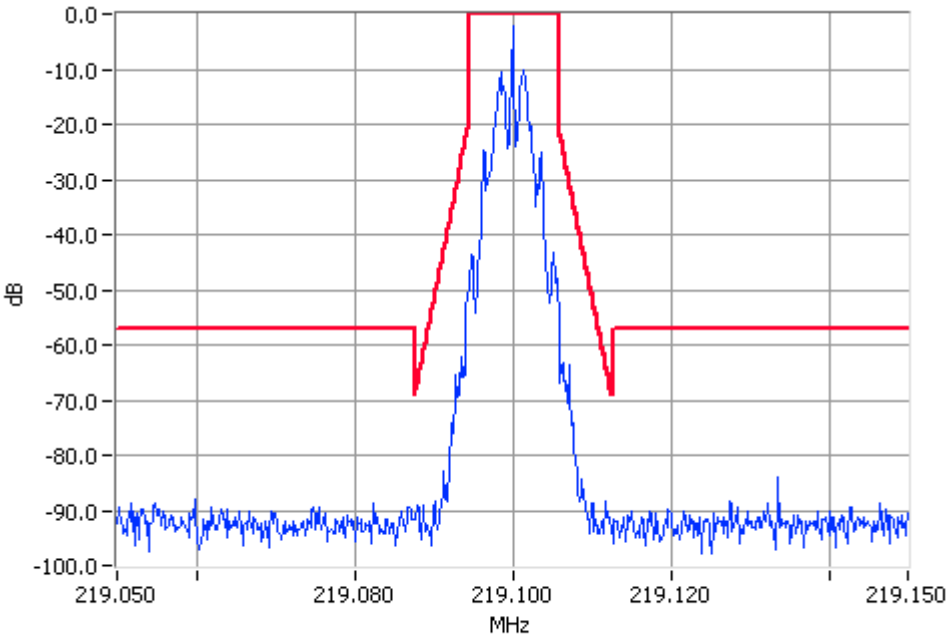
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 5 W 12.5 kHz Channel Spacing



Unmodulated 219.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 219.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

