

REPORT NUMBER 2060

August 2004

RADIO PERFORMANCE MEASUREMENTS

On the TMAB22-D100 Mobile Transceiver

FCC ID: CASTMAD1C

SN: 19015645

In accordance with

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

PREPARED BY:

Marcus Ludwig

Test Technician

CHECKED & APPROVED BY:

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Senior Technician



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REPORT ON :

Type Approval Testing of the TMAB22-D100 (Serial No 19015645)
in accordance with:

FCC CFR 47 Parts 80, 90, & 90 Subpart T

FCC ID: CASTMAD1C

PREPARED FOR :

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

DISTRIBUTION :

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| TELTest Laboratory | Mr S Crompton | Copy No 1 |
| Tait Electronics Ltd | Mr. Des Fox | Copy No 2 |
| Tait Electronics Ltd | Mr. Neil Fletcher | 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

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Revision History

| Date | Revision | Comments |
|---------------|----------|--|
| 11-April-2007 | 2 | Page 5-6 Emission Designators corrected (FFSK, THSD) |
| | | |

DECLARATION OF CONFORMITY

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

Equipment: Mobile Transceiver

Type: TMAD1C

Product code: TMAB22-D100

Serial Numbers: 19015645

Quantity: 1

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

FCC CFR 47 Parts 80, 90, & 90 subpart T

Signature: _____

S. A. Crompton
Compliance Laboratory Manager.

Date: _____

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

Necessary bandwidth

Emission Designator

M = 1.8 kHz

9k60F2D

D = 3.0 kHz (60% of peak deviation)

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

Bn = $3.6 + 6 \times 1$
= 9.6 kHz

5. Tait High Speed Date (THSD)

THSD uses a 4 level gaussian frequency shift keying (CP-4GFSK) modulation scheme. It can be used when transferring data between two radios. Data is transmitted at a rate of 12000bps for narrow band channels, and 19200bps for wide-band channels.

Due to the difficulties in determining the value of k, the necessary bandwidth has been measured using the 99% energy rule.

12.5kHz Bandwidth

99% bandwidth

Emission Designator

7.7 kHz

7k70F1D

F1D represents a FM data transmission without the use of a modulating sub carrier

25kHz Bandwidth

99% bandwidth

Emission Designator

12.7 kHz

12k7F1D

F1D represents a FM data transmission without 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 CFR 47 80.215

Manufacturer's Rated Output Power: Switchable: 1 W and 25 W

| FCC CFR 47 80.215 | | |
|------------------------------|-------------|----------------|
| 219.1 MHz | 1 W nominal | 25 W nominal |
| POWER (W) | 1.1 | 28.4 |
| Variation from Nominal (%) | 10.0 | 13.6 |
| FCC CFR 47 90.729 | | |
| 221.5 MHz | 1 W nominal | 25 W nominal |
| POWER (W) | 1.1 | 28.3 |
| Variation from Nominal (%) | 10.0 | 13.2 |
| Measurement Uncertainty (dB) | | +0.63 -0.68 |

LIMIT CLAUSE: FCC 47 CFR 90.205

Radio Type: Mobile Transceiver
 Frequency Band: 216 MHz ~ 266 MHz

- (o) 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.

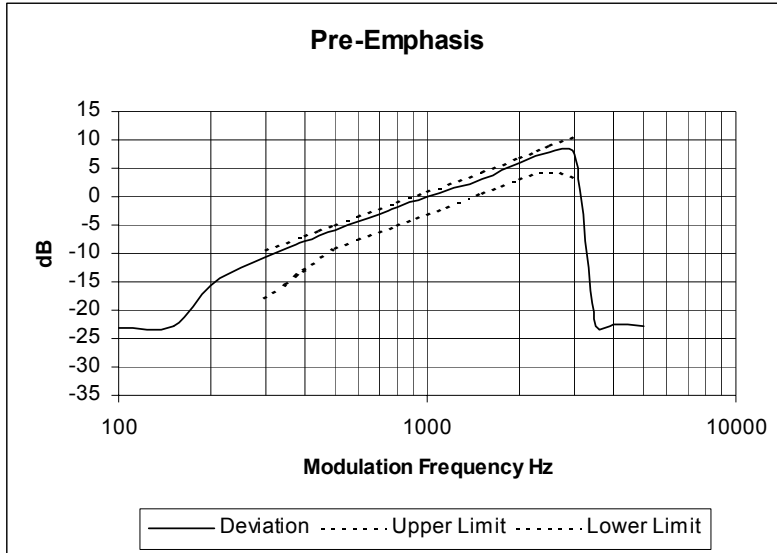
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LIMIT CLAUSE: TIA/EIA-603B 3.2.6

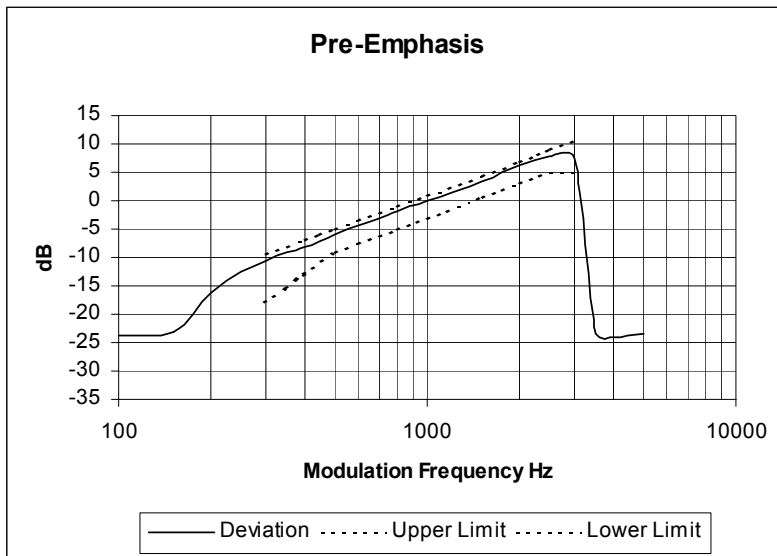
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 219.1 MHz 12.5 kHz Channel Spacing



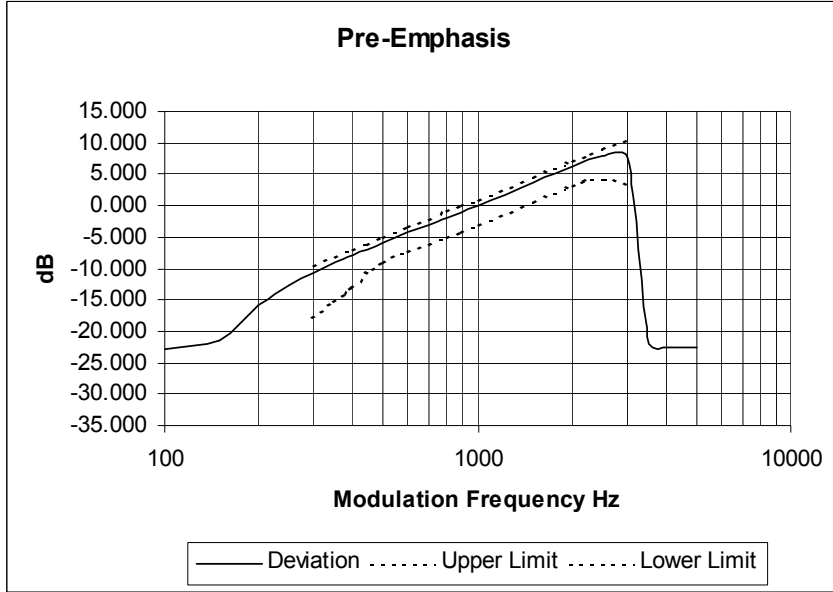
Tx FREQUENCY: 219.1 MHz 25 kHz Channel Spacing



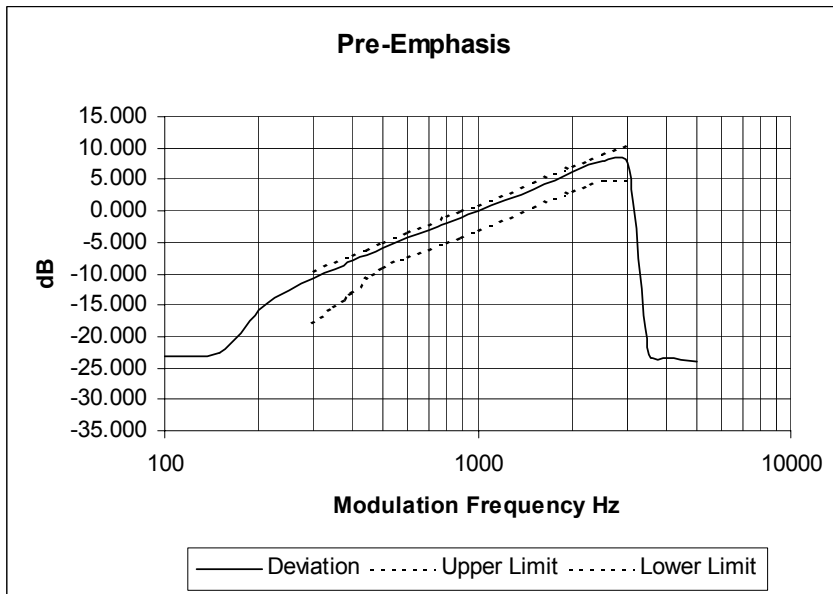
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 221.5 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 221.5 MHz 25 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)
 FCC 47 CFR 80.213 (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:

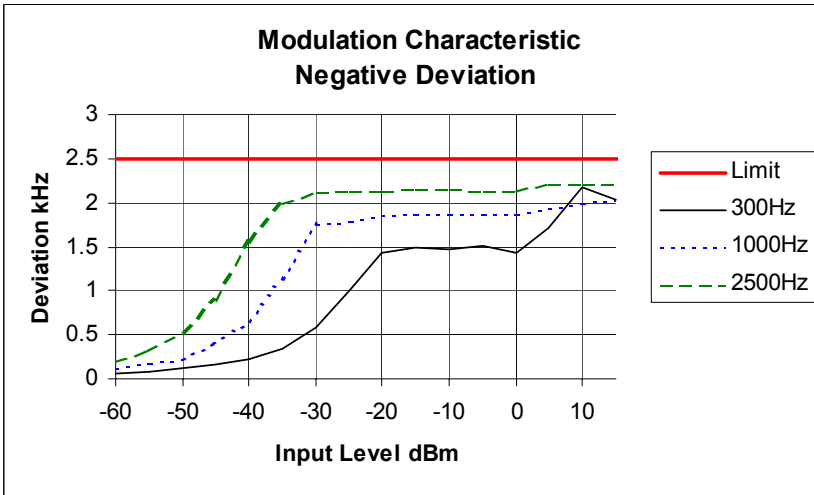
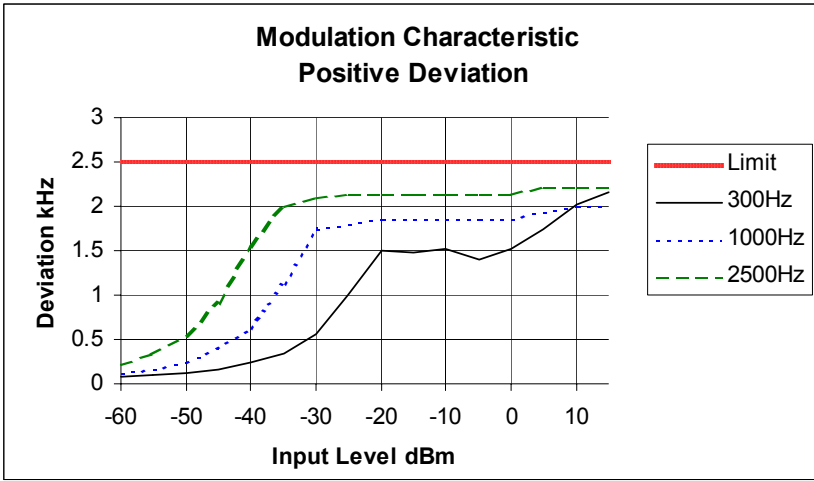
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

