

# Laboratory Test Report

## RADIO PERFORMANCE MEASUREMENTS

for the

**TMAC0C Mobile Transceiver**

Tested In accordance with

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

Report Revision: 1  
Issue Date: 8-November-2010  
FCC ID: CASTMAC0C

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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
8-November-2010	1	Initial test report

## INTRODUCTION

Type Approval Testing of the  
TMAB22-C001A  
Serial No 19578172  
174 MHz → 225 MHz

in accordance with:

**FCC CFR 47 Parts 80, 90K & 90T**

## REPORT PREPARED FOR

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

## DESCRIPTION OF SAMPLE

Manufacturer: Tait Electronics Limited  
Equipment: Mobile Transceiver  
Type: TMAC0C  
Product code: TMAB22-C001A  
Serial Numbers: 19578172  
Quantity: 1  
Hardware & Software

### Control Head

Type	Code and Version
Hardware ID	TMAC40-0000_0004
Boot Code	QCA2B_std_2.01.00.0002
Radio Application	QCA2F_std_6.01.00.0051
FPGA Image	QCA2G_std_2.01.00.0001

### Torso

Hardware ID	TMAB22-C000_0201
Boot Code	QMA2B_std_2.01.00.0002
DSP	QMA2A_std_6.01.00.0051
Radio Application	QMA2F_std_6.01.00.0051
FPGA Image	QMA2G_s01_2.01.00.0001

## STATEMENT OF COMPLIANCE

The TMAB22-C001A Mobile transceiver as tested in this report was found to conform to the following standards:

**FCC CFR 47 Parts 80, 90K (216 → 220MHz), & 90T (220 → 222MHz)**

## TEST CONDITIONS

All testing was performed at the following conditions.

Ambient Temperature	15°C	→ 30°C
Relative Humidity	20%	→ 75%
Standard Test Voltage	13.8 V <sub>DC</sub>	

## MODULATION TYPES AND EMISSION DESIGNATORS

### Modulation Types:

F3E	Analog FM
F2D	FFSK Data ( 1200 bps, 2400 bps)
F1D	THSD (12000 bps, 19200 bps)

### Channel Spacings:

12.5 kHz,  
25.0 kHz

### Emission Designators:

Analog FM		11k0F3E,	16k0F3E
FFSK Data	1200 bps	6k60F2D,	9k60F2D
FFSK Data	2400 bps	7k80F2D,	10k8F2D
THSD Data	12000 bps	7k70F1D,	~
	19200 bps	~	12k7F1D

## 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:**

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

217.1 MHz	25 W nominal	1 W nominal
POWER (W)	25.9	1.04
Variation from Nominal (%)	3.6	4.0
Measurement Uncertainty	± 0.6 dB	

219.9 MHz	25 W nominal	1 W nominal
POWER (W)	25.5	1.04
Variation from Nominal (%)	2.0	4.0
Measurement Uncertainty	± 0.6 dB	

221.975 MHz	25 W nominal	1 W nominal
POWER (W)	25.5	1.06
Variation from Nominal (%)	2.0	6.0
Measurement Uncertainty	± 0.6 dB	

LIMIT CLAUSE: FCC 47 CFR 90.205 (s)

Radio Type: Mobile 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 specifically listed on the authorization.

**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:**

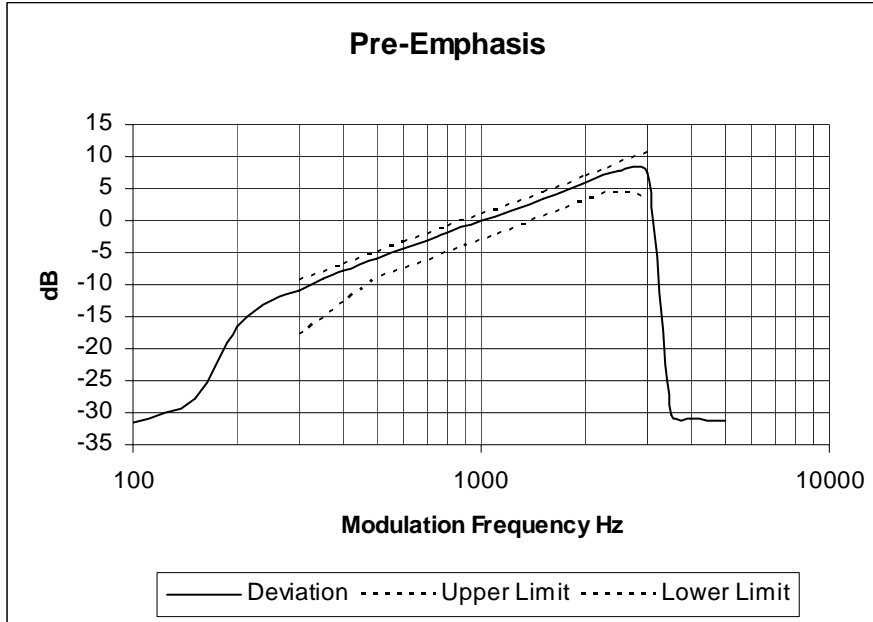
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 3.2.6

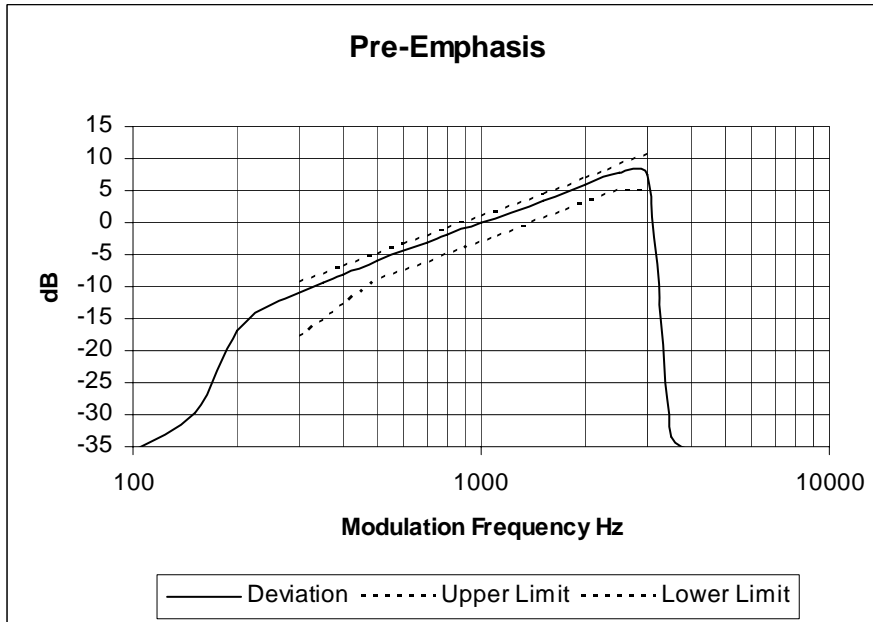
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 217.1 MHz 12.5 kHz Channel Spacing



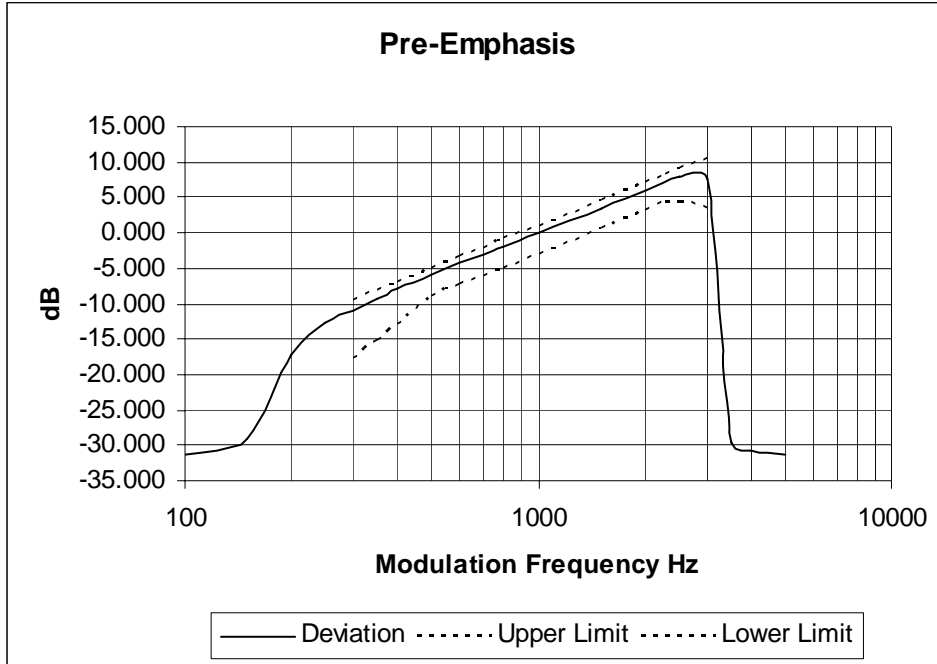
Tx FREQUENCY: 217.1 MHz 25.0 kHz Channel Spacing



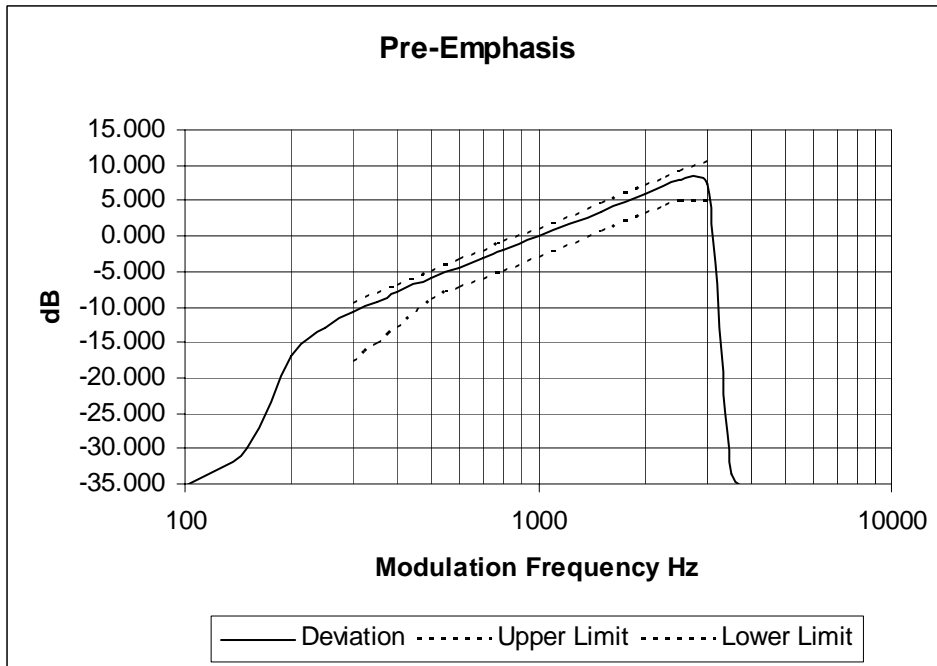


**TELTEST Laboratories**  
Tait Electronics Limited  
Report Number 3222

Tx FREQUENCY: 219.9 MHz 12.5 kHz Channel Spacing

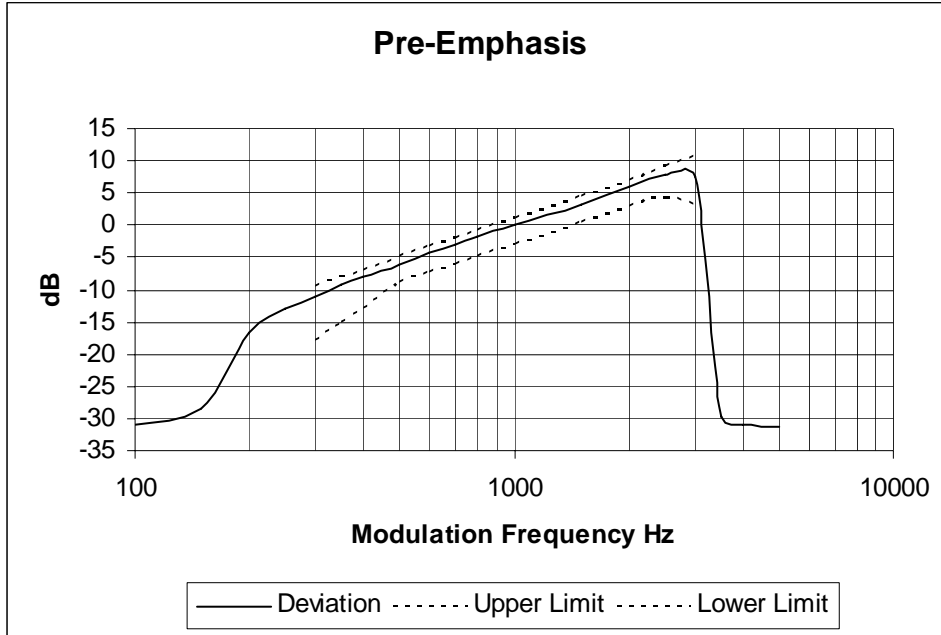


Tx FREQUENCY: 219.9 MHz 25.0 kHz Channel Spacing



TELTEST Laboratories  
Tait Electronics Limited  
Report Number 3222

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:

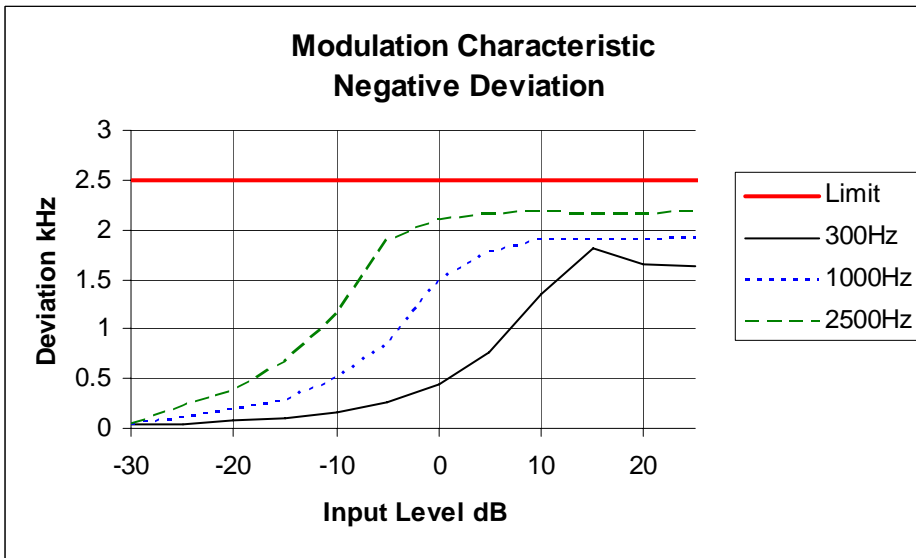
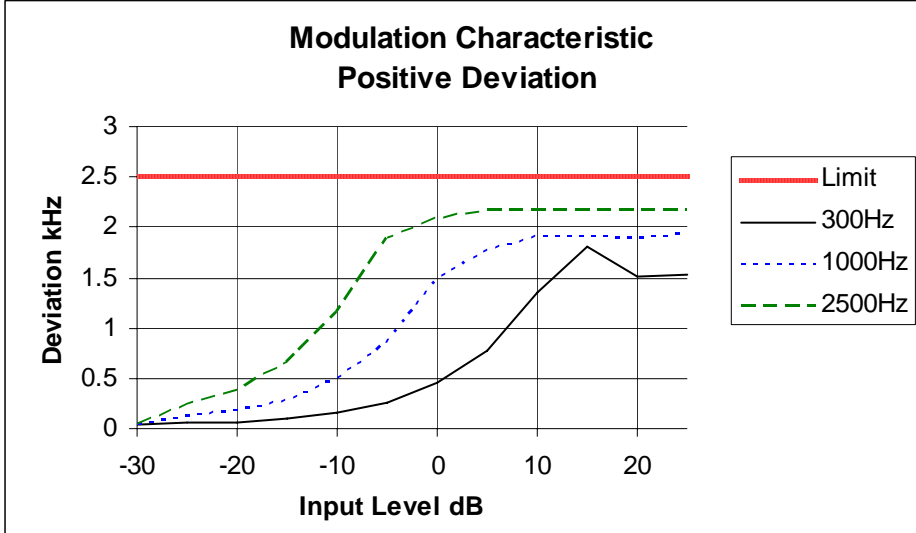
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603C 1.3.4.4

TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

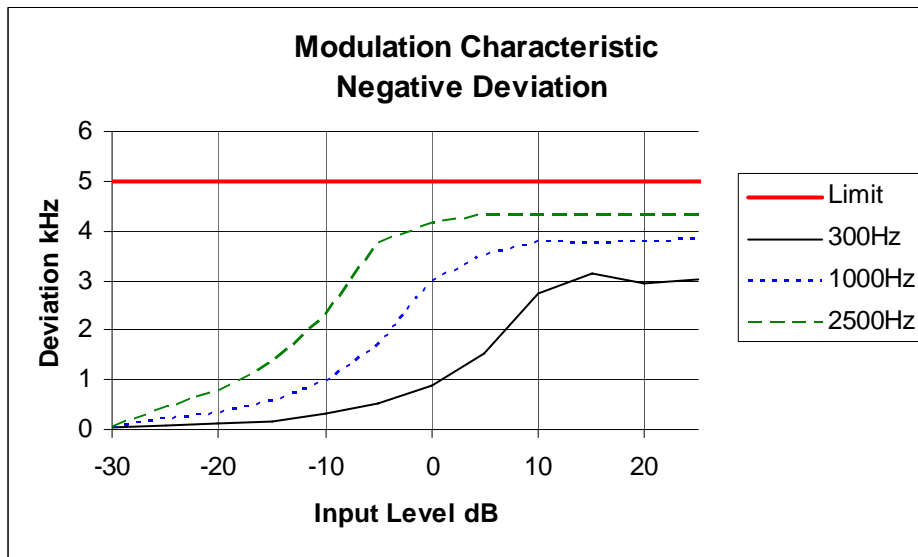
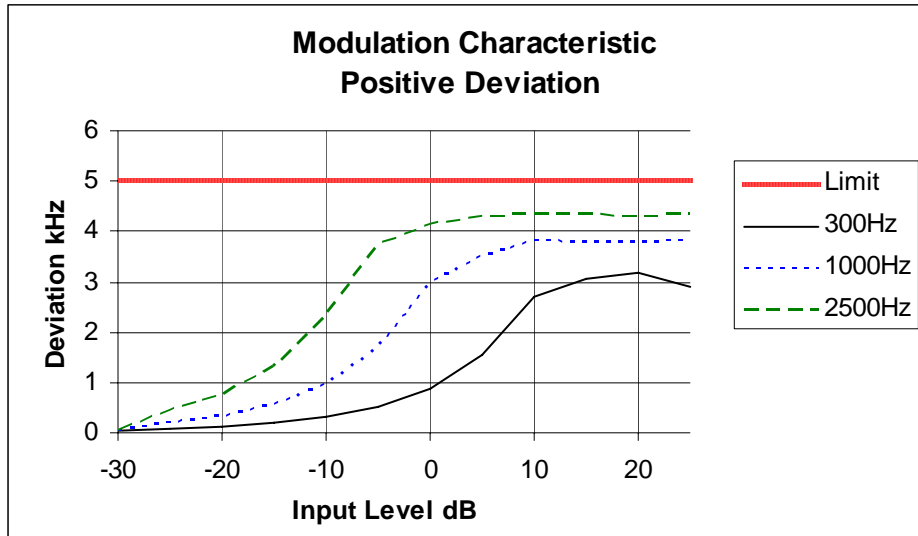
Tx FREQUENCY: 217.1 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY:

217.1 MHz

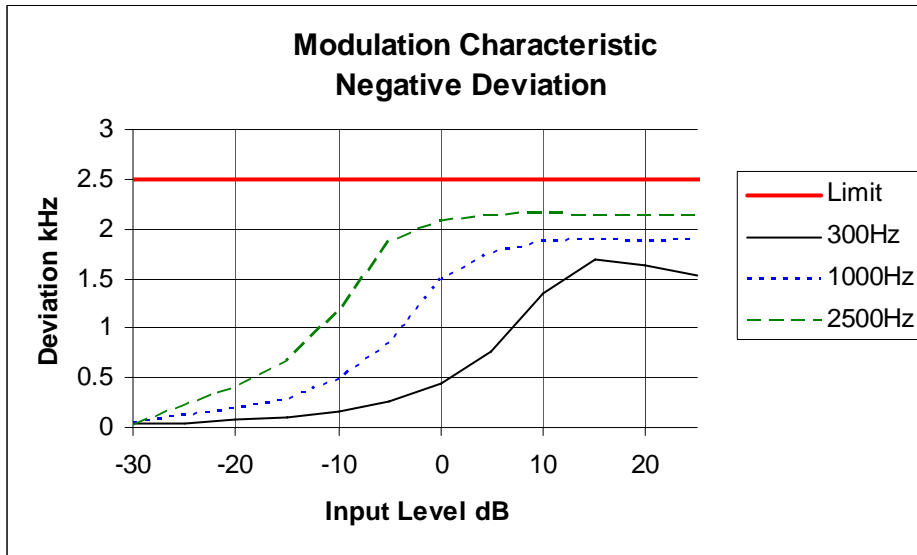
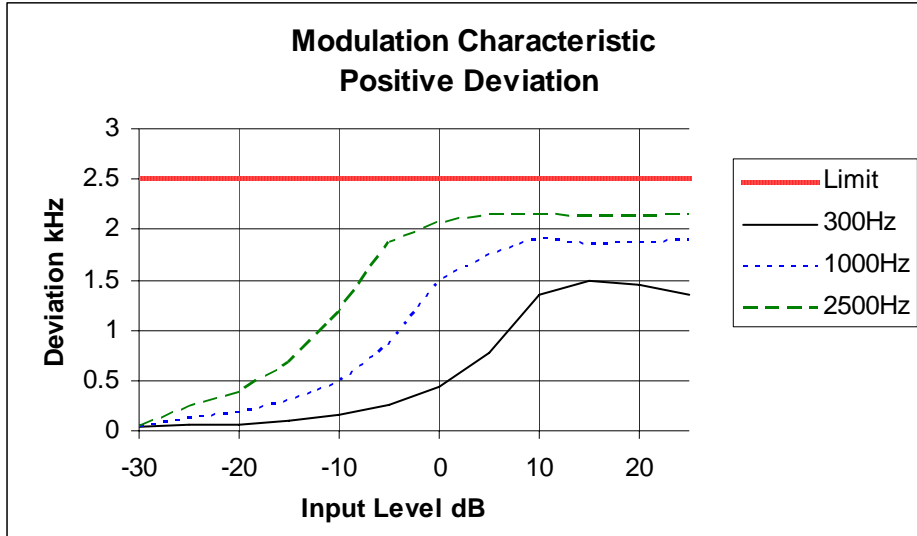
25.0 kHz Channel Spacing



Tx FREQUENCY:

219.9 MHz

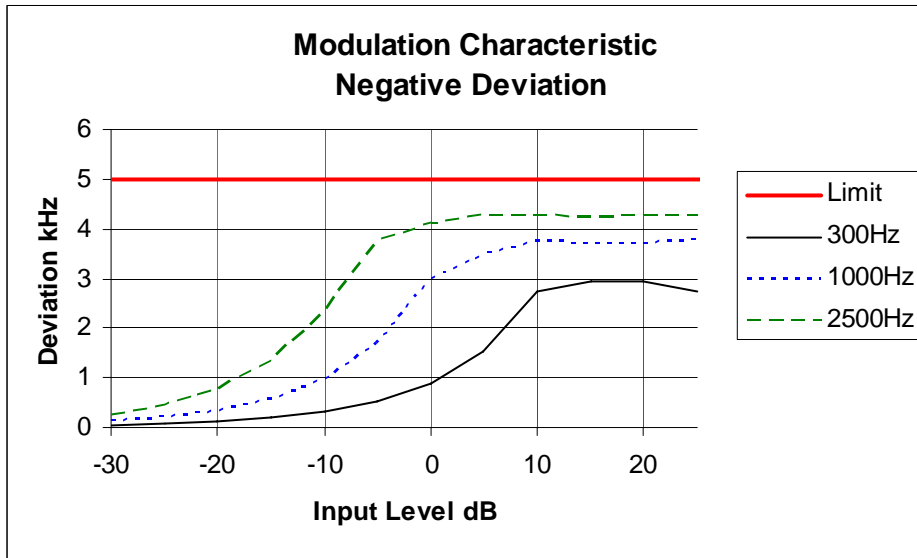
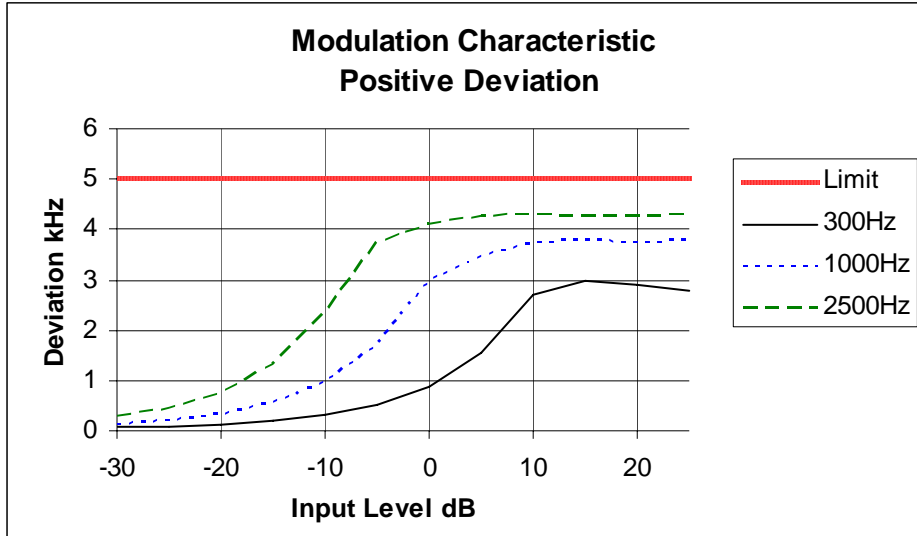
12.5 kHz Channel Spacing



Tx FREQUENCY:

219.9 MHz

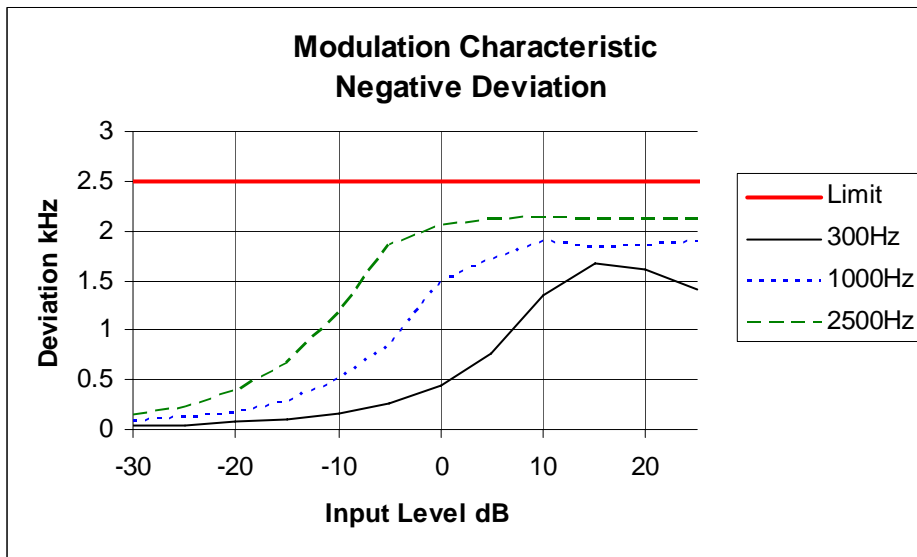
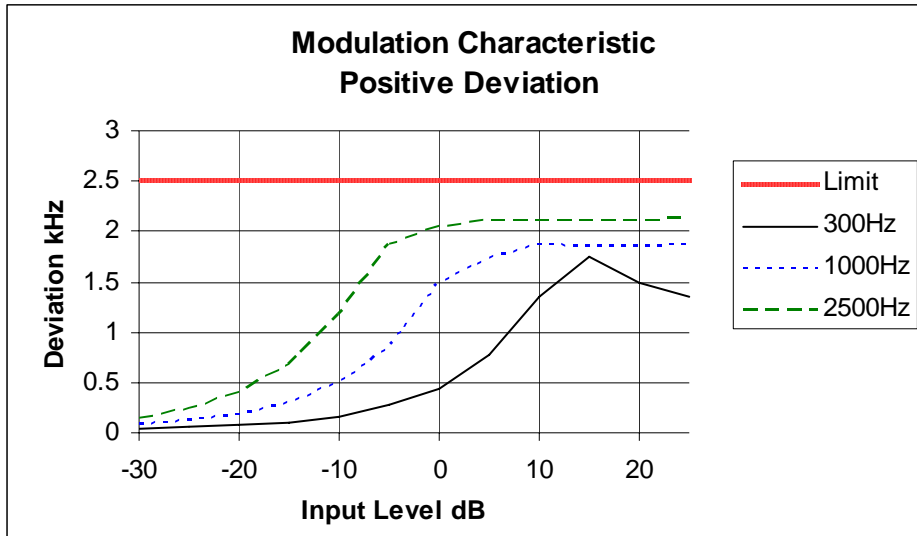
25.0 kHz Channel Spacing



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 analog 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
Emission Mask F x 5	– 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

Emission Mask D	12.5 kHz Channel Spacing	Analog; FFSK; THSD;
Emission Mask F x 5	12.5 kHz Channel Spacing	Analog; FFSK; THSD;
Emission Mask B	25.0 kHz Channel Spacing	Analog;
Emission Mask C	25.0 kHz Channel Spacing	FFSK; THSD;

### DATA SPEED

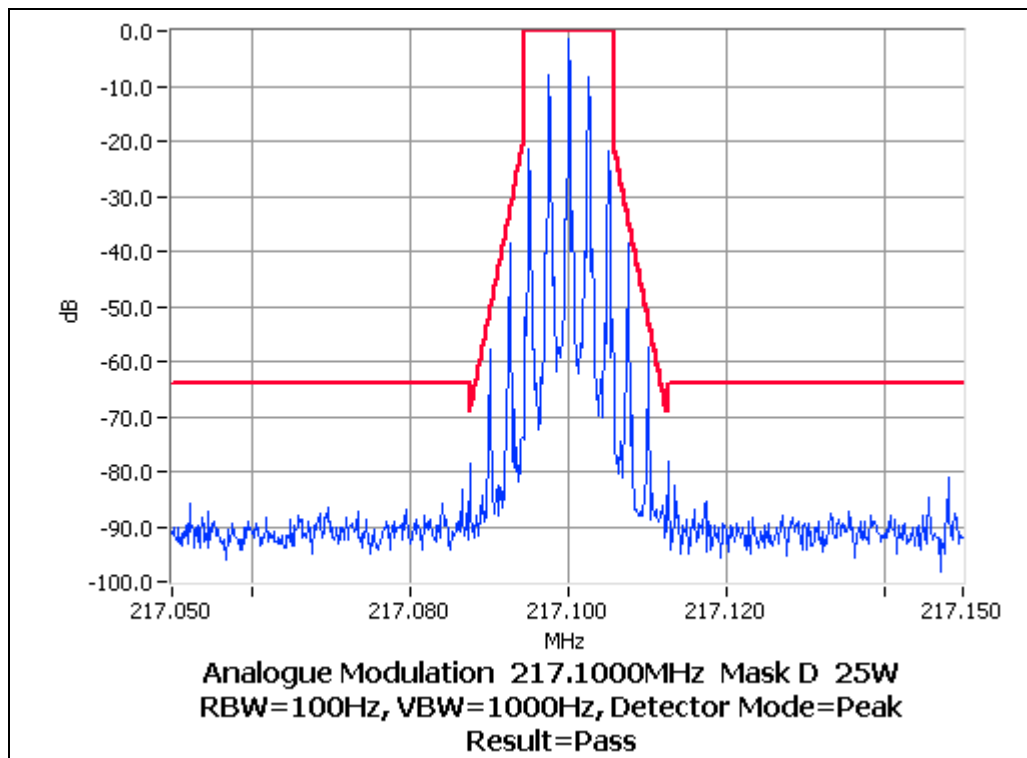
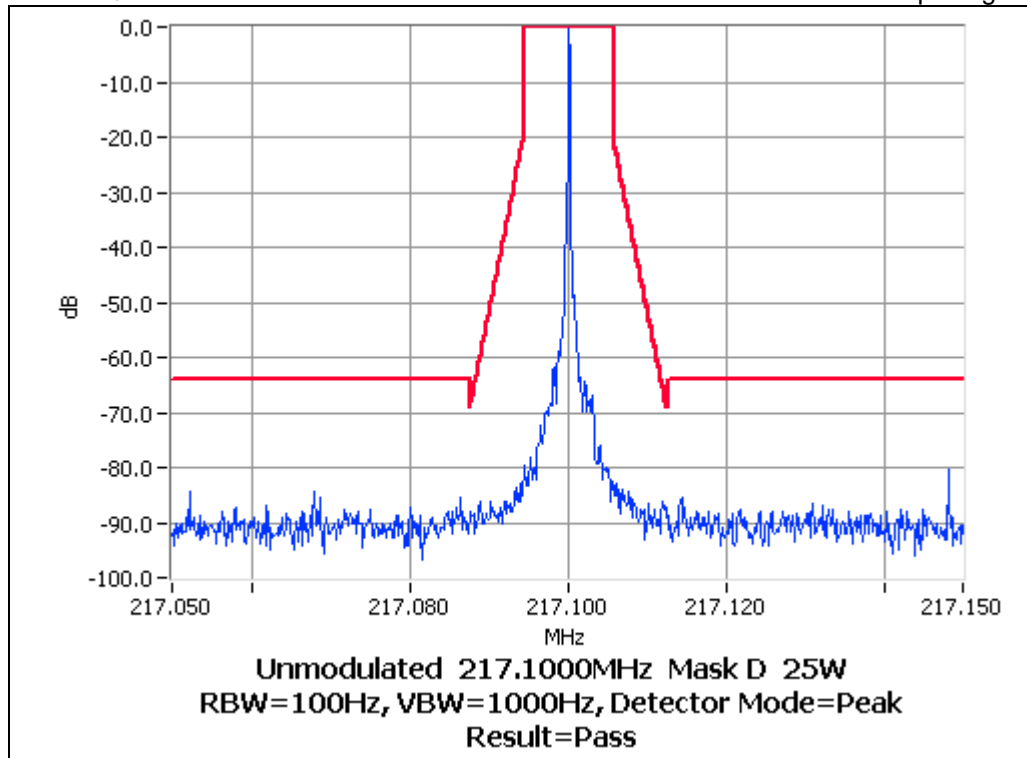
FFSK	12.5 kHz Channel Spacing	1200 & 2400 bps
FFSK	25.0 kHz Channel Spacing	1200 & 2400 bps
THSD	12.5 kHz Channel Spacing	12000 bps
THSD	25.0 kHz Channel Spacing	19200 bps

OCCUPIED BANDWIDTH

ANALOG VOICE

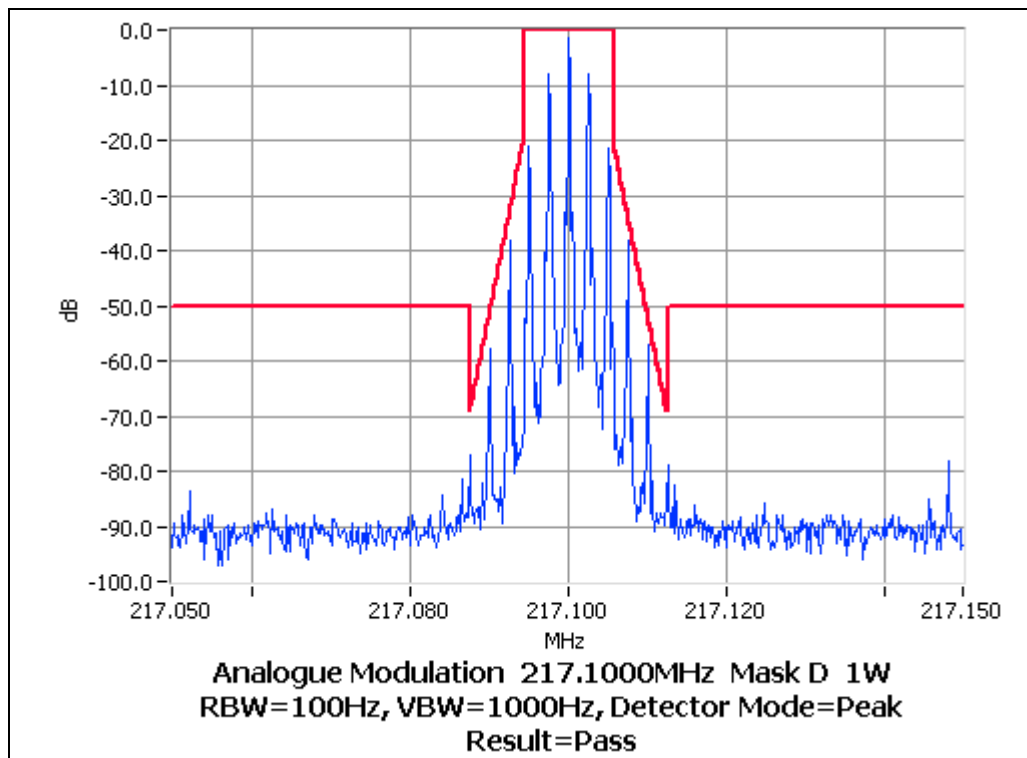
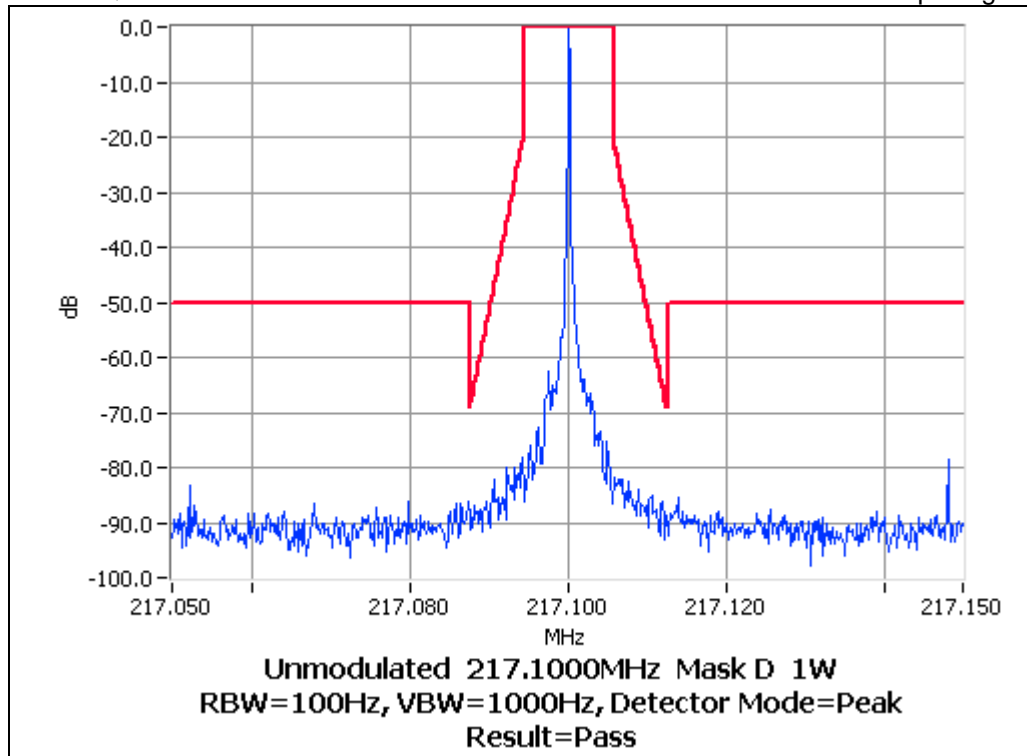
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 25 W 12.5 kHz Channel Spacing