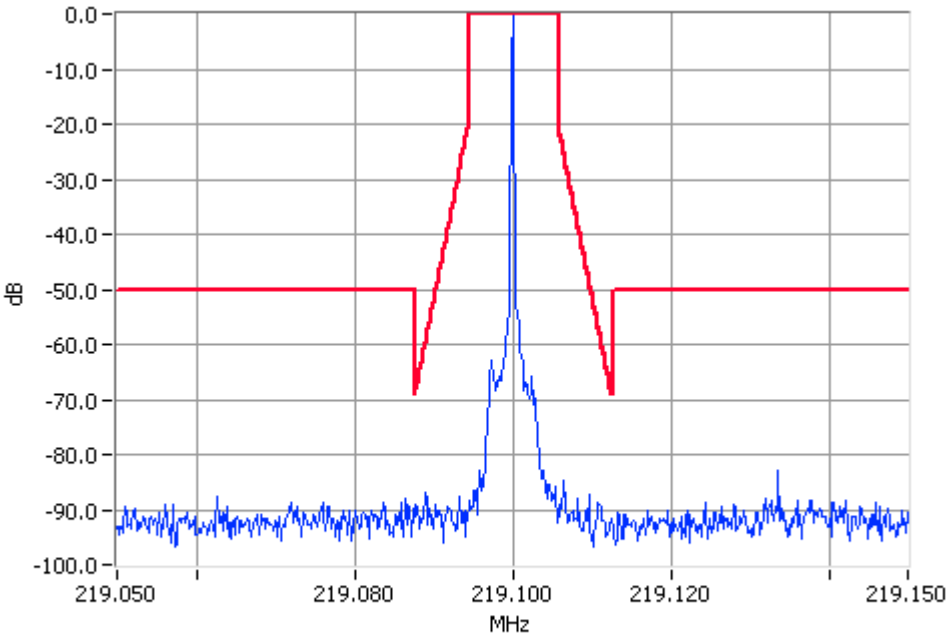
OCCUPIED BANDWIDTH

FFSK

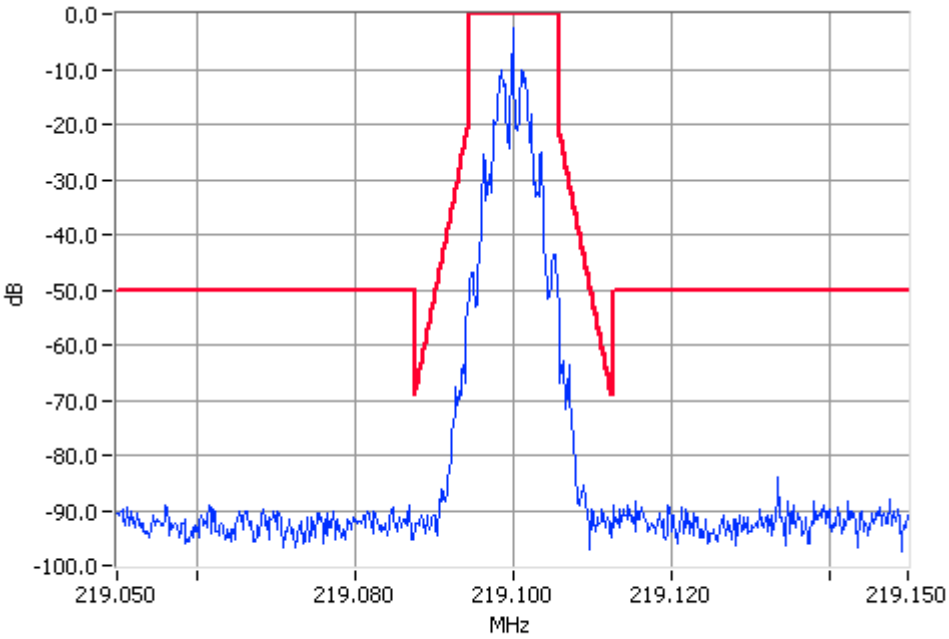
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