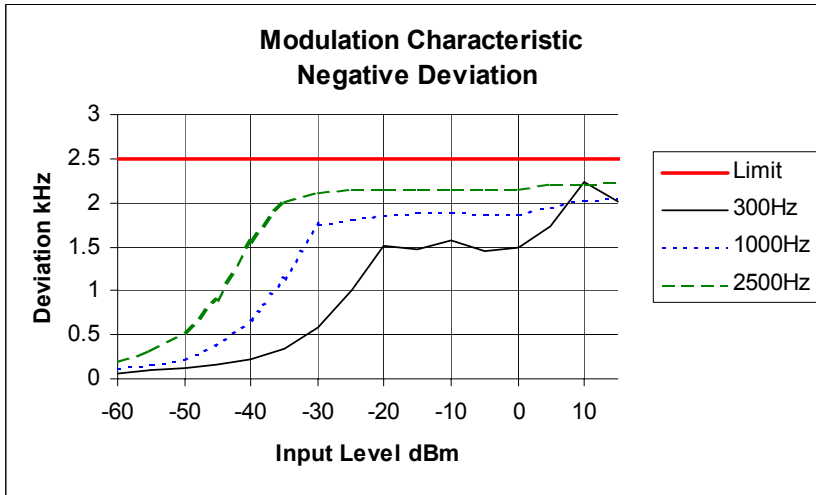
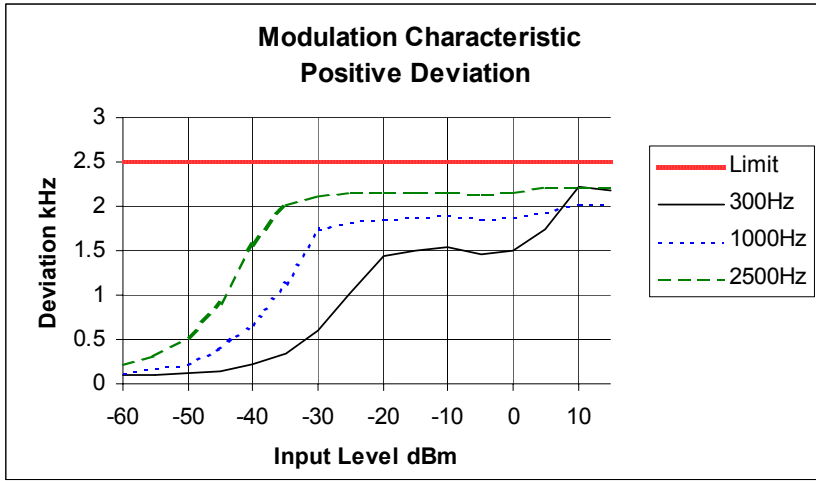
Tx FREQUENCY: 219.1MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

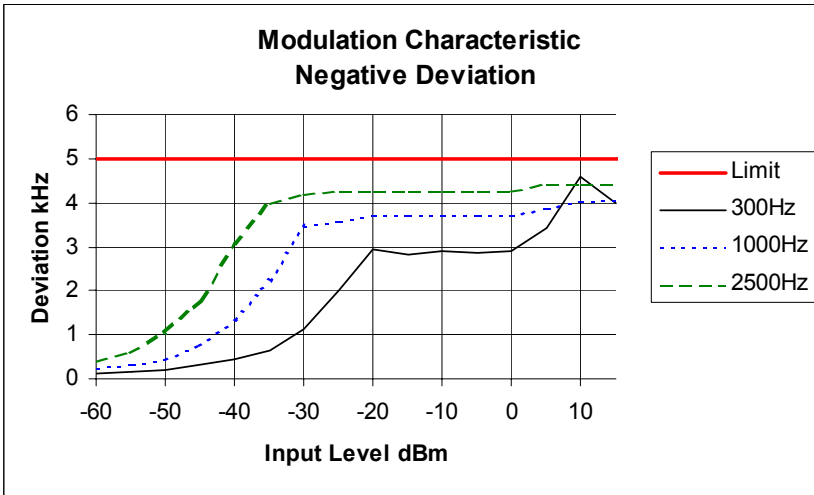
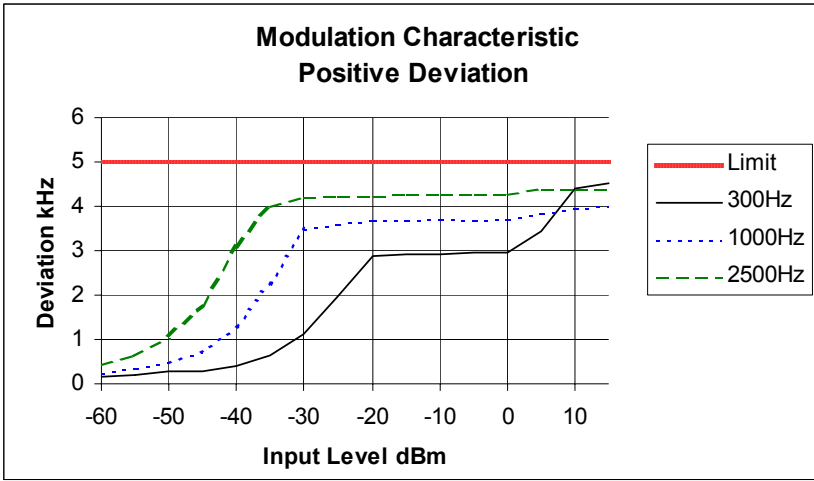
Tx FREQUENCY: 221.5 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

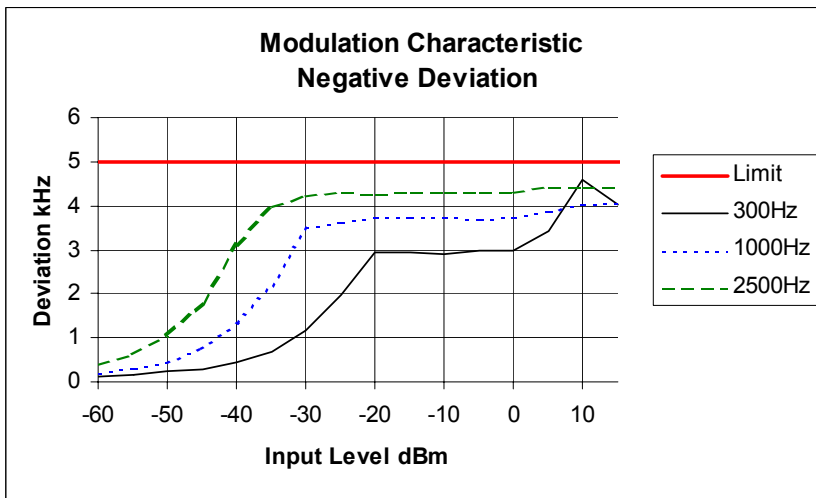
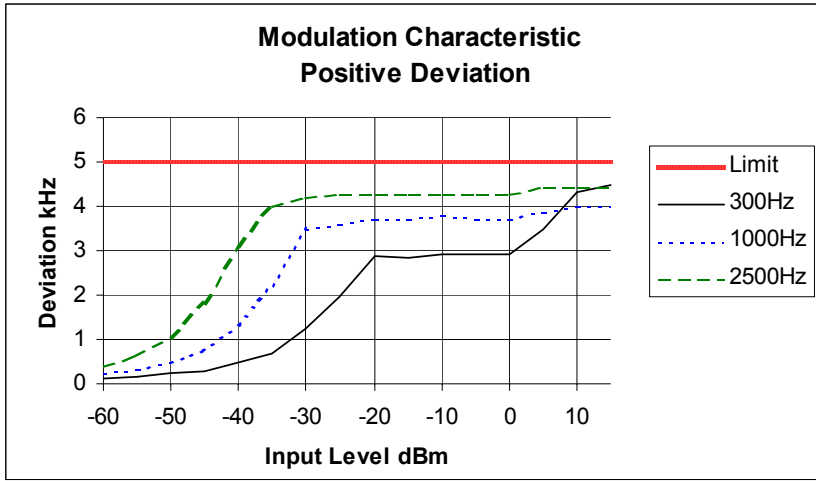
Tx FREQUENCY: 219.1MHz 25 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 221.5 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 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 C – 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 90.210

EMISSION MASKS

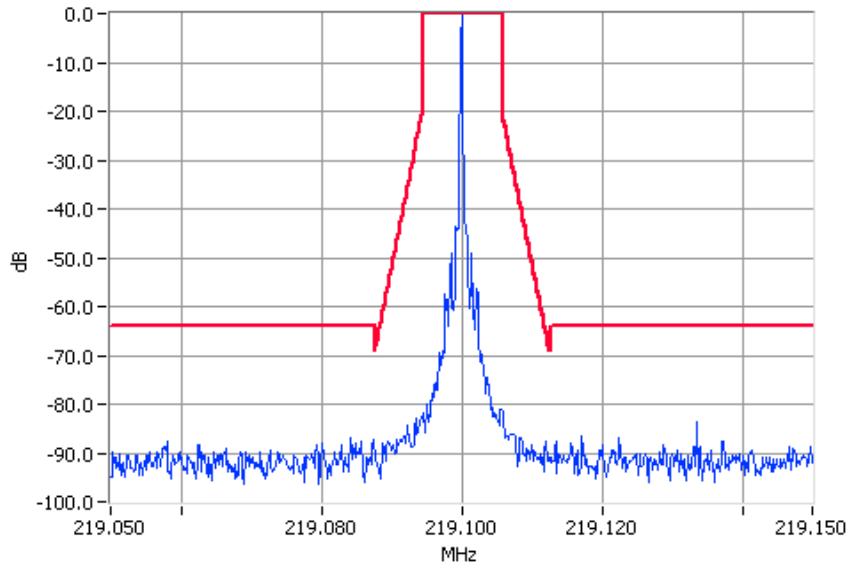
| | | |
|----------------------------|--------------------------|--------------------|
| 216 – 220 MHz | | |
| Emission Mask D | 12.5 kHz Channel Spacing | Analog; FFSK; THSD |
| FCC 47 CFR 80.211(f) | | |
| Emission Mask B | 25.0 kHz Channel Spacing | Analog; FFSK; THSD |
| 220 – 222 MHz | | |
| FCC 47 CFR 90.210(f) | | |
| Emission Mask F (modified) | 12.5 kHz Channel Spacing | Analog; FFSK; THSD |

DATA SPEED

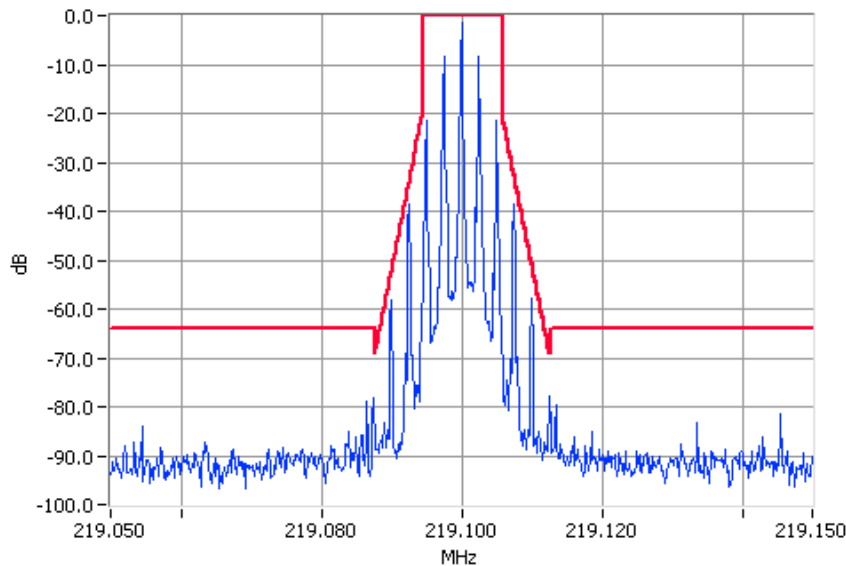
| | | |
|------|-----------|--------------------------|
| FFSK | 1200 bps | 12.5 kHz Channel Spacing |
| FFSK | 1200 bps | 25.0 kHz Channel Spacing |
| THSD | 12000 bps | 12.5 kHz Channel Spacing |
| THSD | 19200 bps | 25.0 kHz Channel Spacing |

(FFSK is Fast Frequency Shift Keying; THSD is Tait High Speed Data – CP4GFSK)

NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz Channel Spacing

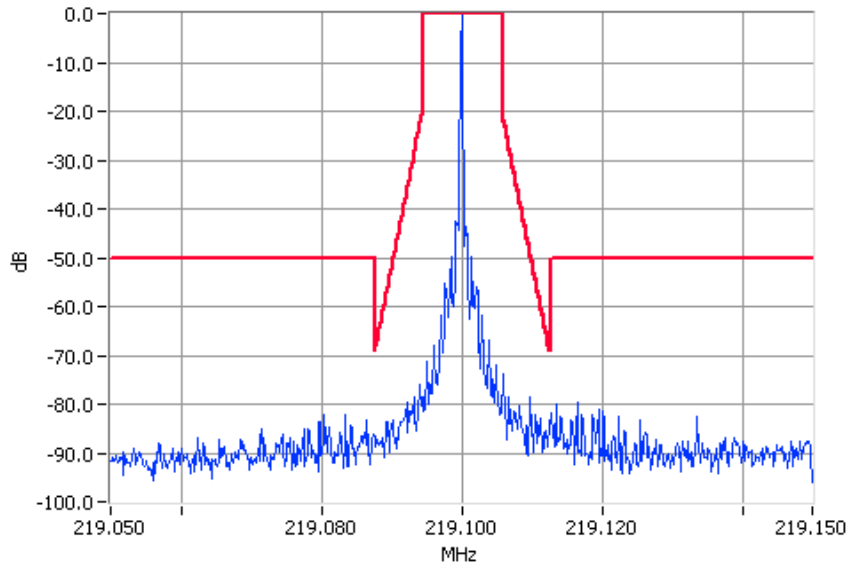


Unmodulated 219.1000MHz Mask D 25W Pass
RBW=100Hz VBW=1000Hz

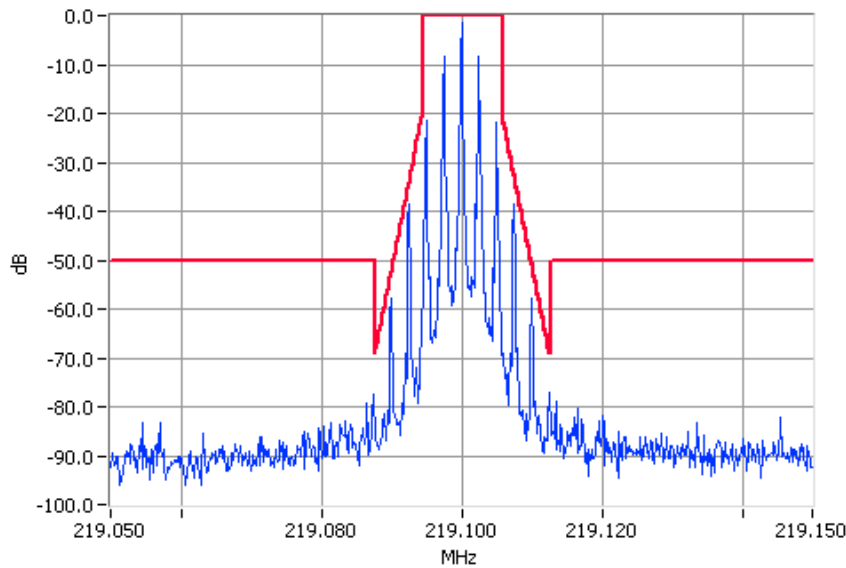


Analogue Modulation 219.1000MHz Mask D 25W
Pass

NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing

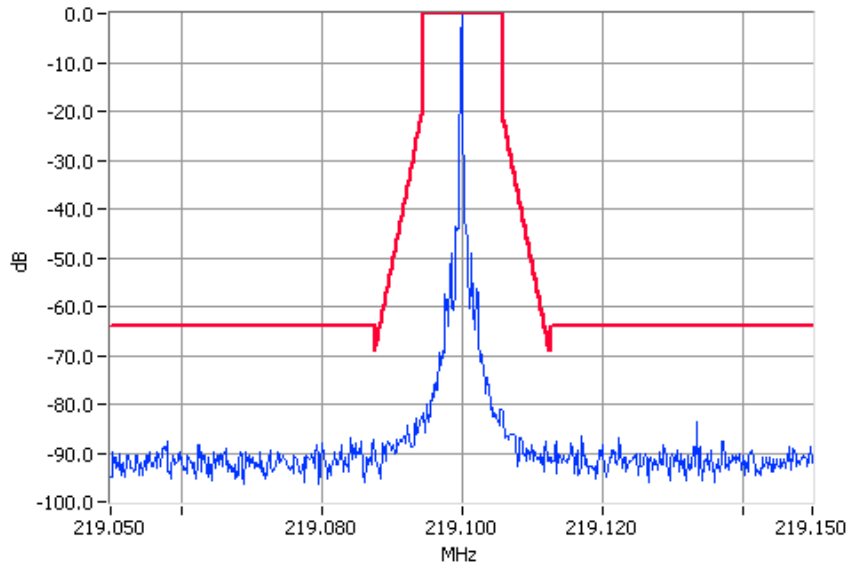


Unmodulated 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz



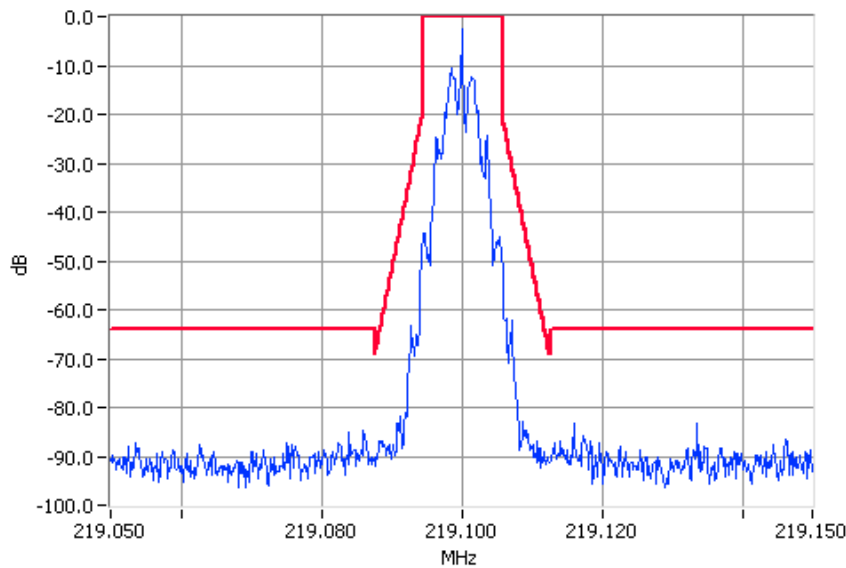
Analogue Modulation 219.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz Channel Spacing



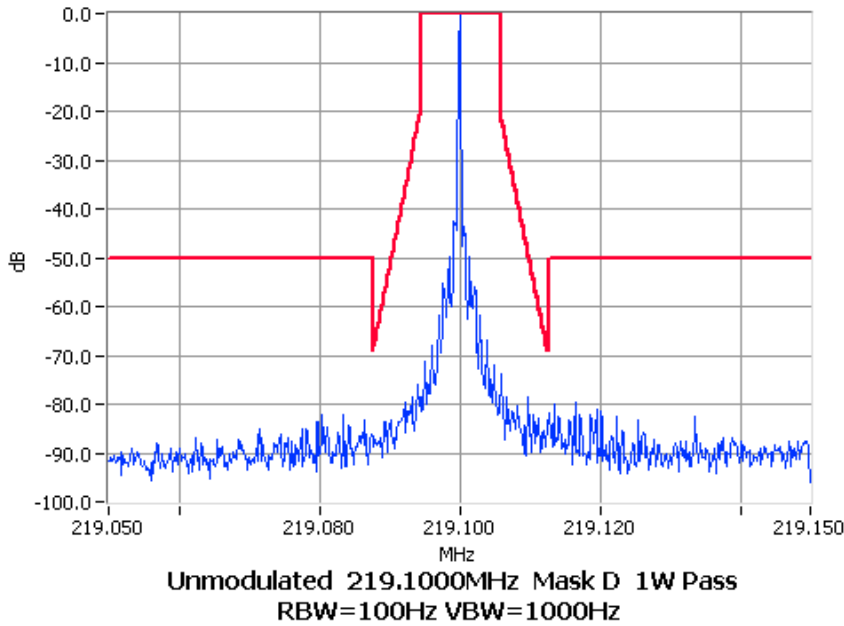
Unmodulated 219.1000MHz Mask D 25W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz Channel Spacing

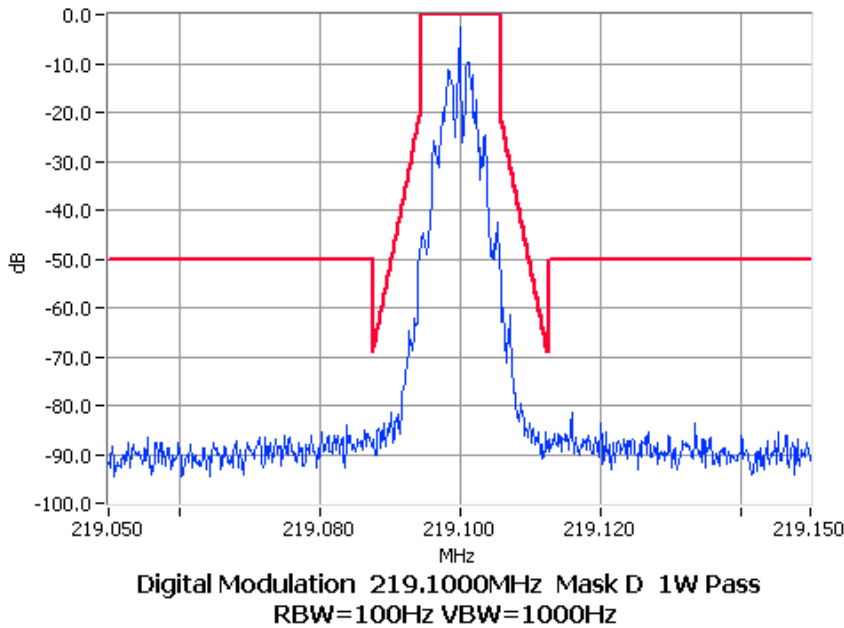


Digital Modulation 219.1000MHz Mask D 25W Pass
RBW=100Hz VBW=1000Hz

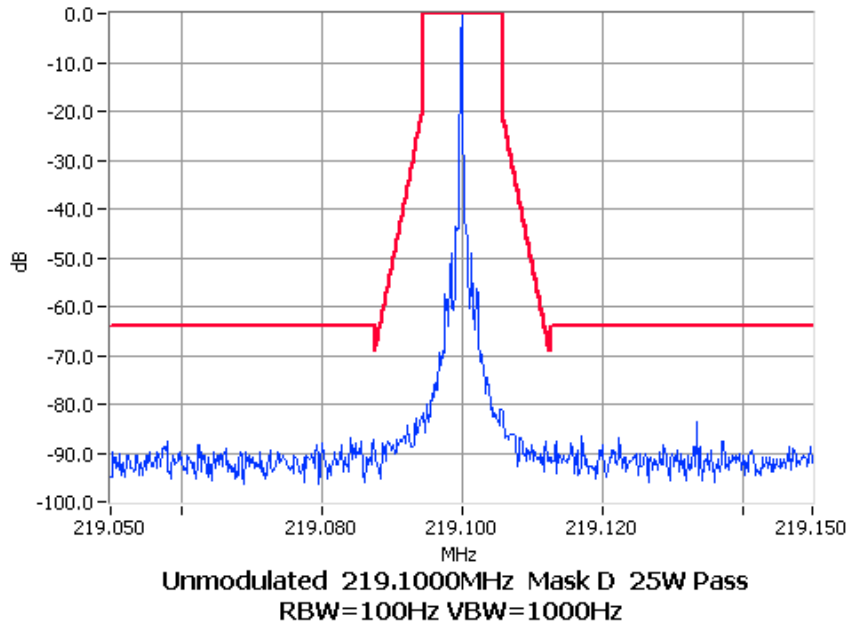
NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



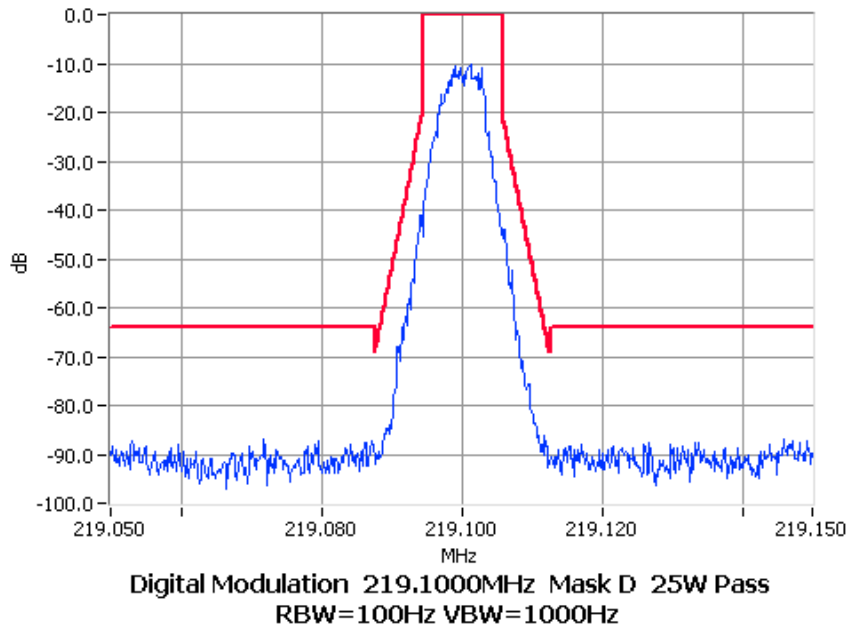
Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