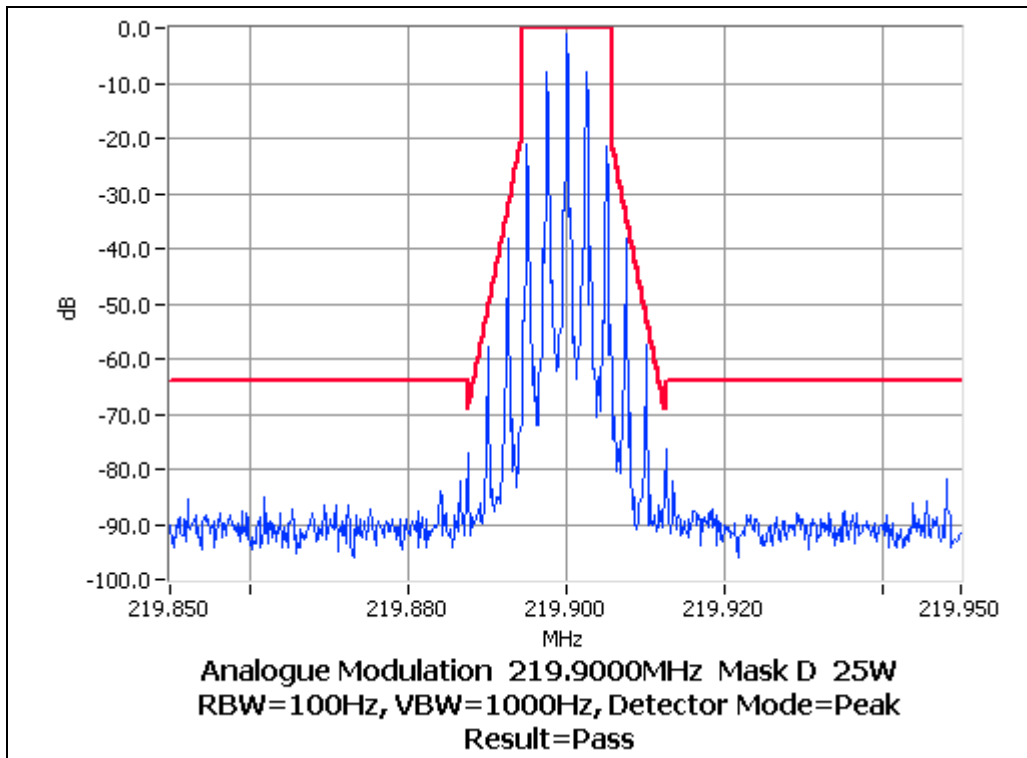
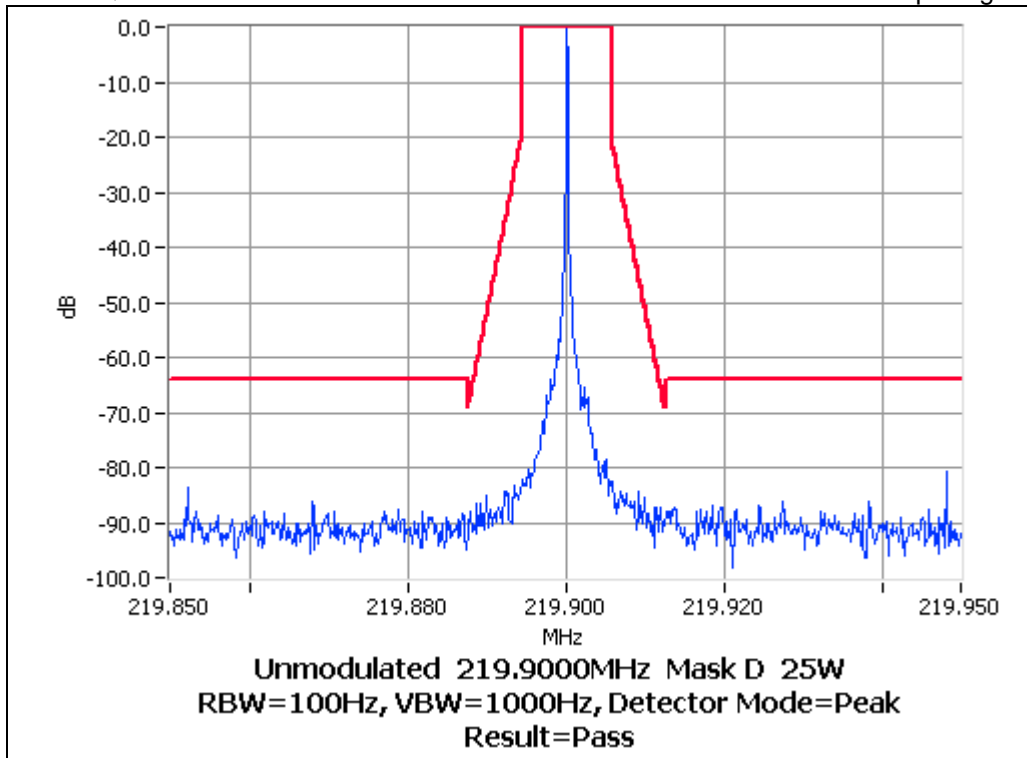
ANALOG VOICE

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing



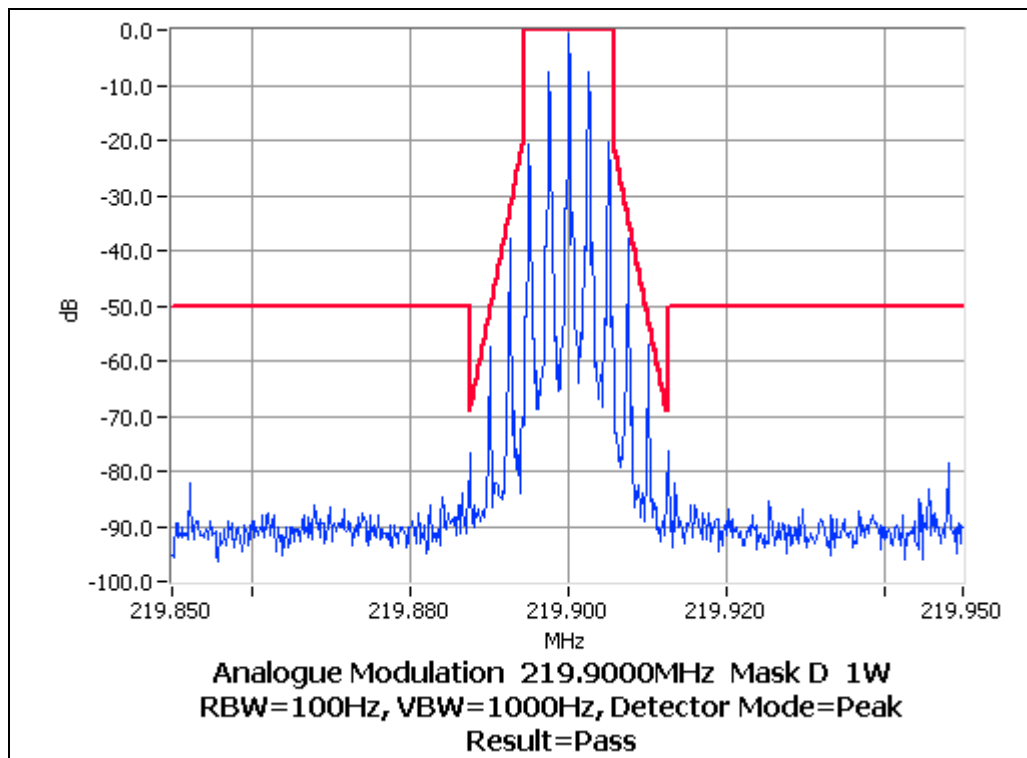
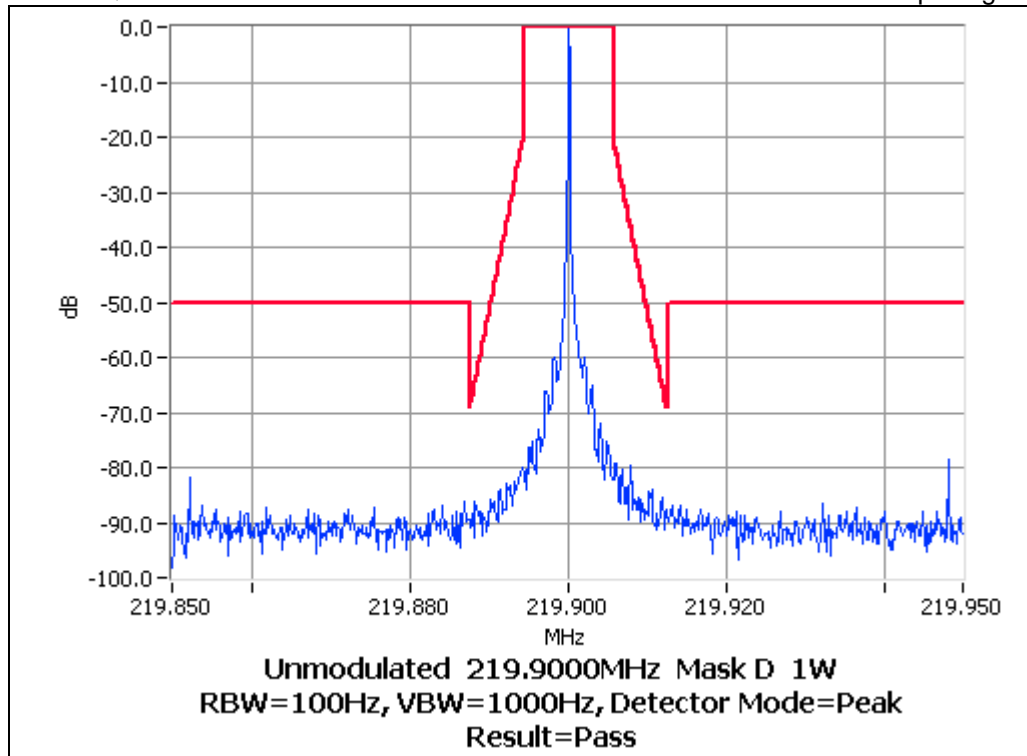
ANALOG VOICE

Tx FREQUENCY: 219.9 MHz 25 W 12.5 kHz Channel Spacing



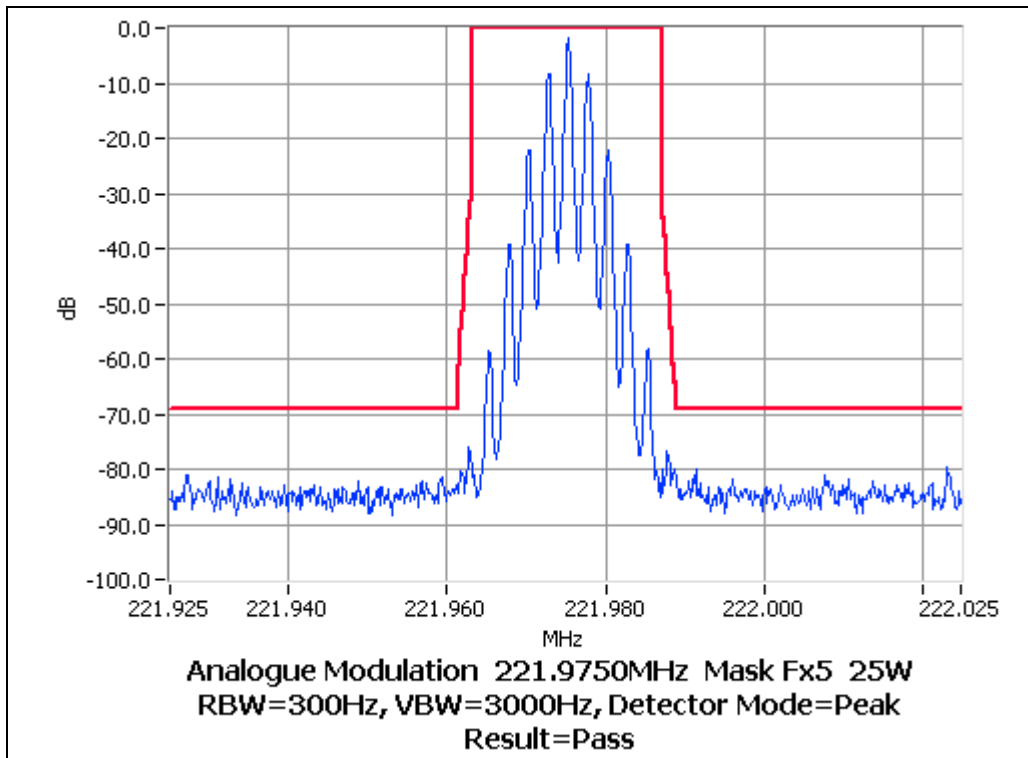
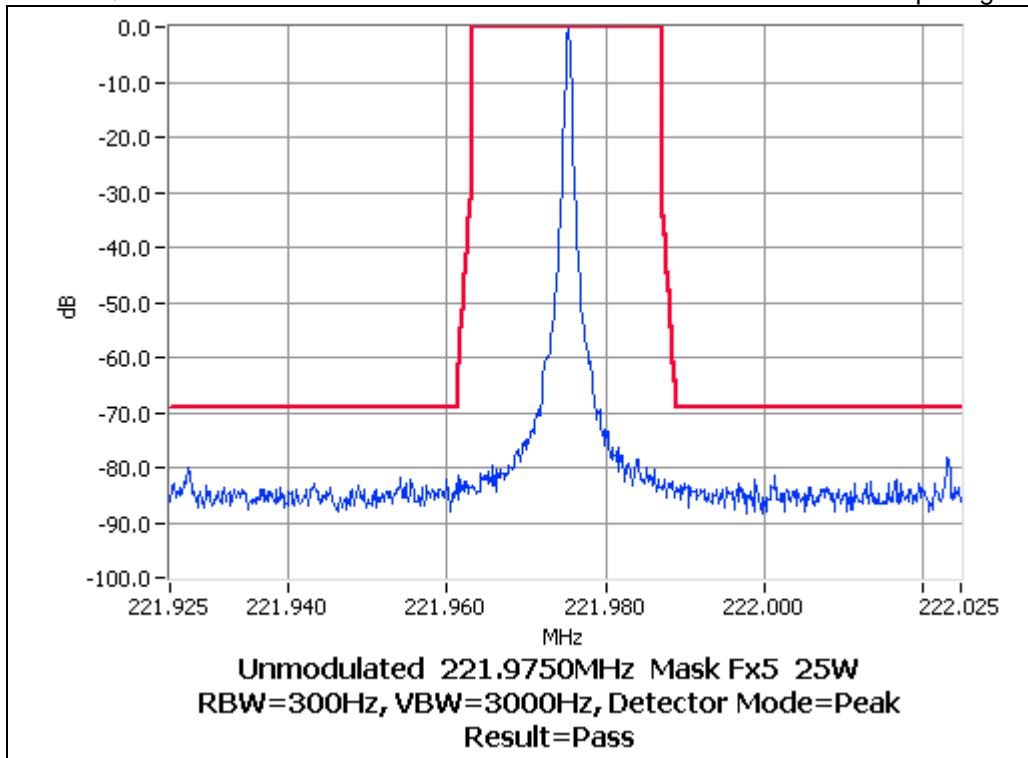
ANALOG VOICE