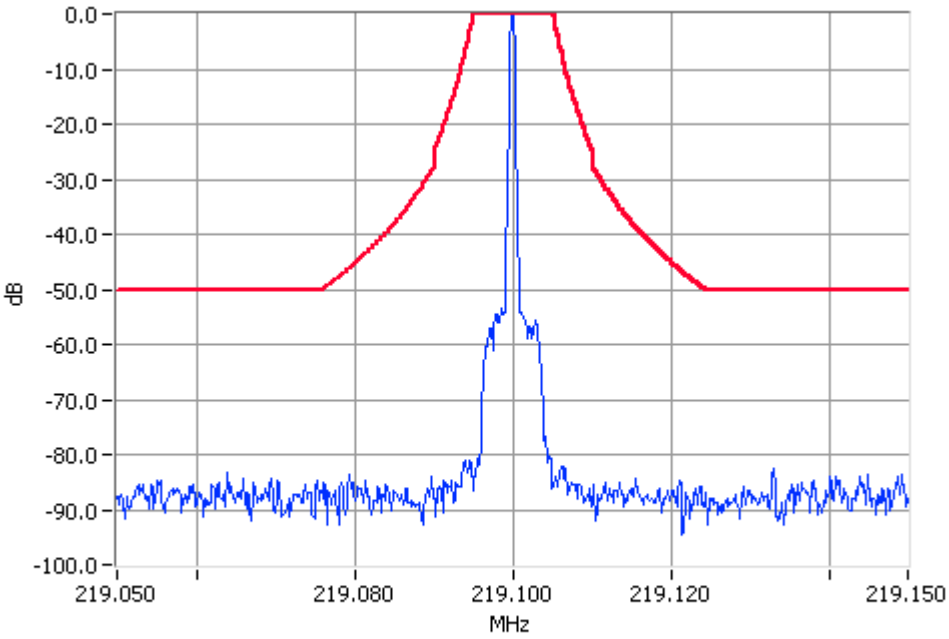
OCCUPIED BANDWIDTH

FFSK

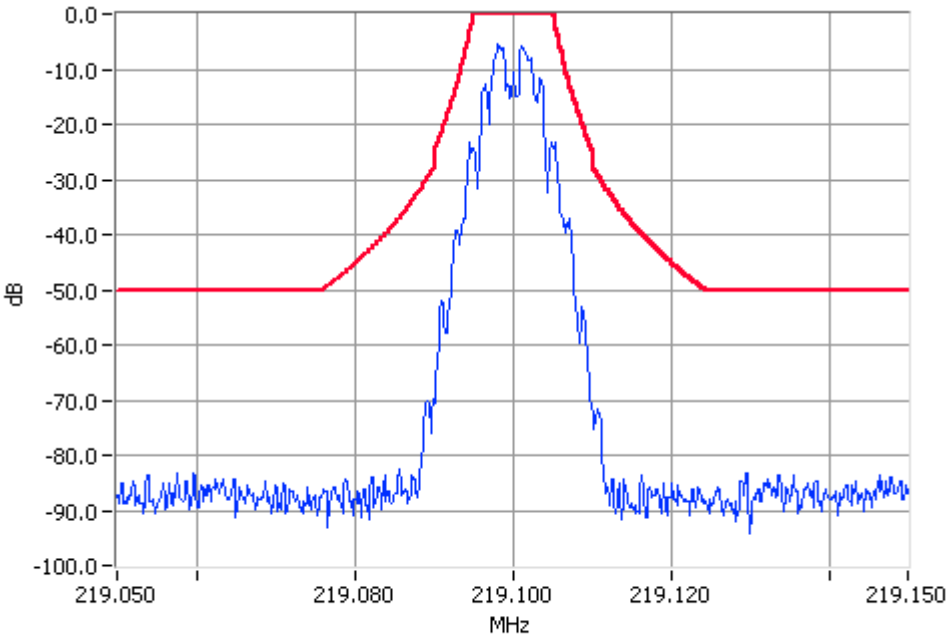
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 5 W 25 kHz Channel Spacing



Unmodulated 219.1000MHz Mask C 5W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 219.1000MHz Mask C 5W Pass
RBW=300Hz VBW=3000Hz