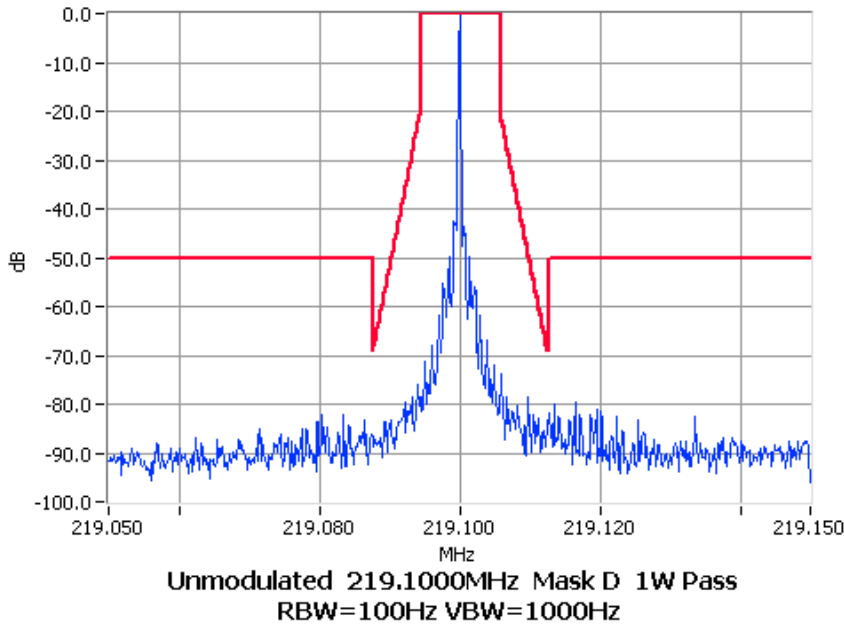
NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz Channel Spacing



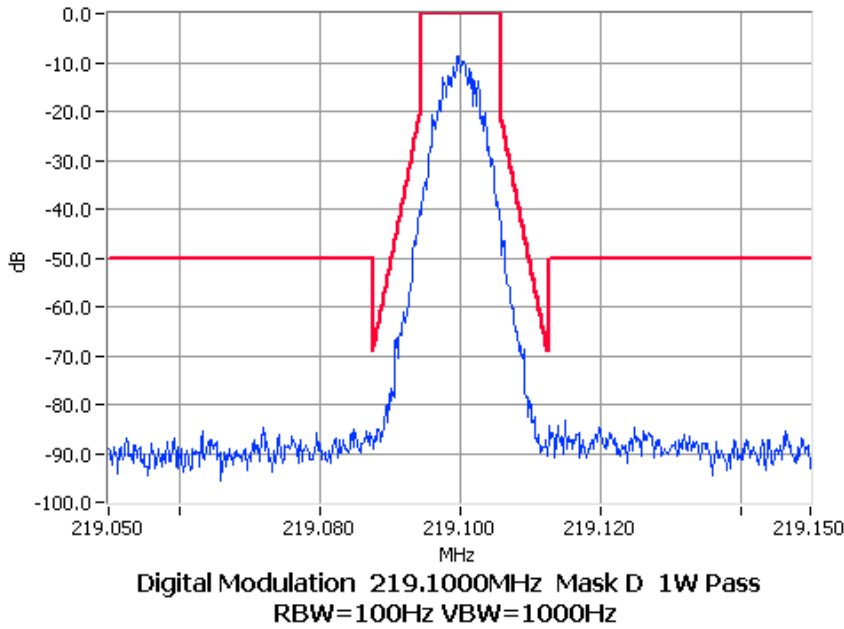
Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz Channel Spacing



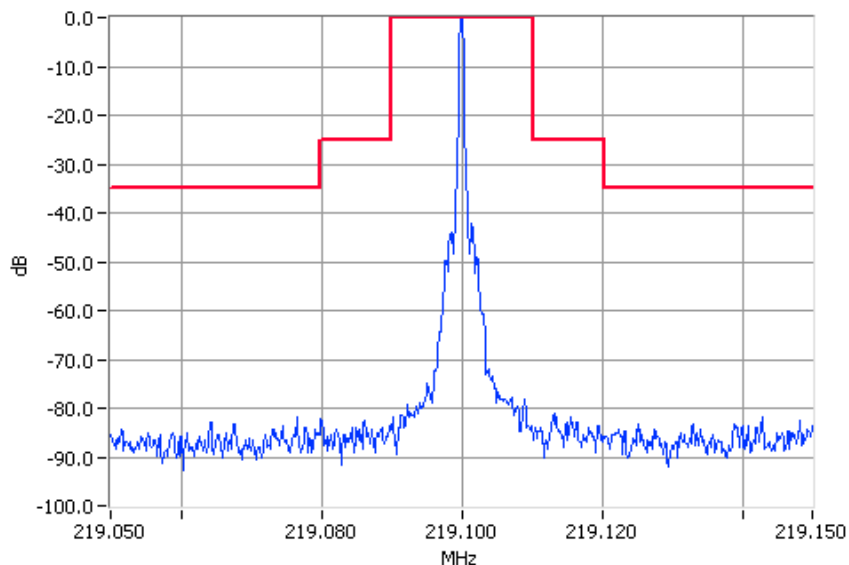
NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



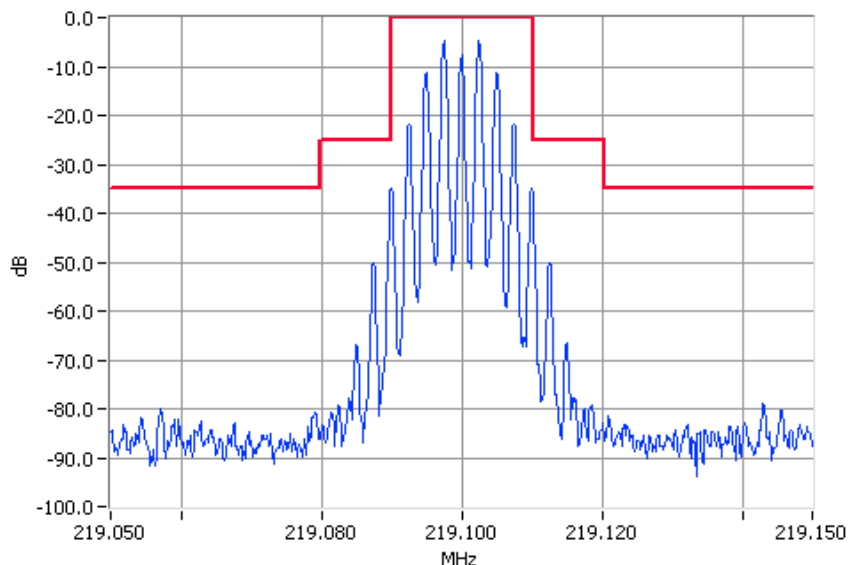
Tx FREQUENCY: 219.1 MHz 1W 12.5 kHz Channel Spacing



NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 25 kHz Channel Spacing

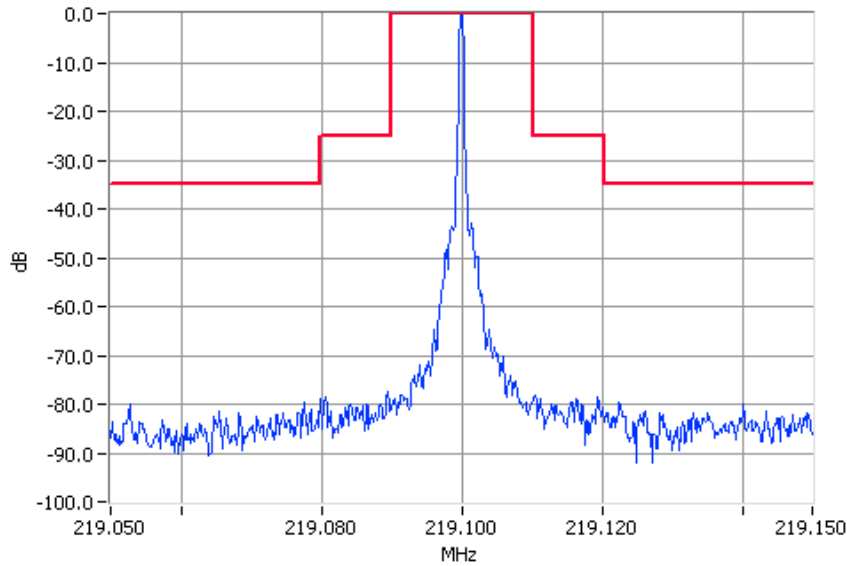


Unmodulated 219.1000MHz Mask B 25W Pass
RBW=300Hz VBW=3000Hz

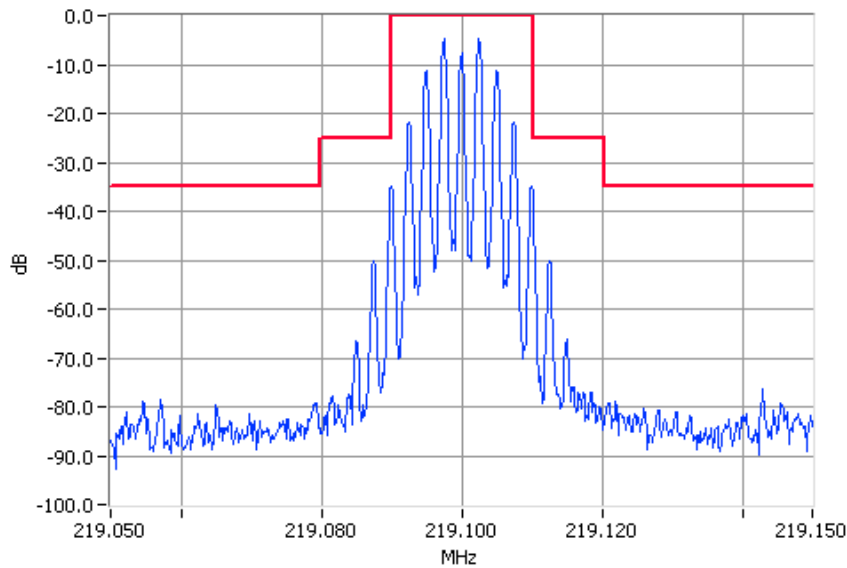


Analogue Modulation 219.1000MHz Mask B 25W
Pass

NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 25 kHz Channel Spacing

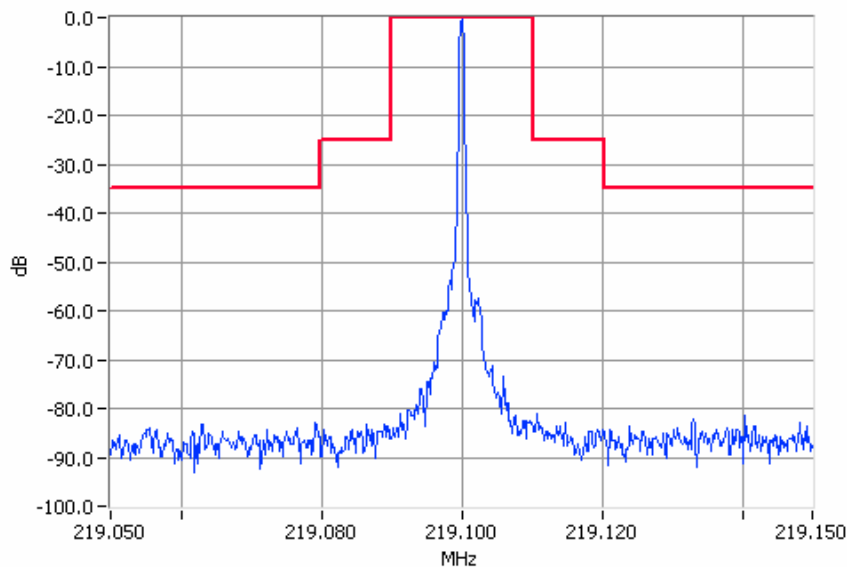


Unmodulated 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

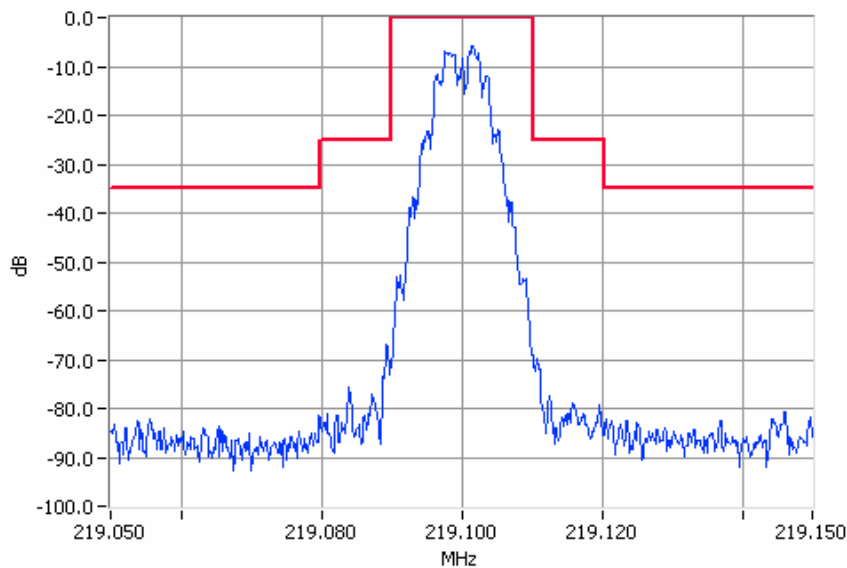


Analogue Modulation 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 25 kHz Channel Spacing