Tx FREQUENCY: 219.9 MHz 1 W 12.5 kHz Channel Spacing



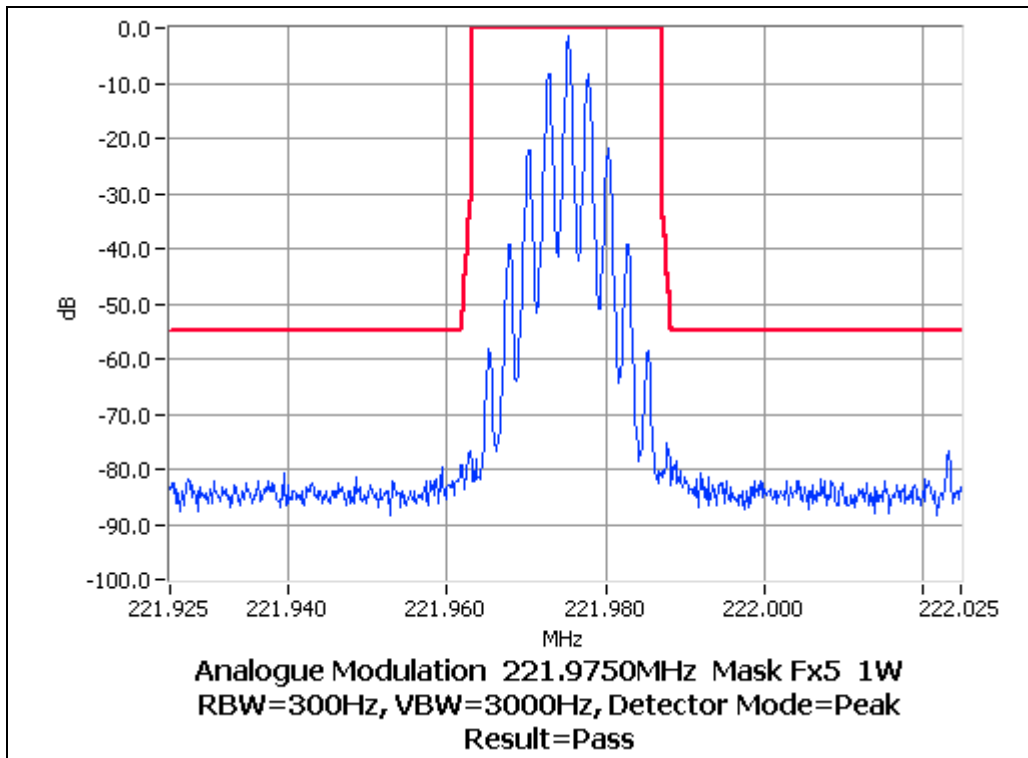
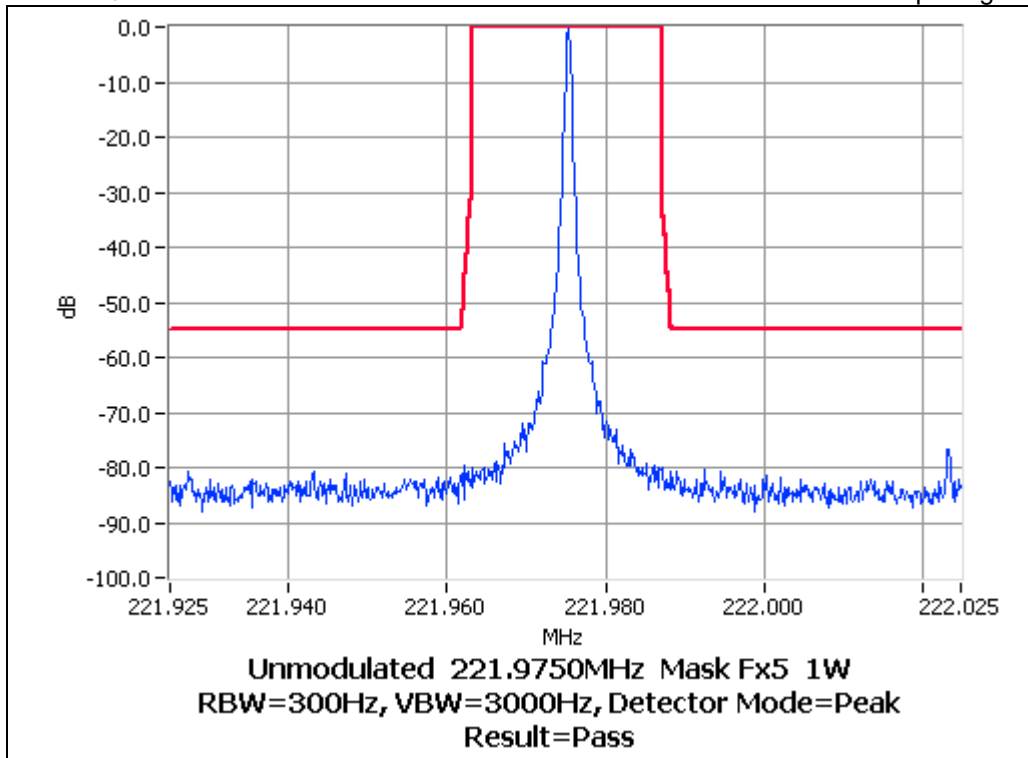
ANALOG VOICE

Tx FREQUENCY: 221.975 MHz 25 W 12.5 kHz Channel Spacing



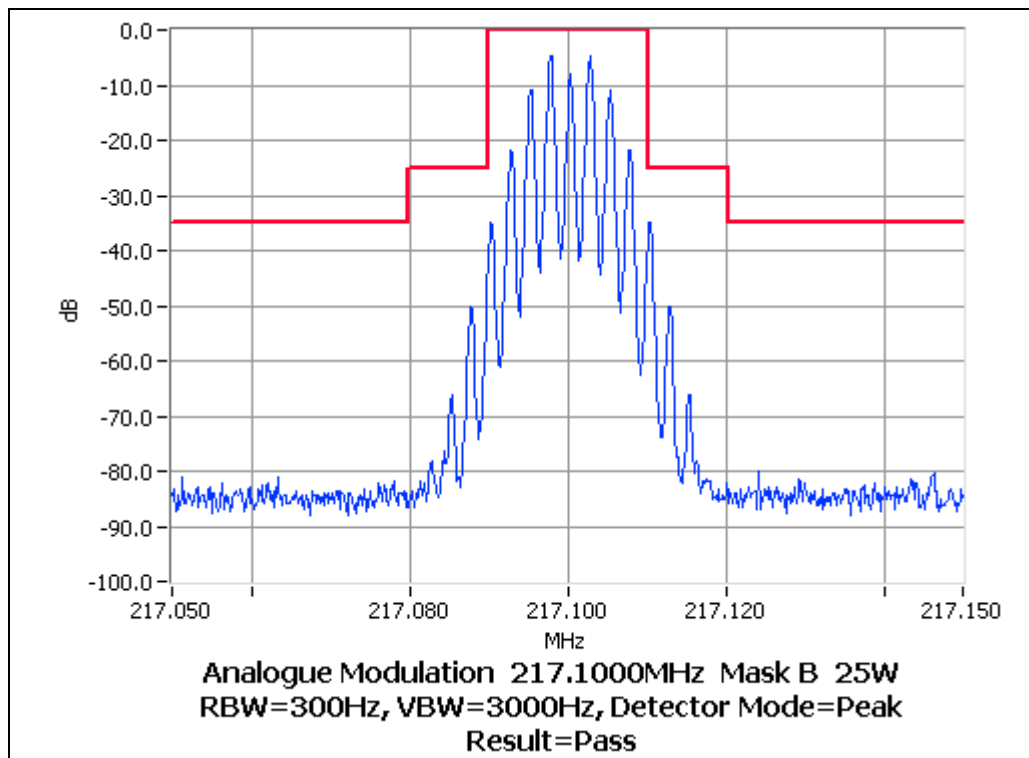
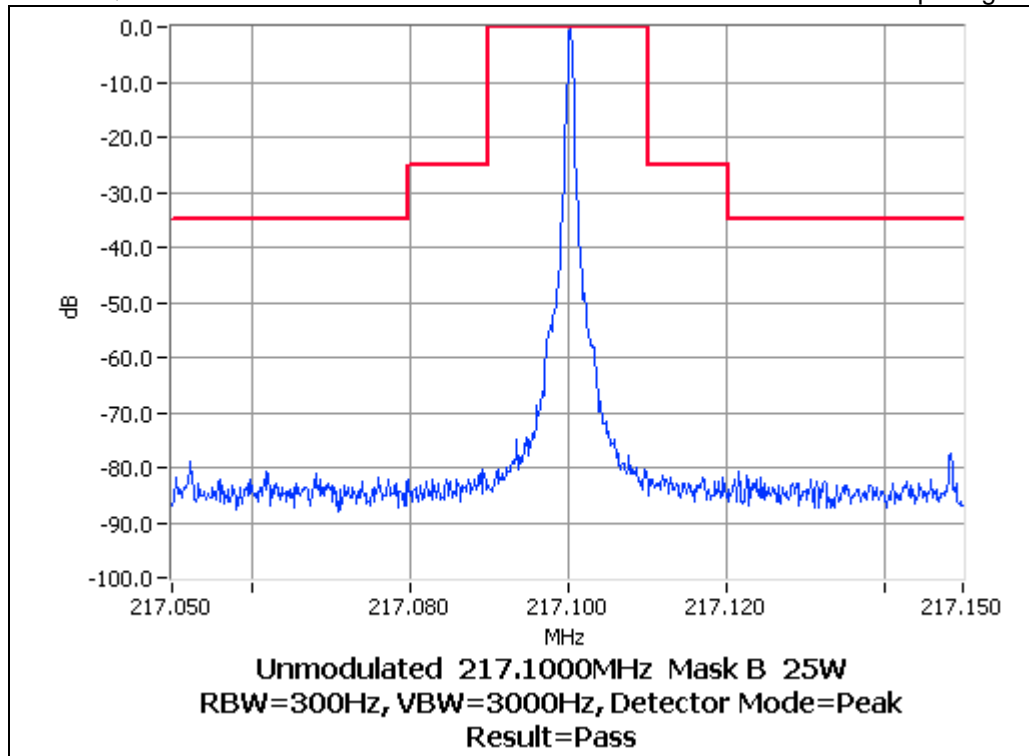
ANALOG VOICE