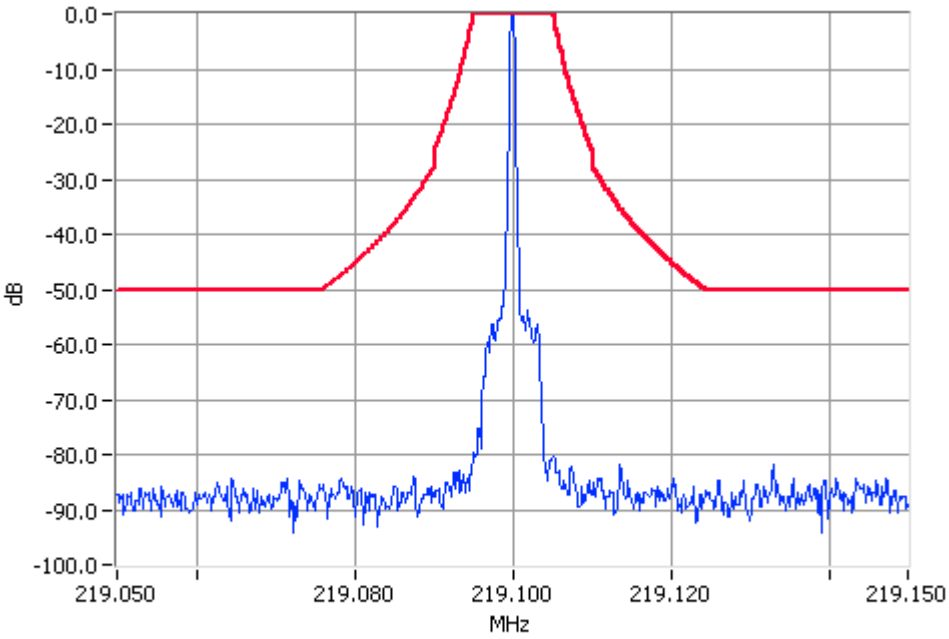
OCCUPIED BANDWIDTH

FFSK

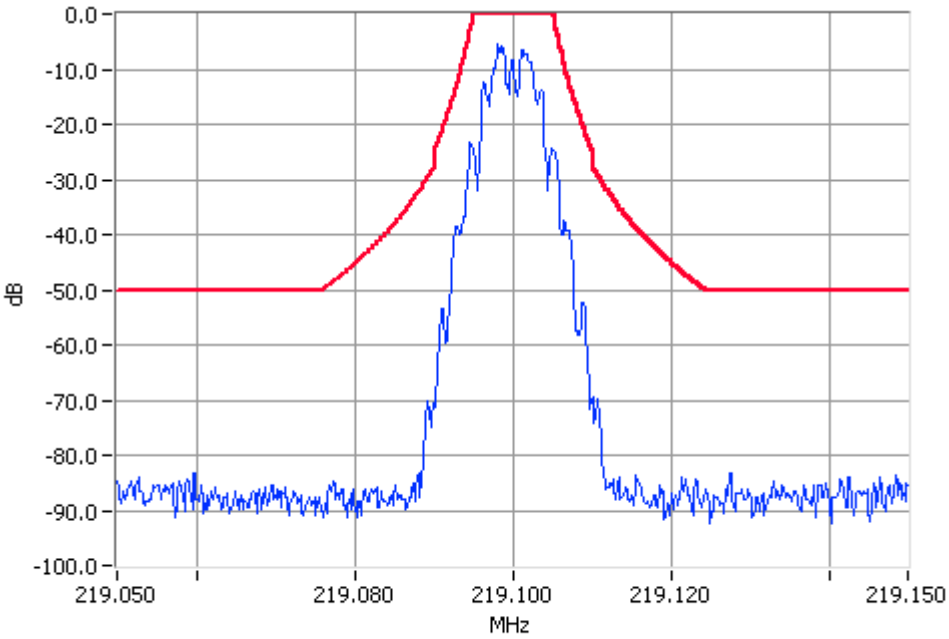
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 219.1 MHz 1W 25 kHz Channel Spacing



Unmodulated 219.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 219.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1051

GUIDE: TIA/EIA-603B 2.2.13

MEASUREMENT PROCEDURE:

1. Refer Appendix 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^{th} Harmonic: 100kHz to Fc-BW
   Fc+BW to 4.7 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 30kHz.
4. Spurious emissions which were attenuated more than 20dB 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

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	221.5 MHz @ 100 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
100 W	-25 dBm	75 dBc
10 W	-25 dBm	65 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing 221.5 MHz @ 10 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
100 W	-25 dBm	75 dBc
10 W	-25 dBm	65 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 50W		
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.		

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 dBc
5 W	-25 dBm	62 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 50W		
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.		
No other 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 dBc
5 W	-25 dBm	62 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 219.1 MHz

Power Amplifier: 5W		
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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 219.1 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing	219.1 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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 5W		
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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-25 dBm	62 dBc
1 W	-25 dBm	55 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing	221.5 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-25 dBm	62 dBc
1 W	-25 dBm	55 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603B 2.2.12

MEASUREMENT PROCEDURE:
1. Refer Appendix A for equipment set up.
2. The EUT was placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal was connected to an RF dummy load.
3. The turntable was rotated through 360^{o} to obtain the maximum response of each spurious emission. Valid emissions were determined by switching the EUT on and off.
4. The EUT was 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: 221.5 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	221.5 MHz @ 100 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
100 W	-25 dBm	75 dBc
10 W	-25 dBm	65 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	221.5 MHz @ 10 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
100 W	-25 dBm	75 dBc
10 W	-25 dBm	65 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 50W		
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.		

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 dBc
5 W	-25 dBm	62 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 50W		
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 dBc
5 W	-25 dBm	62 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 219.1 MHz

Power Amplifier: 5W		
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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 219.1 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing 219.1 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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	57 dBc
1 W	-20 dBm	50 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing	221.5 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 F 12.5 kHz Channel Spacing $55 + 10 \text{ Log}_{10} (P_{Watts})$	
5 W	-20 dBm	62 dBc
1 W	-20 dBm	55 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 221.5 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing	221.5 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 $55 + 10 \text{ Log}_{10} (P_{Watts})$	
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-603B 2.2.2

MEASUREMENT PROCEDURE:
1. Refer Appendix A for equipment set up.
2. The EUT was tested for frequency error from –30 °C to +50°C in 10 °C increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:
See the plots on the following pages.