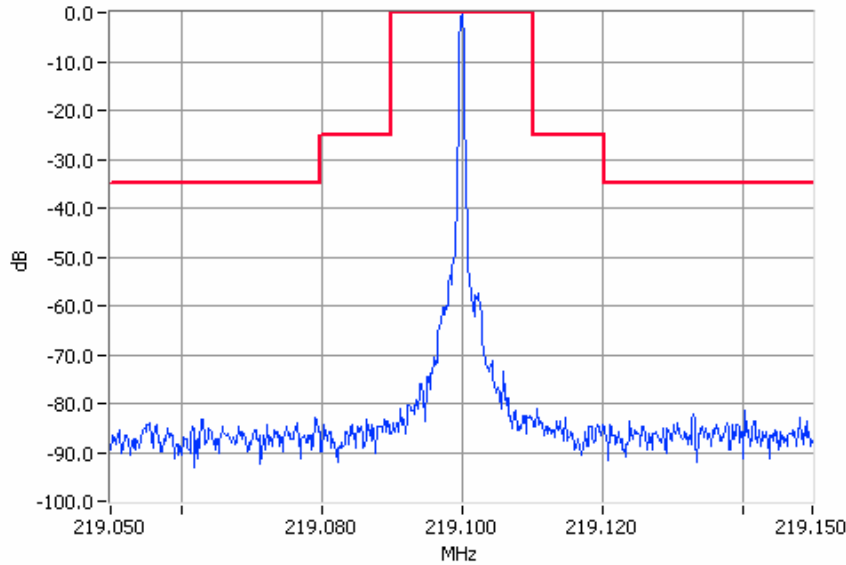


Unmodulated 219.1000MHz Mask B 25W Pass
RBW=300Hz VBW=3000Hz

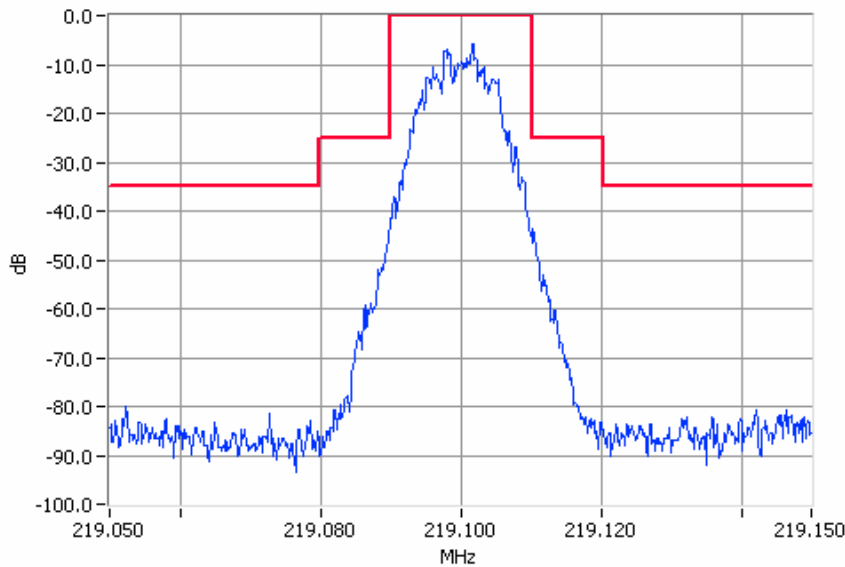


Digital Modulation 219.1000MHz Mask B 25W Pass
RBW=300Hz VBW=3000Hz

NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 25W 25 kHz Channel Spacing

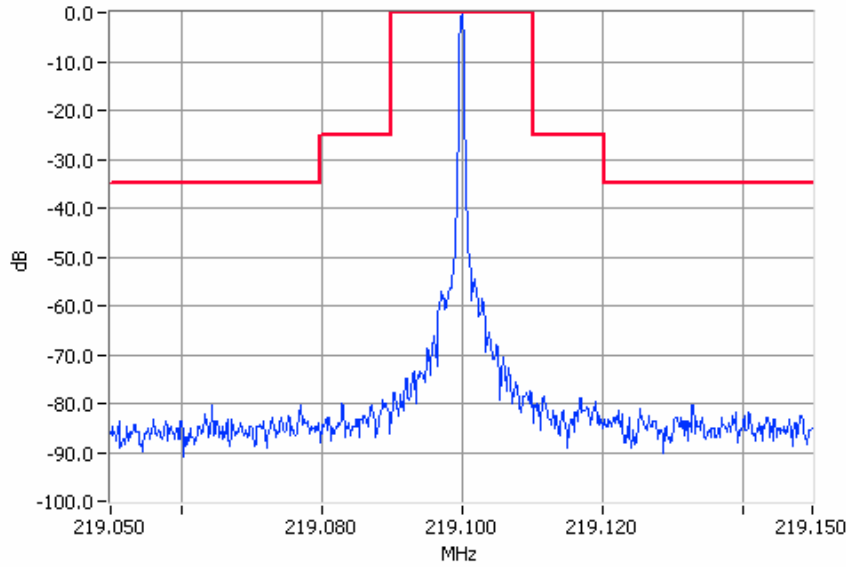


Unmodulated 219.1000MHz Mask B 25W Pass
RBW=300Hz VBW=3000Hz

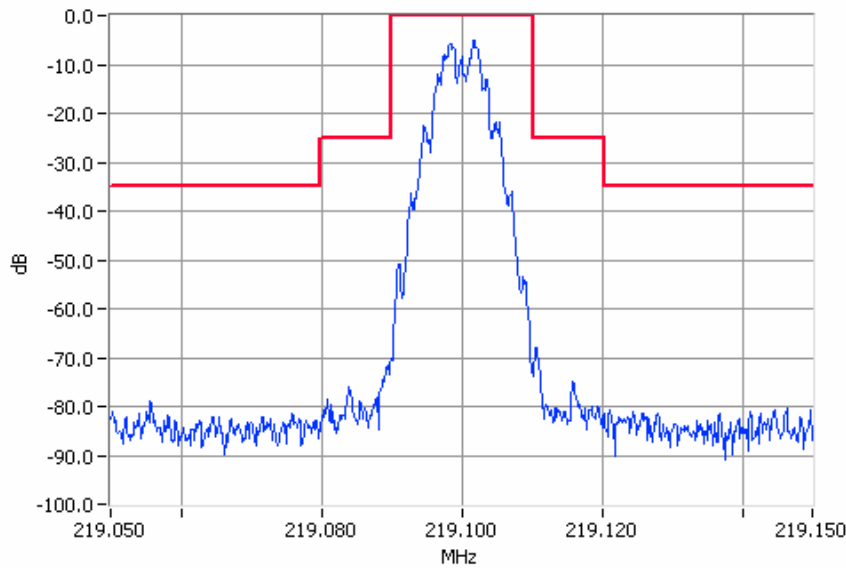


Digital Modulation 219.1000MHz Mask B 25W Pass
RBW=300Hz VBW=3000Hz

NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 25 kHz Channel Spacing

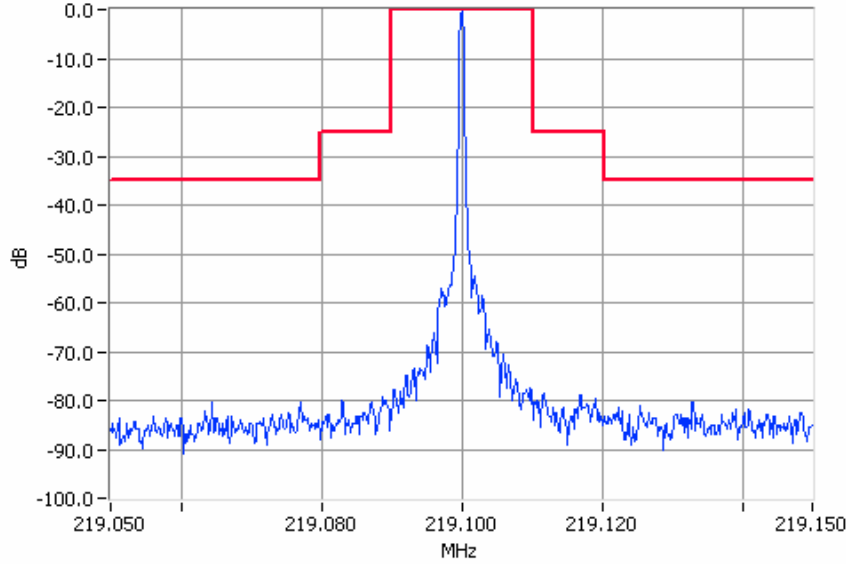


Unmodulated 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

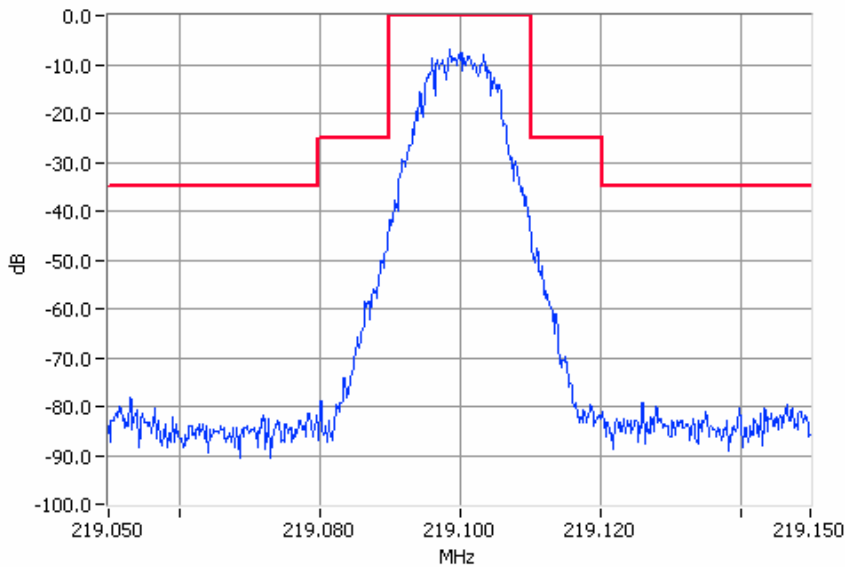


Digital Modulation 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 219.1 MHz 1W 25 kHz Channel Spacing