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing



ANALOG VOICE

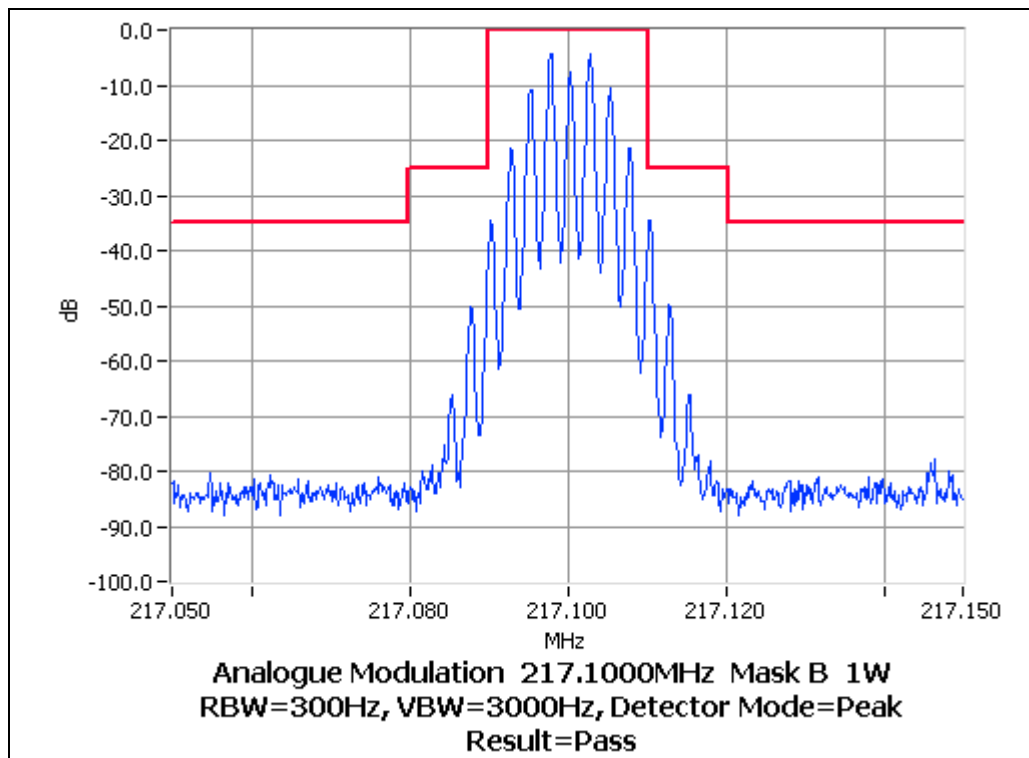
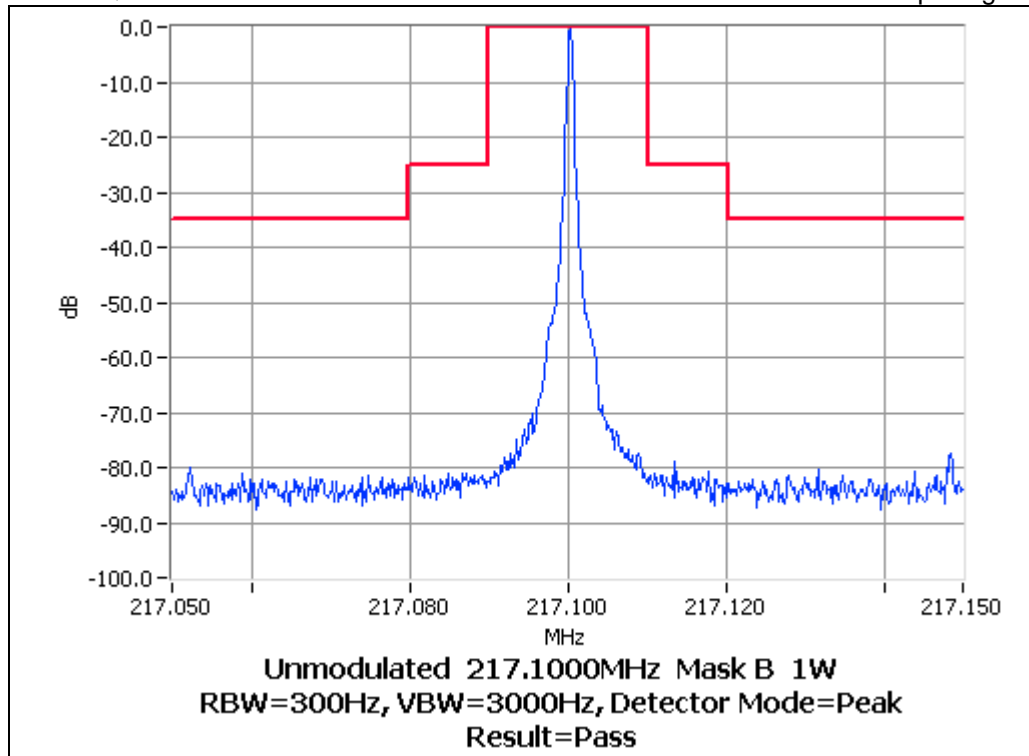
Tx FREQUENCY: 217.1 MHz 25 W 25.0 kHz Channel Spacing





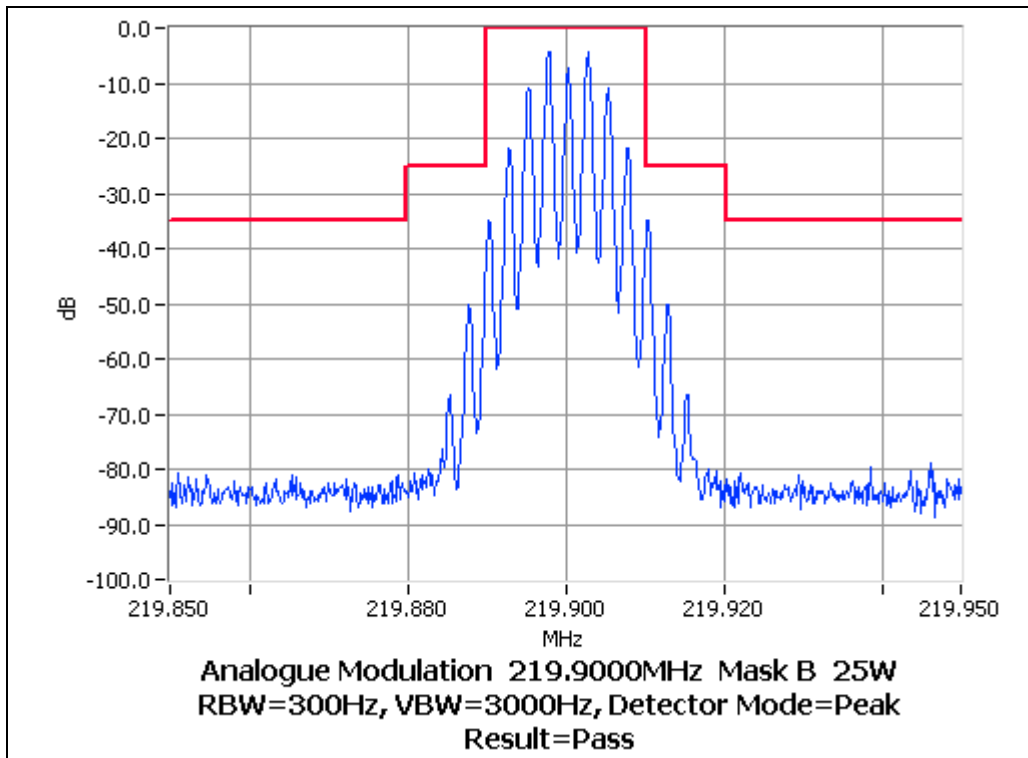
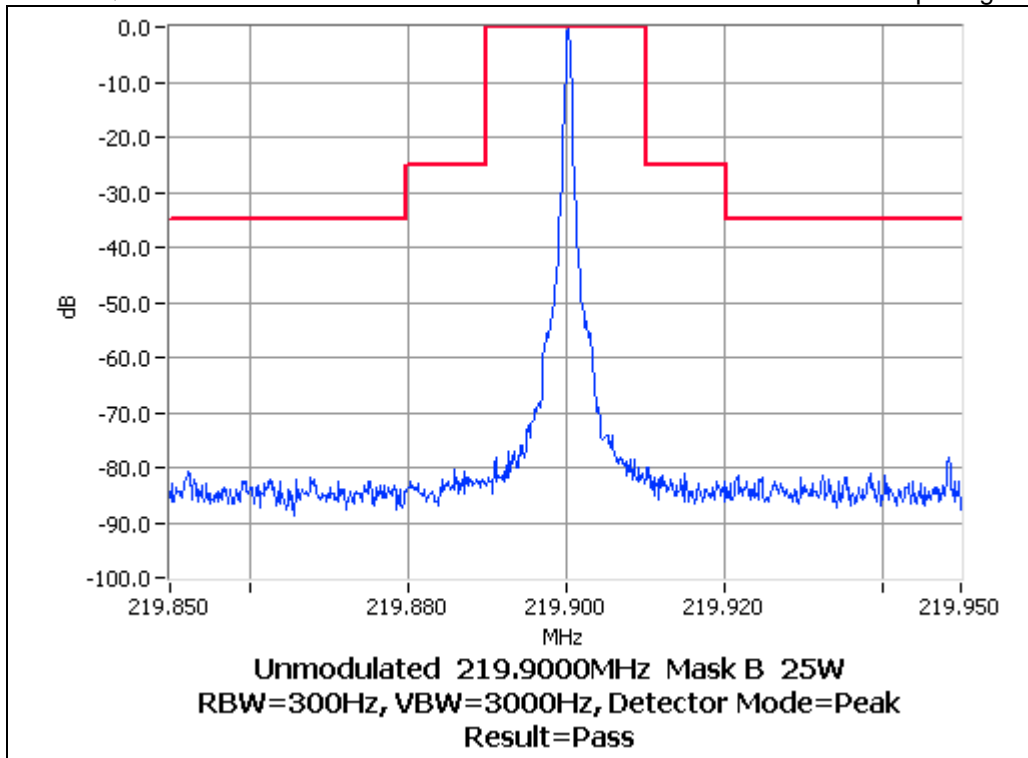
ANALOG VOICE

Tx FREQUENCY: 217.1 MHz 1 W 25.0 kHz Channel Spacing



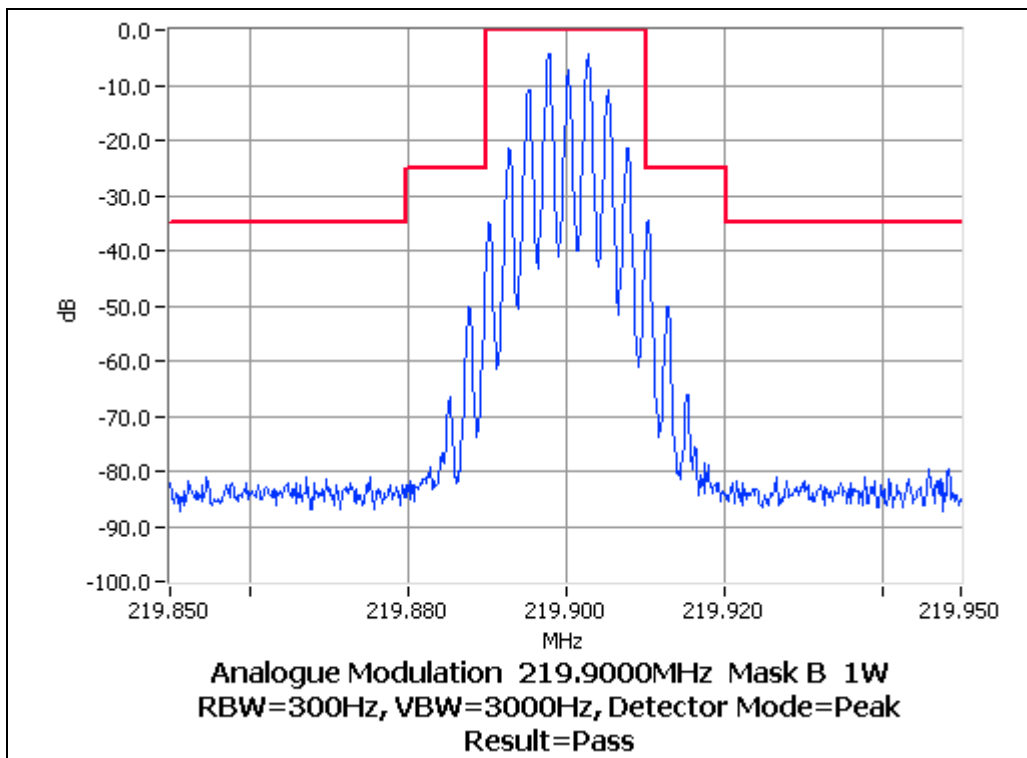
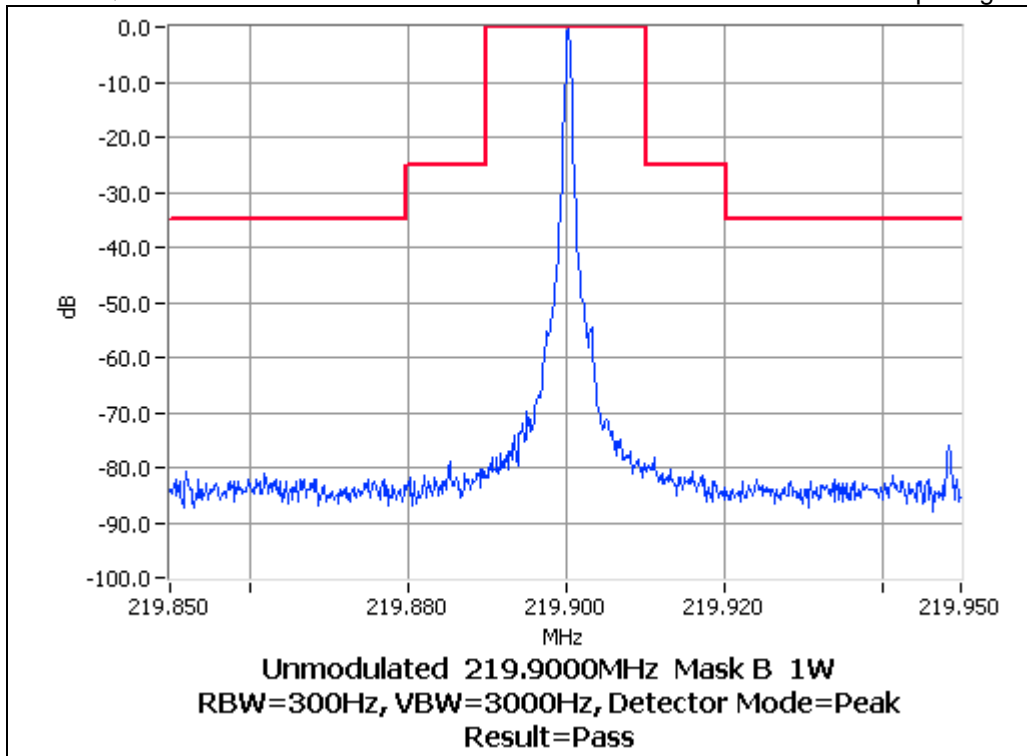
ANALOG VOICE