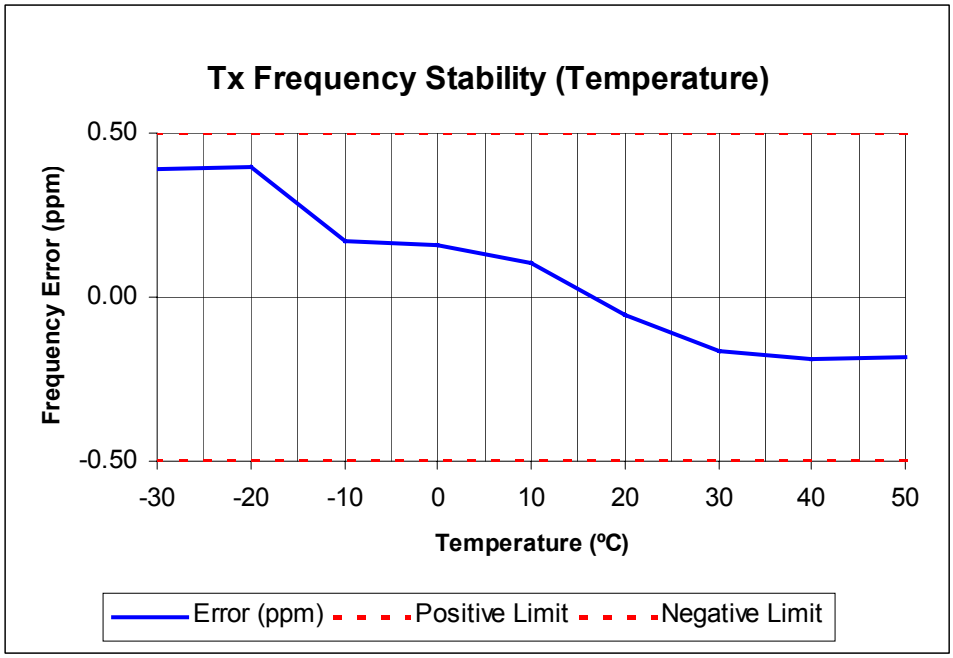
LIMIT CLAUSE: FCC 47 CFR 90.213	
Frequency Range	Frequency Error (ppm)
216 – 220 MHz	1.0
220 – 222 MHz	0.1

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

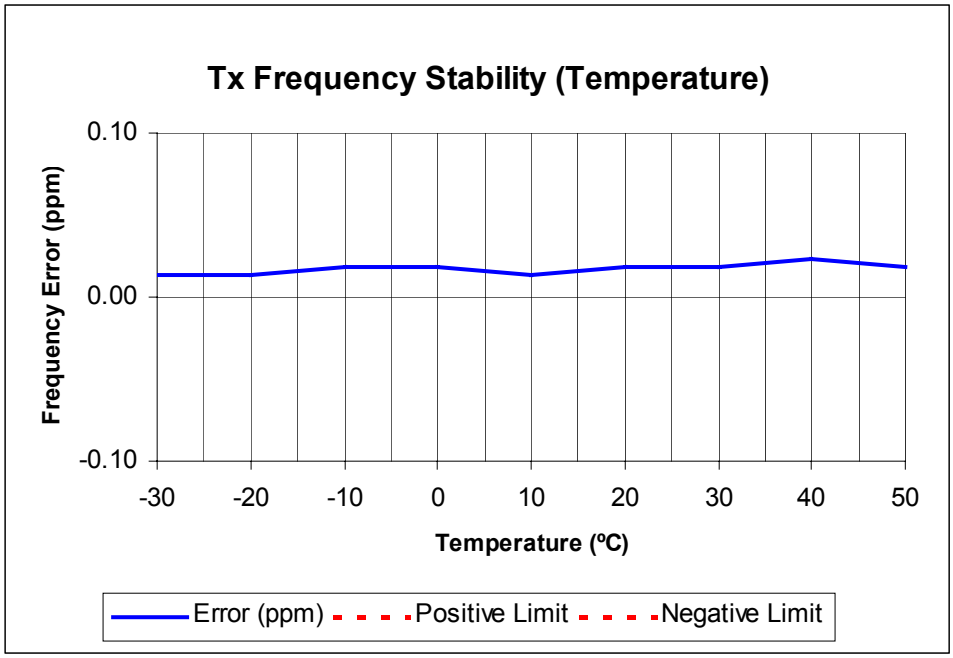
SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