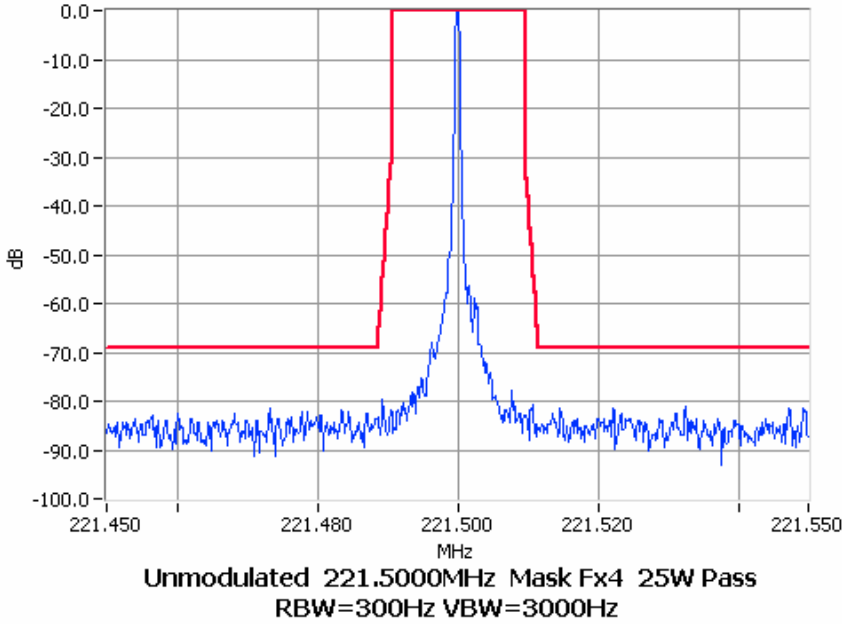


Unmodulated 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

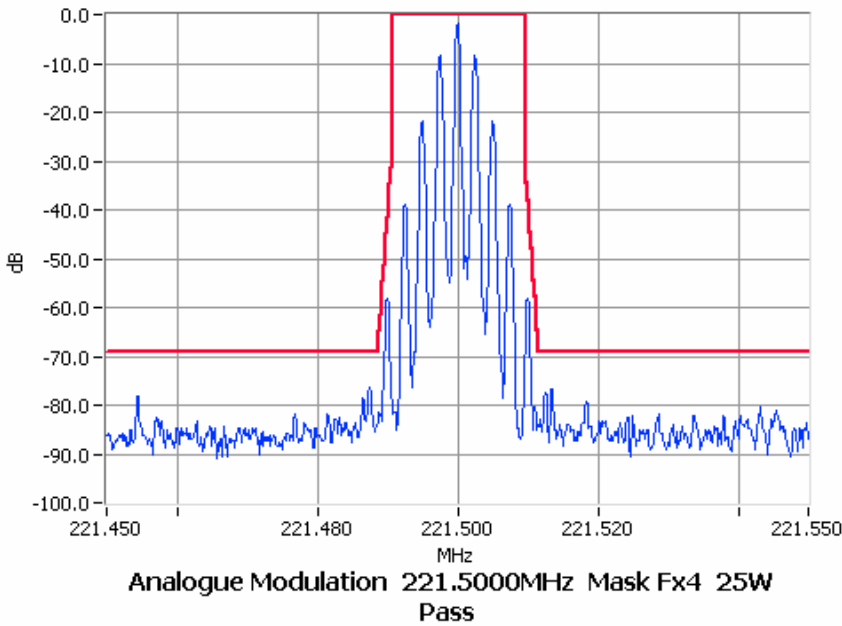


Digital Modulation 219.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

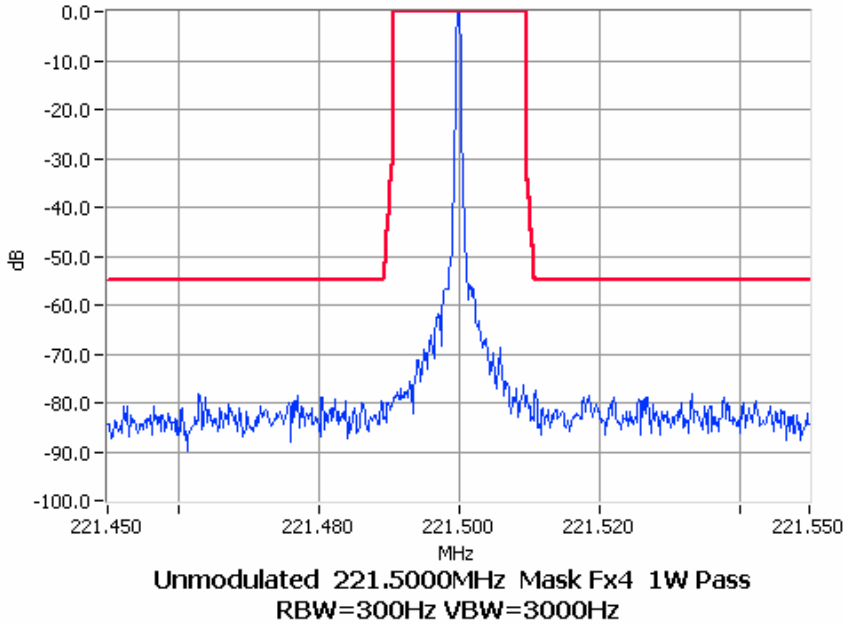
NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing



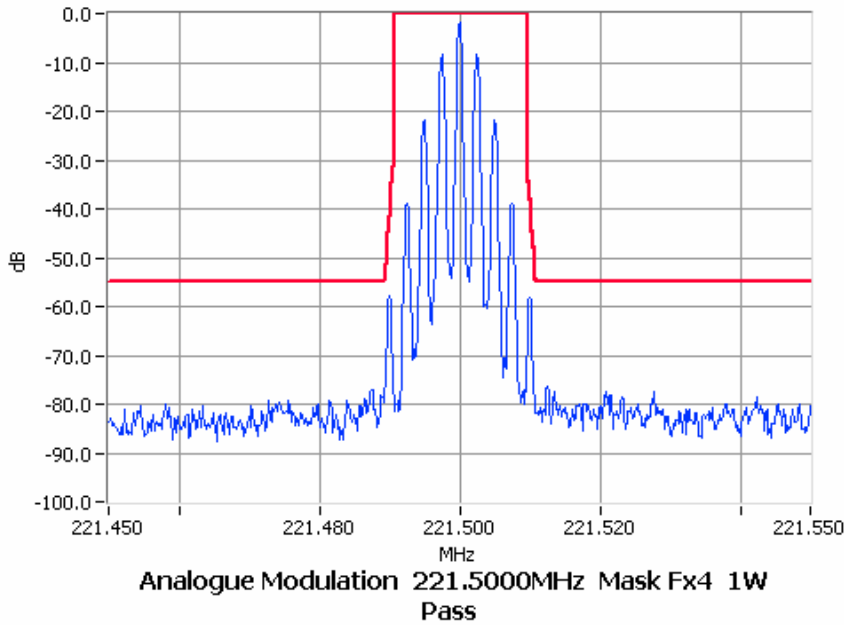
Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing



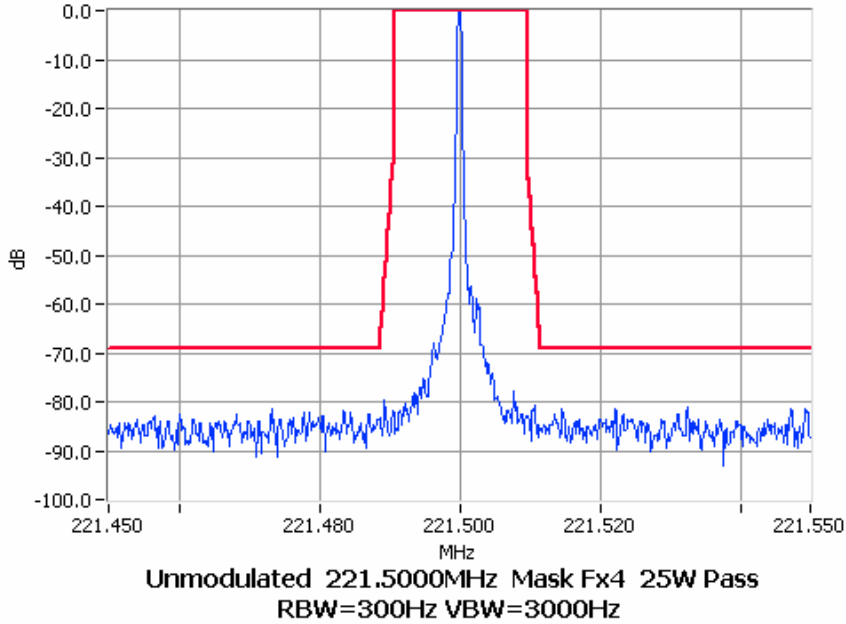
NAME OF TEST: OCCUPIED BANDWIDTH VOICE
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



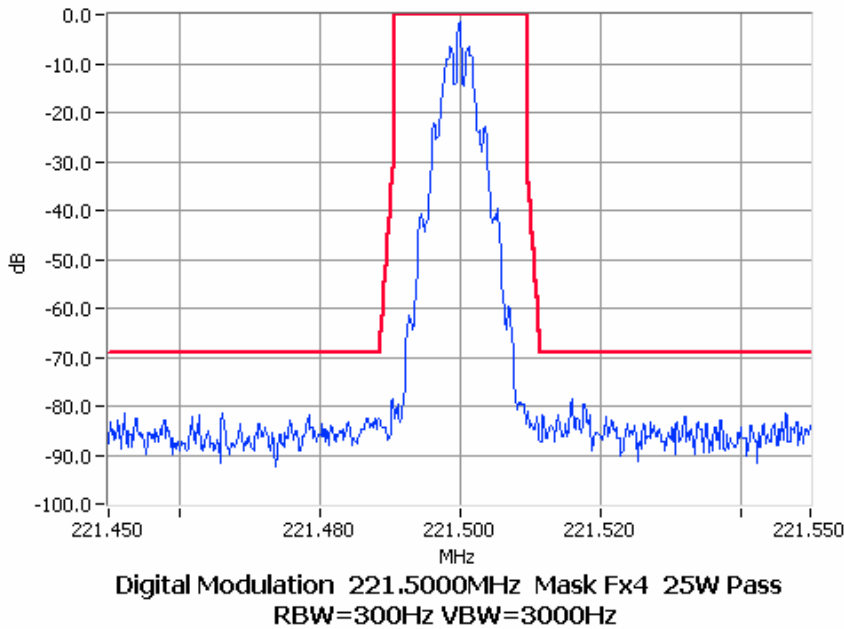
Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



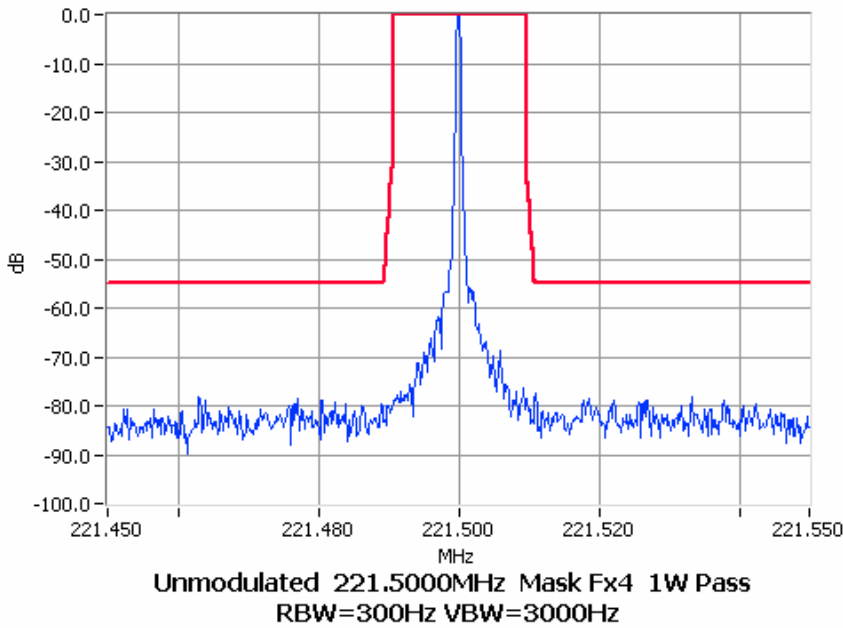
NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing



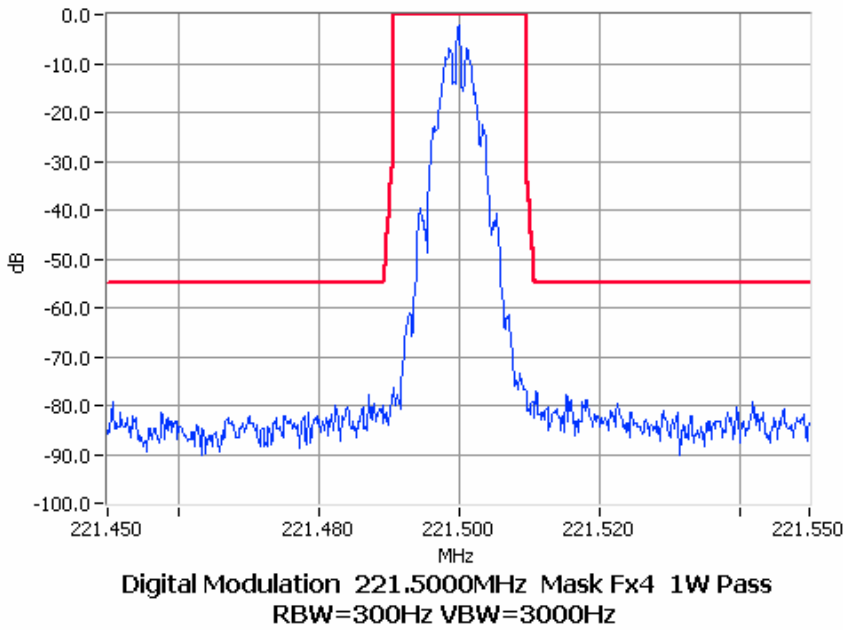
Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing



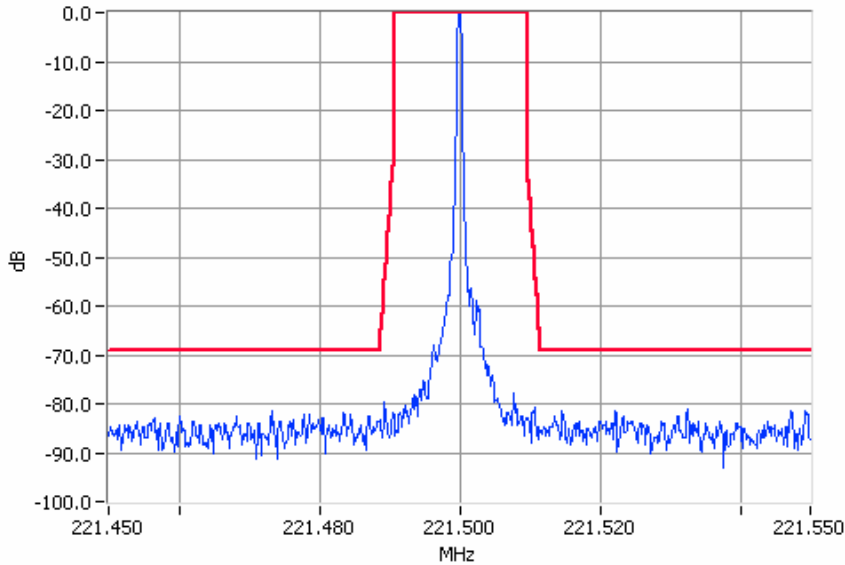
NAME OF TEST: OCCUPIED BANDWIDTH FFSK
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing

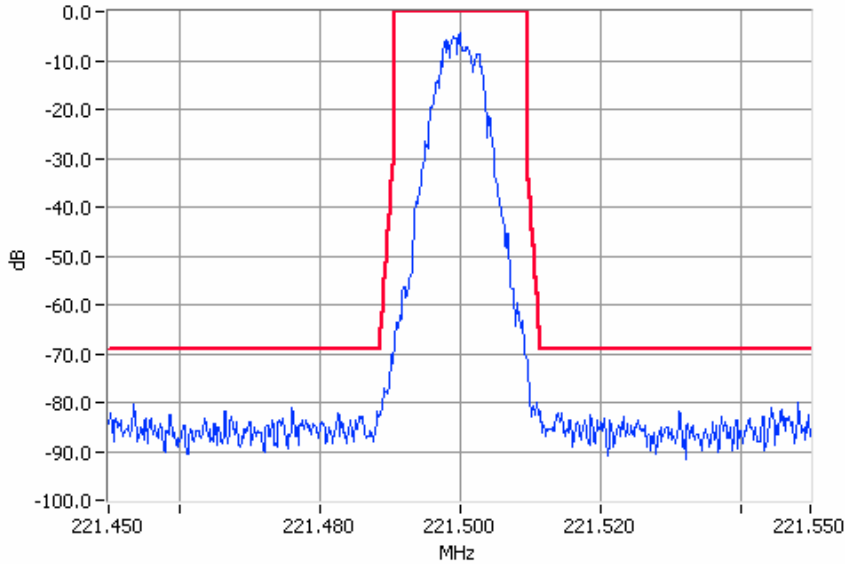


NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing



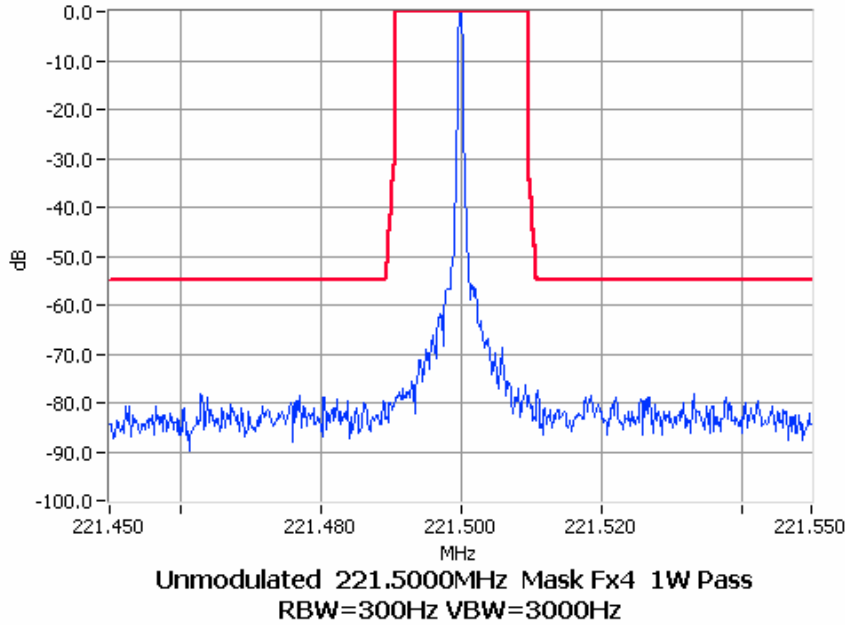
Unmodulated 221.5000MHz Mask Fx4 25W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz Channel Spacing

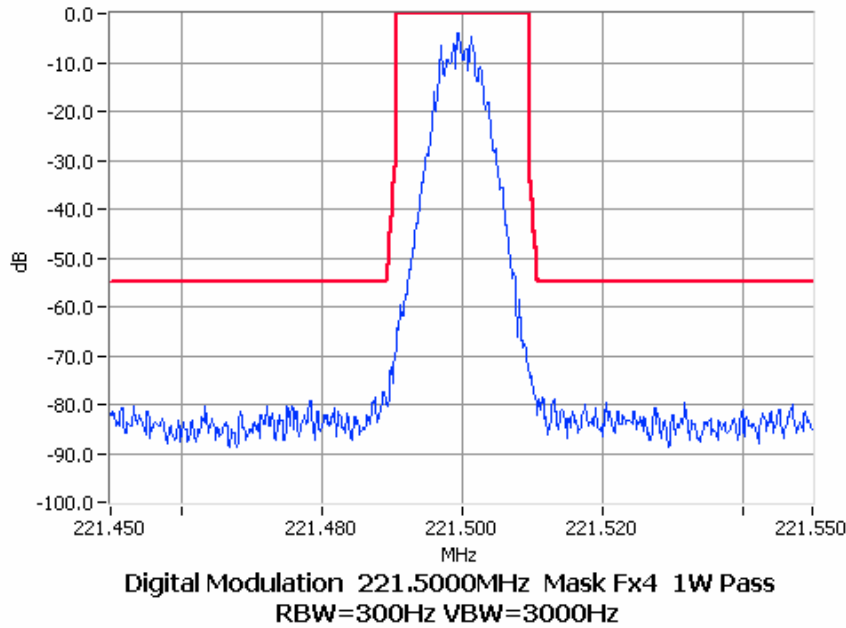


Digital Modulation 221.5000MHz Mask Fx4 25W Pass
RBW=300Hz VBW=3000Hz

NAME OF TEST: OCCUPIED BANDWIDTH THSD
SPECIFICATION: FCC CFR 2.1049 (c)
Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



Tx FREQUENCY: 221.5 MHz 1W 12.5 kHz Channel Spacing



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 10th 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.

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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: 219.1MHz

| 12.5 kHz Channel Spacing | 219.1 MHz @ 25 W | Emission Mask D |
|---|------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|--------|
| 1 W | -20 dBm | 50 dBc |
| 25 W | -20 dBm | 64 dBc |

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 219.1MHz

| 12.5 kHz Channel Spacing | 219.1 MHz @ 1 W | Emission Mask D |
|---|-----------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|--------|
| 1 W | -20 dBm | 50 dBc |
| 25 W | -20 dBm | 64 dBc |

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5 MHz

| 12.5 kHz Channel Spacing | 221.5 MHz @ 25 W | Emission Mask F |
|---|------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $55 + 10 \text{ Log}_{10}(P_{\text{Watts}})$ | |
|-------------------------------|---|--------|
| 1 W | -25 dBm | 55 dBc |
| 25 W | -25 dBm | 69 dBc |

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 221.5MHz

| 12.5 kHz Channel Spacing | 221.5 MHz @ 1 W | Emission Mask F |
|---|-----------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $55 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|----------------------------|--|--------|
| 1 W | -25 dBm | 55 dBc |
| 25 W | -25 dBm | 69 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° 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 2.1051

Tx FREQUENCY: 219.1MHz

| 12.5 kHz Channel Spacing | 219.1 MHz @ 25 W | Emission Mask D |
|---|------------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|--------|
| 1 W | -20 dBm | 50 dBc |
| 25 W | -20 dBm | 64 dBc |

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 219.1MHz

| 12.5 kHz Channel Spacing | 219.1 MHz @ 1 W | Emission Mask D |
|---|-----------------|-----------------|
| Emission Frequency (MHz) | Level (dBm) | Level (dBc) |
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| 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 $50 + 10 \text{ Log}_{10} (P_{\text{Watts}})$ | |
|-------------------------------|--|--------|
| 1 W | -20 dBm | 50 dBc |
| 25 W | -20 dBm | 64 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 for 12.5 kHz & 25.0 kHz channel spacings.

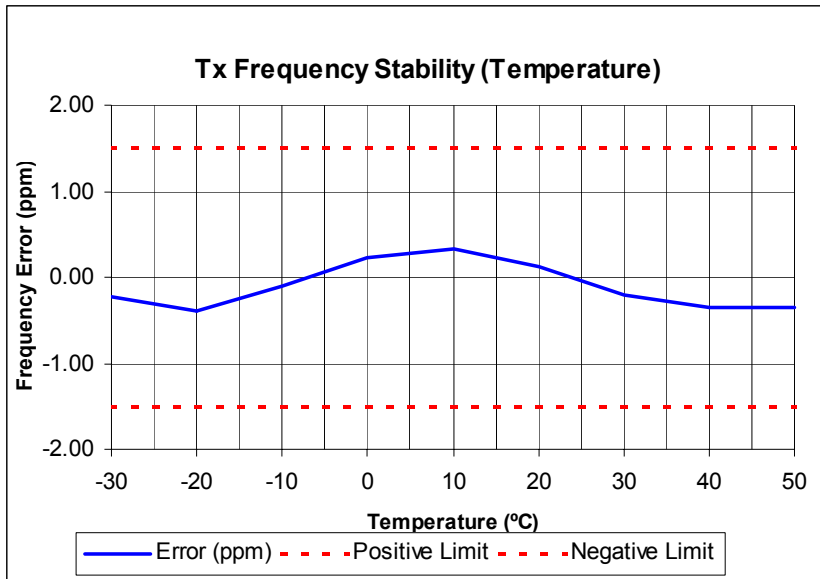
| | |
|---------------------------------|-----------------------|
| Frequency Range: 216 - 220 MHz | |
| LIMIT CLAUSE: FCC 47 CFR 80.209 | |
| Channel Spacing (kHz) | Frequency Error (ppm) |
| 12.5 | 5.0 |
| 25.0 | 5.0 |

| | |
|---------------------------------|-----------------------|
| Frequency Range: 220 - 222 MHz | |
| LIMIT CLAUSE: FCC 47 CFR 90.213 | |
| Channel Spacing (kHz) | Frequency Error (ppm) |
| 12.5 | 1.5 |