Tx FREQUENCY: 219.9 MHz 25 W 25.0 kHz Channel Spacing



ANALOG VOICE

Tx FREQUENCY: 219.9 MHz 1 W 25.0 kHz Channel Spacing

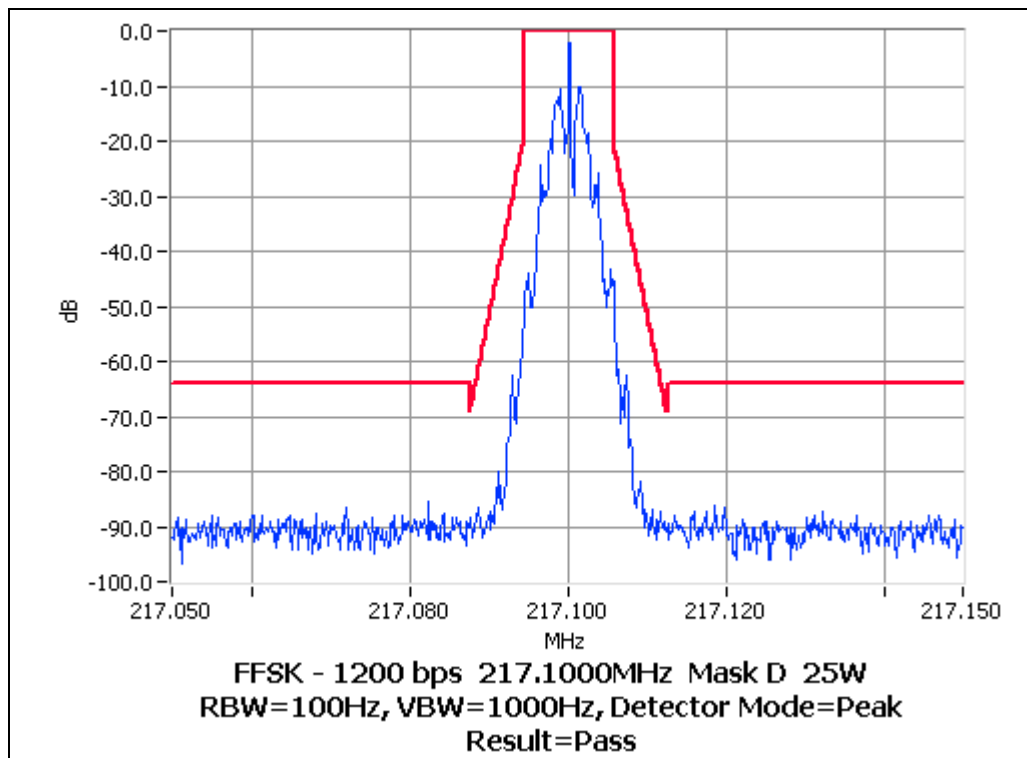
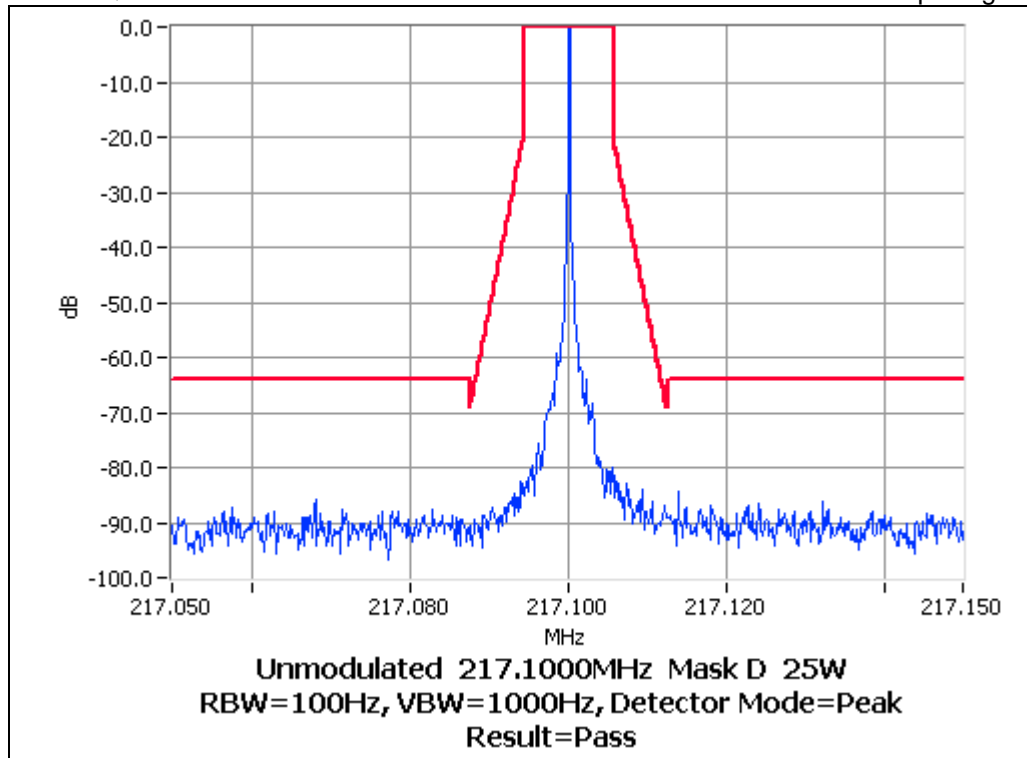


OCCUPIED BANDWIDTH

FFSK – 1200 bps

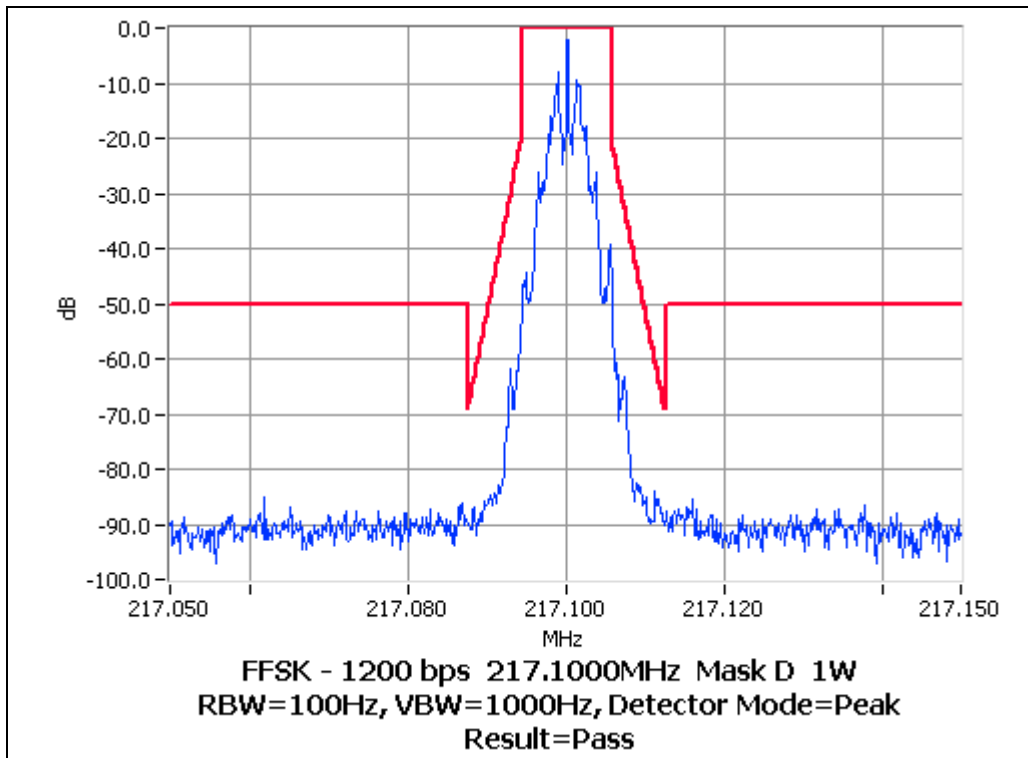
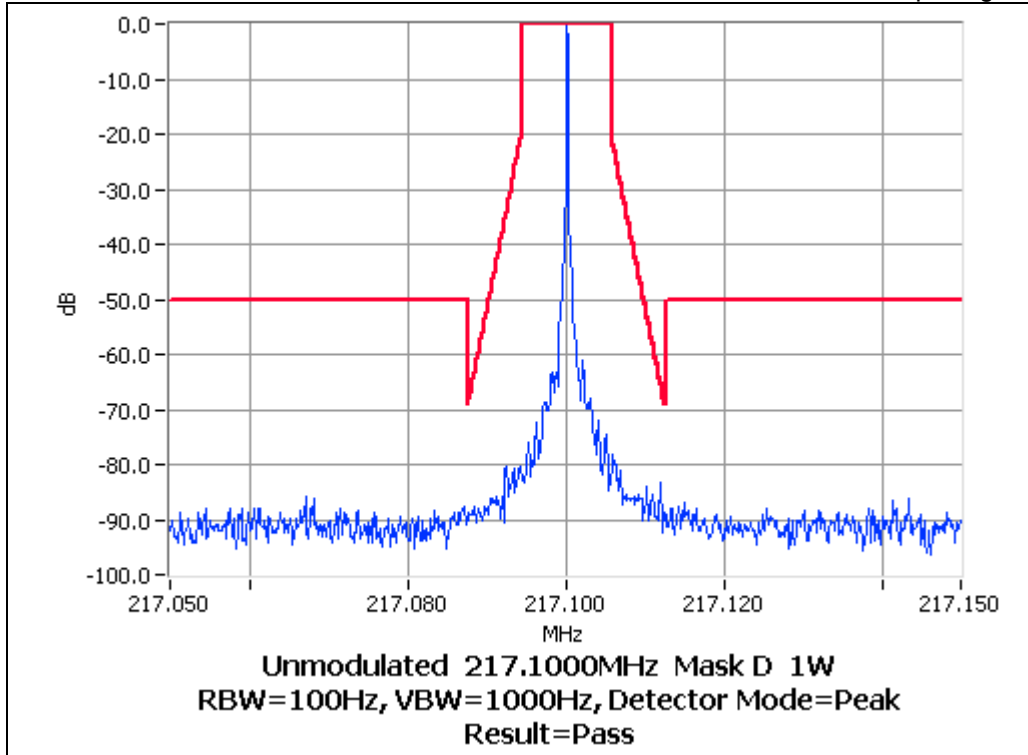
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 25 W 12.5 kHz Channel Spacing



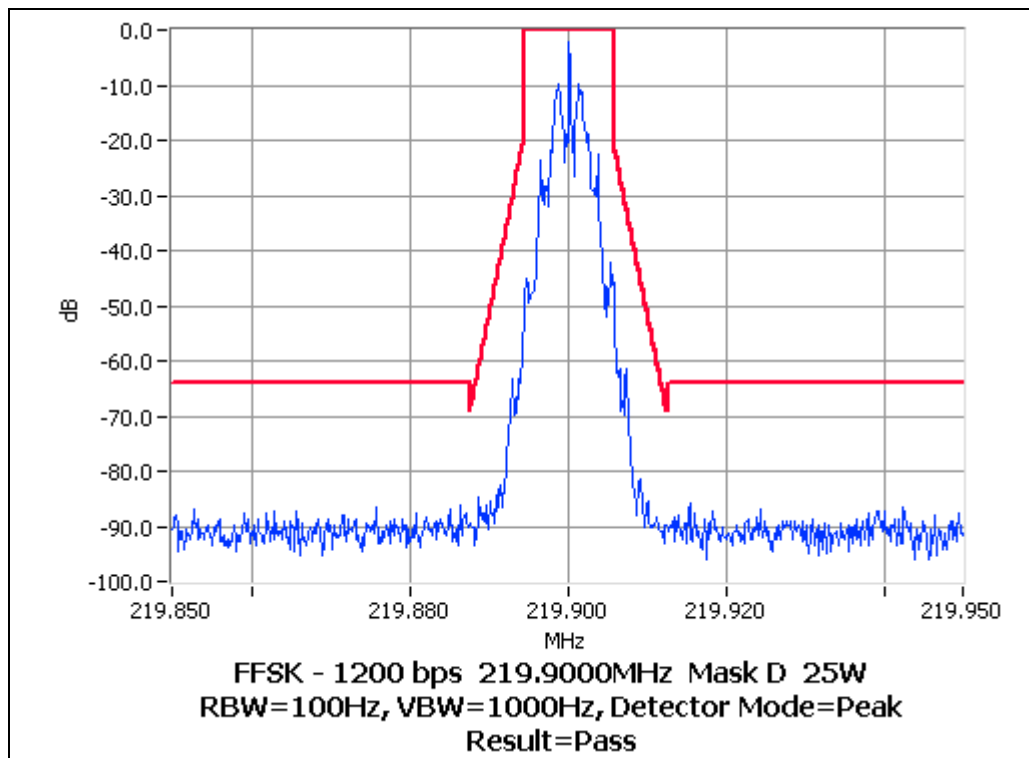
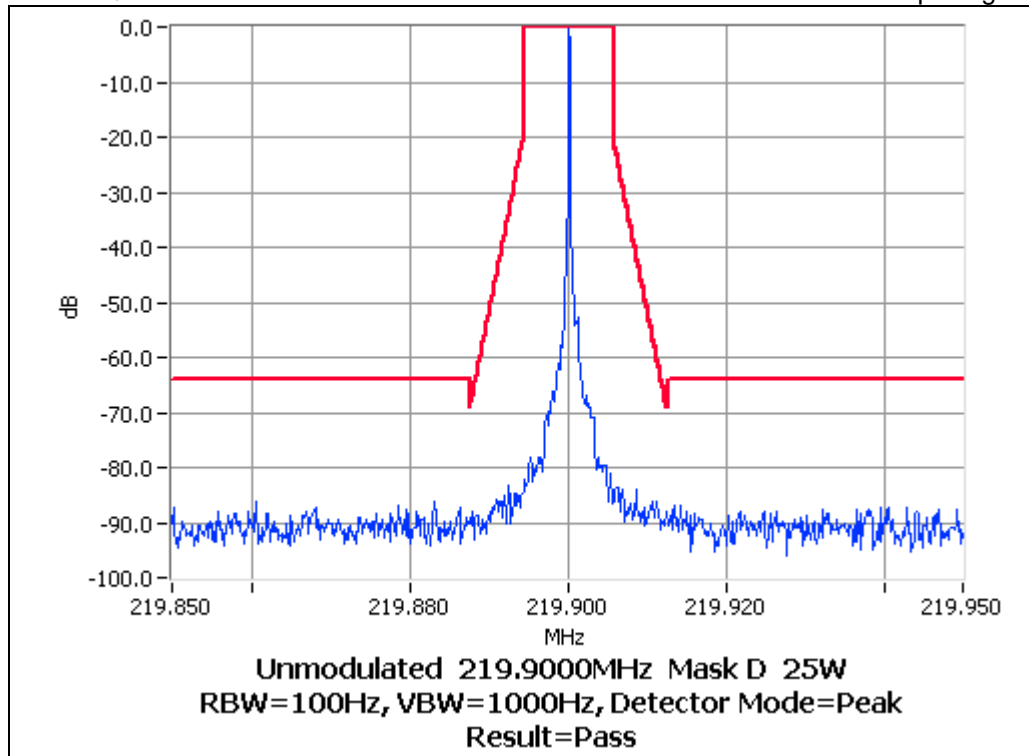
FFSK – 1200 bps