Tx FREQUENCY: 221.5 MHz 100W

(EUT Internal Frequency Reference)



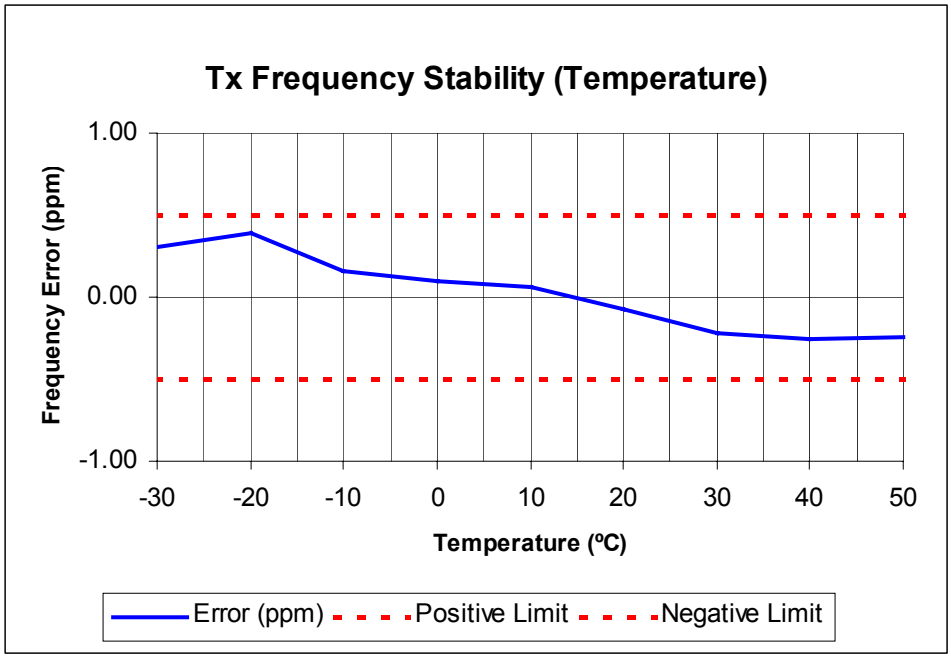
(External 10 MHz Frequency Reference T801-20-000)



TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 219.1 MHz 5W



TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

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

GUIDE: TIA/EIA-603B 2.2.2

MEASUREMENT PROCEDURE:
1. Refer Appendix 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: 193 MHz ~ 225 MHz

Frequency 219.1 MHz	FREQUENCY ERROR (ppm) @		
	102 V ac	120 V ac	138 V ac
EUT Internal Frequency Reference	0.08	0.07	0.07

Frequency 221.5 MHz	FREQUENCY ERROR (ppm)		
	102 V ac	120 V ac	138 V ac
EUT Internal Frequency Reference	-0.11	-0.12	-0.11
External 10 MHz Frequency Reference T801-20-000	0.01	0.00	0.01

LIMIT CLAUSE: FCC 47 CFR 90.213	
Frequency Range	Frequency Error (ppm)
216 – 220 MHz	1.0
220 – 222 MHz	0.1