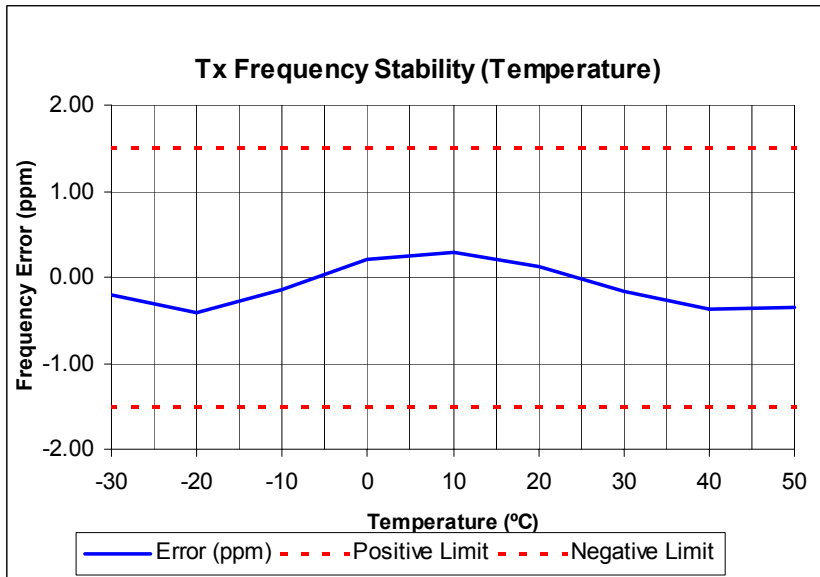
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

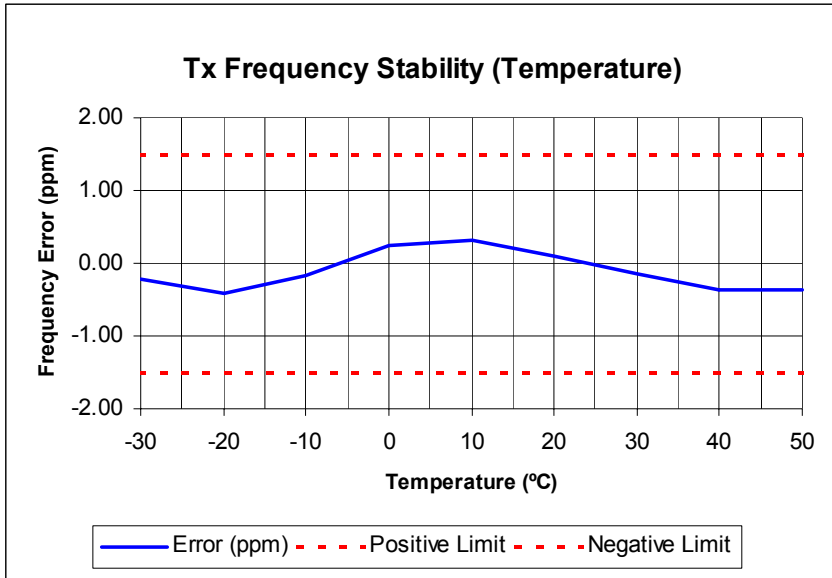
Tx FREQUENCY: 219.1 MHz 25W 12.5 kHz channel Spacing



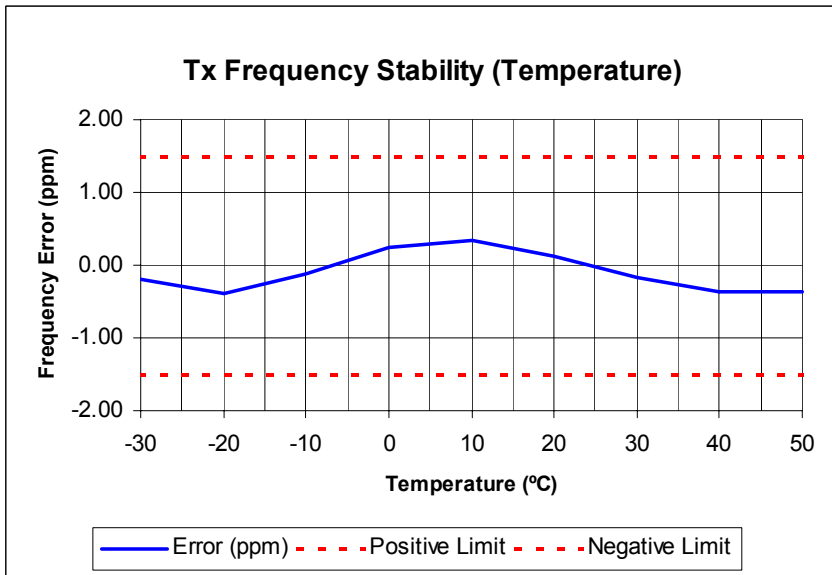
Tx FREQUENCY: 219.1 MHz 25W 25.0 kHz channel Spacing



Tx FREQUENCY: 221.5 MHz 25W 12.5 kHz channel Spacing



Tx FREQUENCY: 221.5 MHz 25W 25.0 kHz channel Spacing



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: 216 MHz ~ 266 MHz

| Channel Spacing (kHz) | FREQUENCY ERROR (ppm) @ 219.1 MHz | | |
|-----------------------|-----------------------------------|-----------|-----------|
| | 11.7 V DC | 13.8 V DC | 15.9 V DC |
| 12.5 | -0.05 | -0.07 | -0.09 |
| 25.0 | 0.06 | 0.05 | 0.04 |

| Channel Spacing (kHz) | FREQUENCY ERROR (ppm) @ 221.5 MHz | | |
|-----------------------|-----------------------------------|-----------|-----------|
| | 11.7 V DC | 13.8 V DC | 15.9 V DC |
| 12.5 | -0.10 | -0.09 | -0.16 |
| 25.0 | -0.05 | -0.04 | -0.06 |

LIMITS

| Frequency Range: 216 - 220 MHz | |
|---------------------------------|-----------------------|
| LIMIT CLAUSE: FCC 47 CFR 80.209 | |
| Channel Spacing (kHz) | Frequency Error (ppm) |
| 12.5 | 5.0 |
| 25.0 | 5.0 |

| Frequency Range: 220 - 222 MHz | |
|---------------------------------|-----------------------|
| LIMIT CLAUSE: FCC 47 CFR 90.213 | |
| Channel Spacing (kHz) | Frequency Error (ppm) |
| 12.5 | 1.5 |

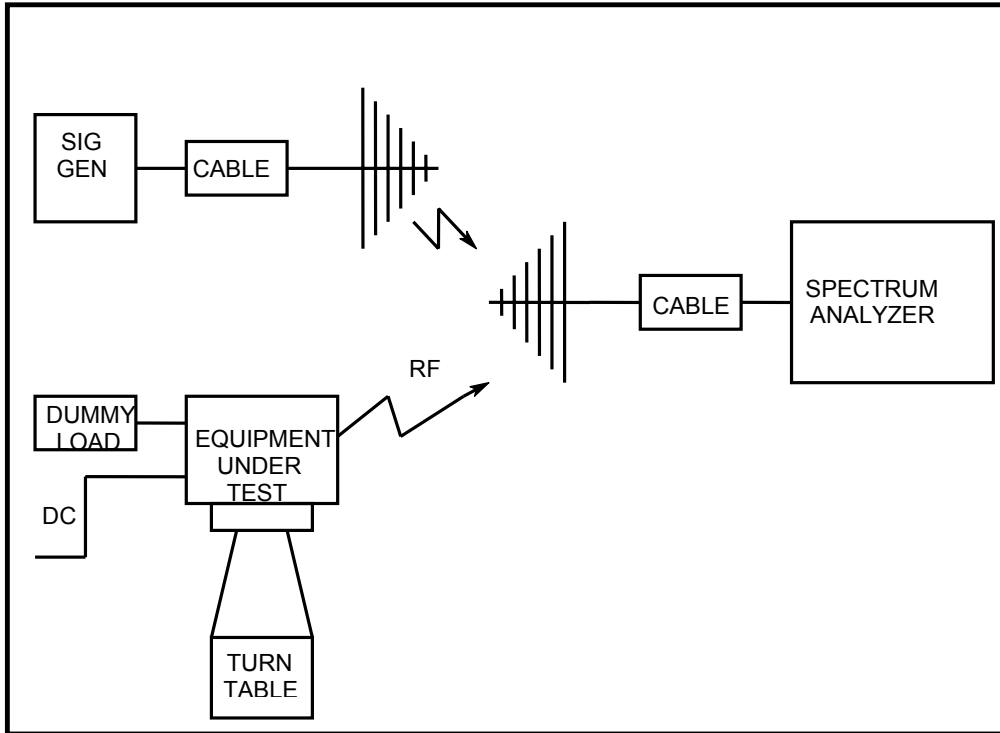
TEST EQUIPMENT USED

| No# | Equipment | Manufacturer | Model No | Serial No# | Tait ID | Cal Due |
|-----|------------------------|-----------------|------------------------|-------------|---------|-----------|
| 1 | Signal Generator | Hewlett Packard | HP8642B (Opt 001) | 2512A00176 | E3064 | 18-Feb-05 |
| 2 | Signal Generator | Hewlett Packard | HP8648A | 3430U00344 | E3579 | 15-Oct-04 |
| 3 | Signal Generator | Agilent | E4422B | GB40050320 | E3788 | 22-Oct-04 |
| 4 | Signal Generator | Hewlett Packard | HP8648C | 3443U00543 | E3558 | 11-Sep-05 |
| 5 | Signal Generator | Rohde & Schwarz | SMY01 1062.5502.11 | 841736/019 | E3553 | 29-Oct-04 |
| 13 | Audio Analyser | Hewlett Packard | HP8903A | 2308A02597 | E3074 | 15-Oct-04 |
| 16 | Power Sensor | Rohde & Schwarz | URV5- Z4 395.1619. 55 | 841.498/003 | E3557 | 11-Mar-05 |
| 20 | Power Supply | Hewlett Packard | HP6032A | 2441A-0041Z | E3075 | 15-Oct-04 |
| 21 | Power Supply | Rohde & Schwarz | NGS M32/10 192.0810.31 | Fnr 434 | E3556 | 14-Jun-05 |
| 22 | Oscilloscope | Tektronics | TDS340 | B013611 | E3585 | 25-Nov-04 |
| 24 | Environ. Chamber | Contherm | Temp Control | E3397 | E3397 | 04-Mar-05 |
| 43 | Horn Antenna | Emco | DRG3115 | | E3076 | 27-Sep-06 |
| 52 | Amplifier +21.7 dB | Tait | ZFL-1000LN | E3660 | E3360 | |
| 53 | RF Filter 21.4M (CAST) | Tait | NDK21G-6DT | E3069 | E3069 | 28-May-05 |
| 62 | RF Attenuator 150W | Weinschel | 57-10-34 | LB590 | E3674 | 20-Jul-05 |
| 65 | RF Attenuator 50W | Weinschel | 24-20-44 | AW1266 | E3562 | 28-Jun-05 |
| 82 | 3m Coax Cable BLUE) | Suhner | Sucoflex 104A | 25033/4A | E3694 | 30-Oct-04 |
| 84 | 1m Coax Cable (BLUE) | Suhner | Sucoflex 104A | 25005/4A | E3692 | 15-Jul-05 |
| 87 | Audio Analyser | Hewlett Packard | HP8903B | 2818A04275 | E3710 | 25-Nov-04 |
| 88 | Spectrum Analyser | Hewlett Packard | HP8562E | 3821A00779 | E3715 | 06-Jan-05 |
| 90 | Power Supply | Hewlett Packard | HP6012B | 2524A00616 | E3712 | 21-Jul-05 |
| 91 | 20m Coax Cable | | RG214/U-50 (Ext Cal) | CBL01 | E3404 | 08-Sep-04 |
| 100 | Oscilloscope | Tektronics | TDS380 | B017095 | E3782 | 16-Oct-04 |
| 111 | Modulation Analyser | Hewlett Packard | HP8901B (Opt 002) | 3704A05837 | E3786 | 15-Oct-04 |
| 114 | Signal Generator | Rohde & Schwarz | SML03 1090.3000.13 | | E4050 | 28-Nov-04 |
| 115 | Environ. Chamber | Contherm | 5400 RHSLT.M | | E4051 | 04-Mar-05 |
| 123 | Spectrum Analyser | Agilent | E4445A | MY42510072 | E4139 | 23-Apr-05 |

APPENDIX A

TEST SETUP DETAILS

Test set up for Spurious Emissions (Radiated)



All other testing was performed using the Teltest Radio **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.