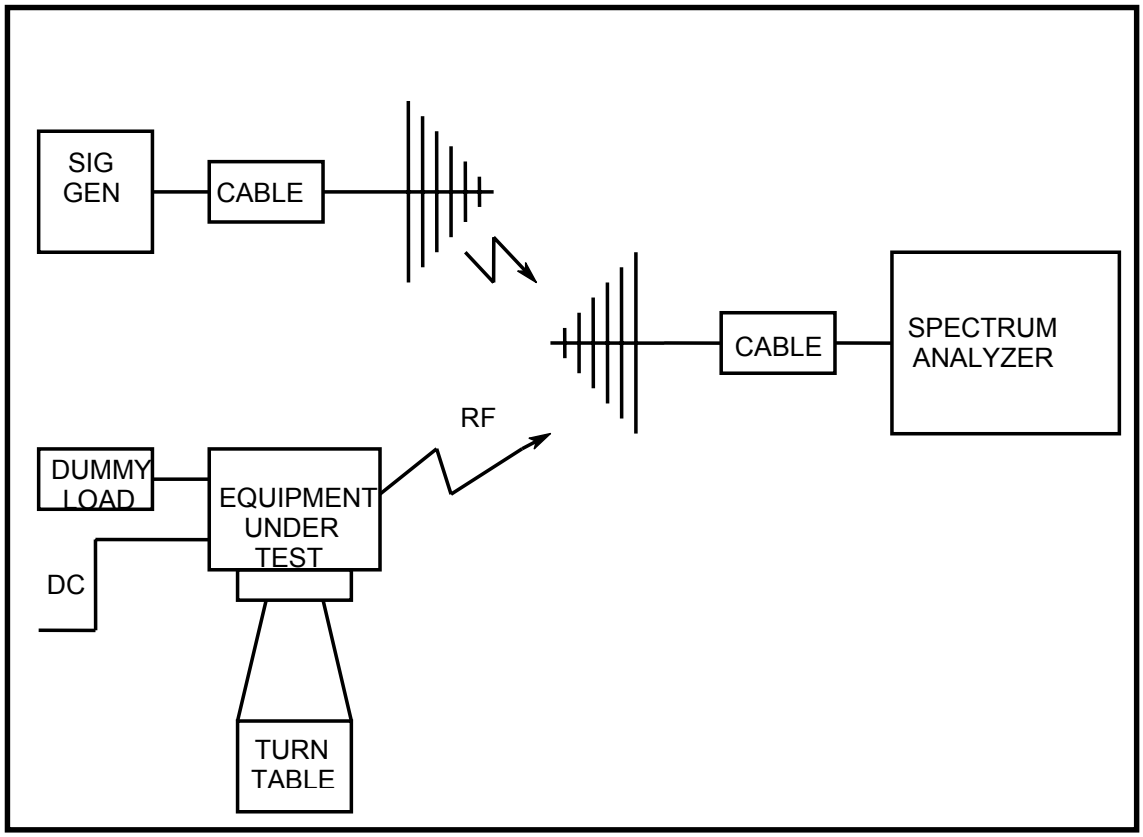
TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1	Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	07-Feb-06
2	Signal Generator	Hewlett Packard	HP8648A	3430U00344	E3579	06-Nov-05
4	Signal Generator	Hewlett Packard	HP8648C	3443U00543	E3558	07-Feb-06
5	Signal Generator	Rohde & Schwarz	SMY01 1062.5502.11	841736/019	E3553	06-Nov-05
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	11-Sep-05
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	15-Sep-05
14	Power Head	Hewlett Packard	HP11722A	2320A00688	E3307	08-Nov-05
22	Oscilloscope	Tektronics	TDS340	B013611	E3585	06-Nov-05
40	Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	17-Oct-06
42	Reference Horn Antenna	Emco	DRG3115	9512-4638	E3560	27-Sep-06
43	Horn Antenna	Emco	DRG3115	2084	E3076	27-Sep-06
62	RF Attenuator 150W	Weinschel	57-10-34	LB590	E3674	08-Nov-05
64	RF Attenuator 50W	Weinschel	24-10-34	AZ0401	E3388	11-Sep-05
65	RF Attenuator 50W	Weinschel	24-20-44	AW1266	E3562	08-Nov-05
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	07-Nov-05
70	RF Load 150W	Bird	8166	524	E3625	15-Nov-05
82	3m Coax Cable BLUE)	Suhner	Sucoflex 104A	25033/4A	E3694	19-Nov-05
83	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25006/4A	E3693	19-Nov-05
84	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25005/4A	E3692	15-Jul-05
85	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25004/4A	E3691	15-Jul-05
86	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25003/4A	E3690	13-Aug-05
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	12-Nov-05
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	14-Nov-05
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	14-Oct-05
115	Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	04-Mar-05
116	Power Head	Hewlett Packard	HP11722A	2716A02037	E1575	10-Sep-05
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	23-Apr-05
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	13-Aug-05
136	Multimeter	Fluke	77	35069359	E3237	09-Nov-05

APPENDIX 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.