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing



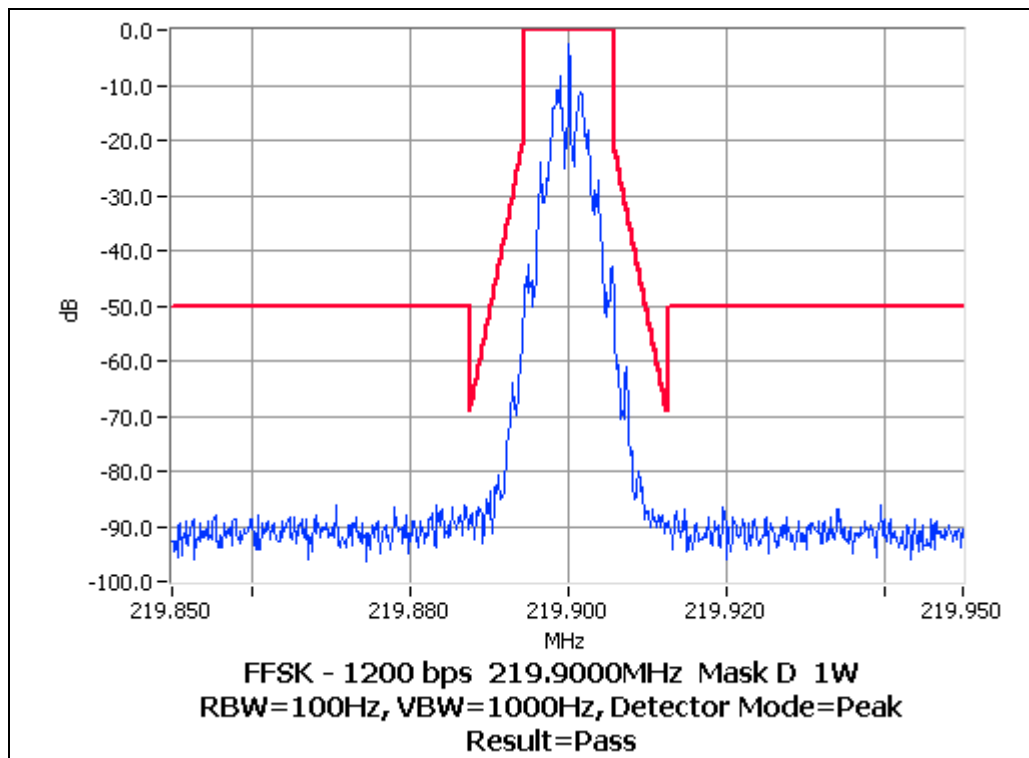
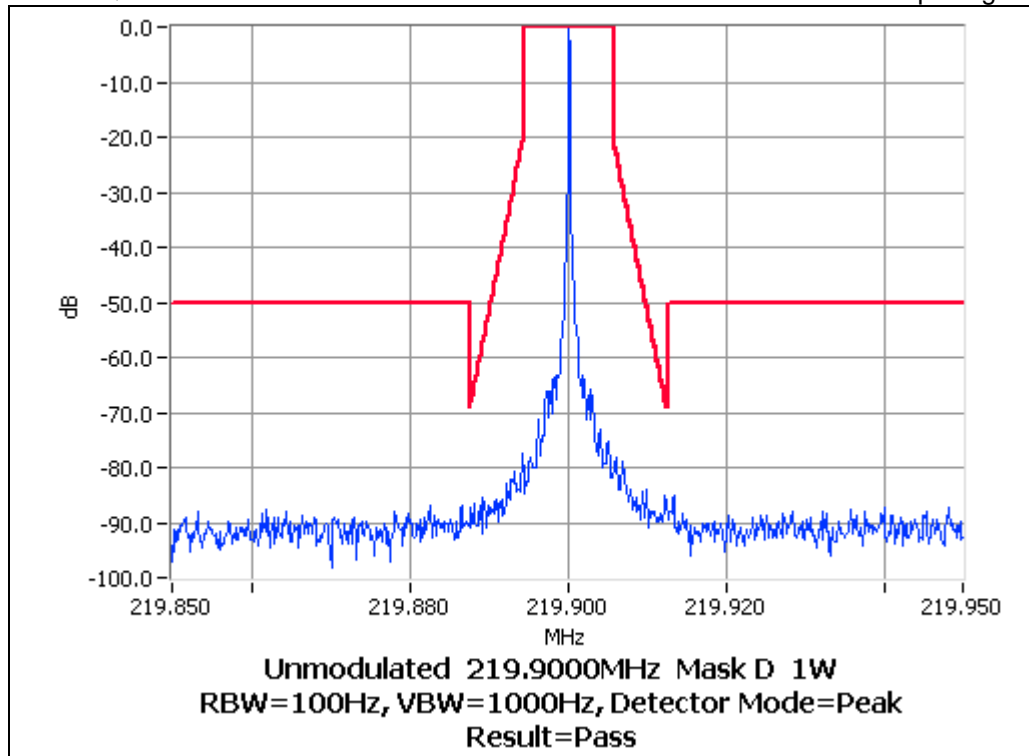
FFSK – 1200 bps

Tx FREQUENCY: 219.9 MHz 25 W 12.5 kHz Channel Spacing



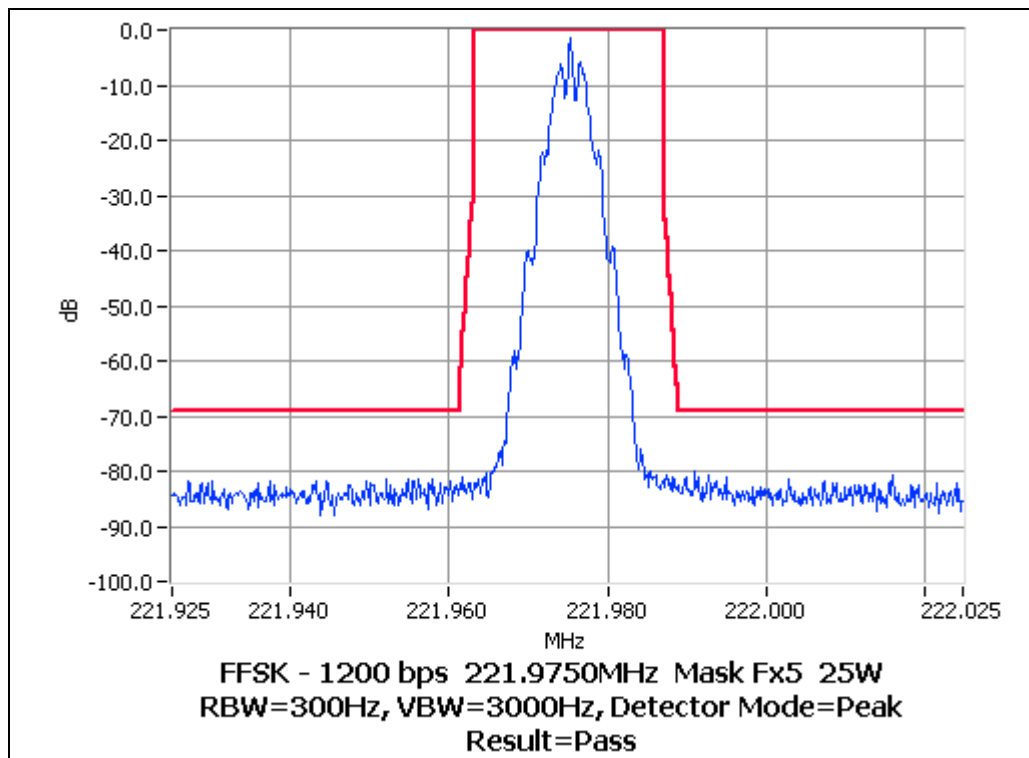
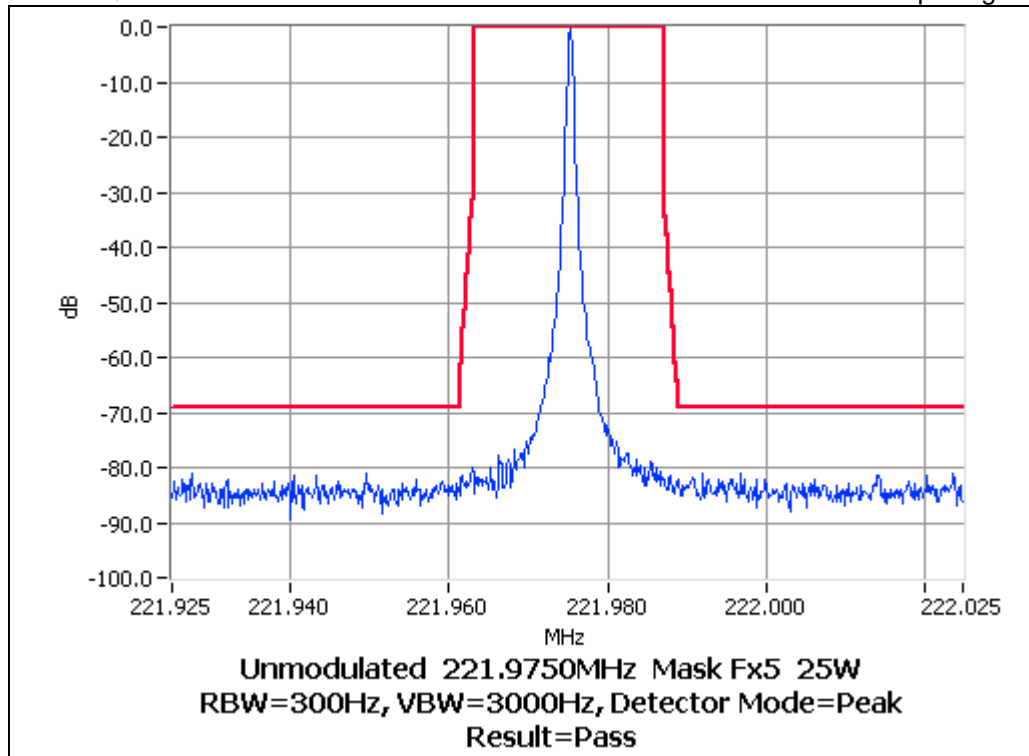
FFSK – 1200 bps

Tx FREQUENCY: 219.9 MHz 1 W 12.5 kHz Channel Spacing



FFSK – 1200 bps

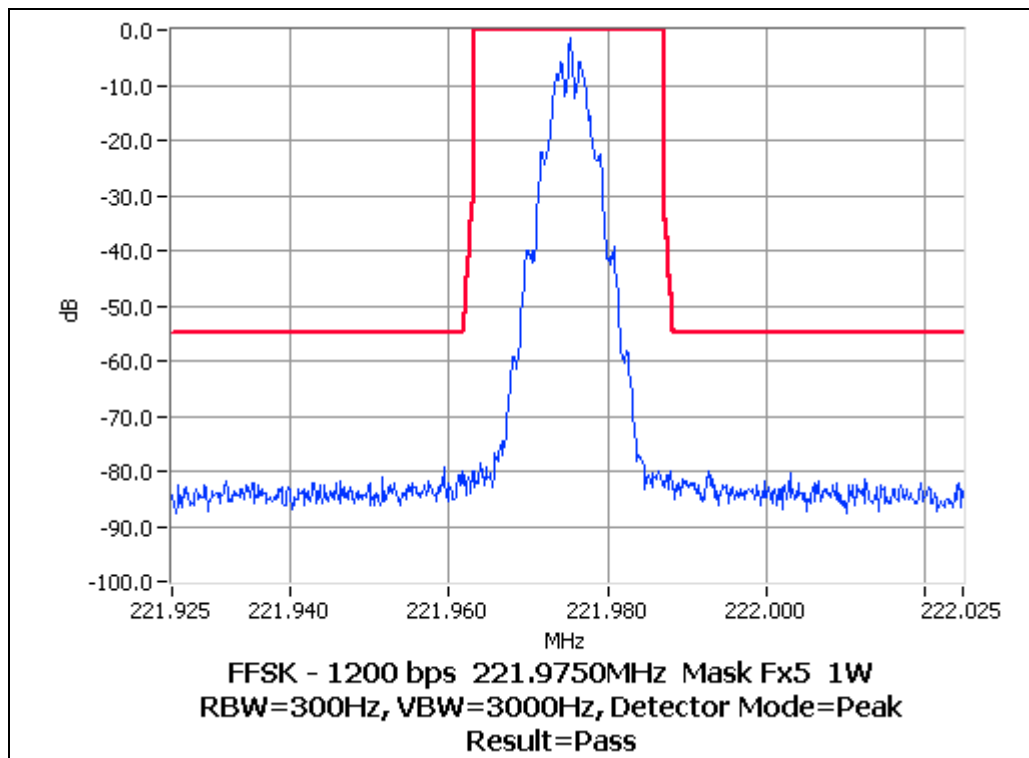
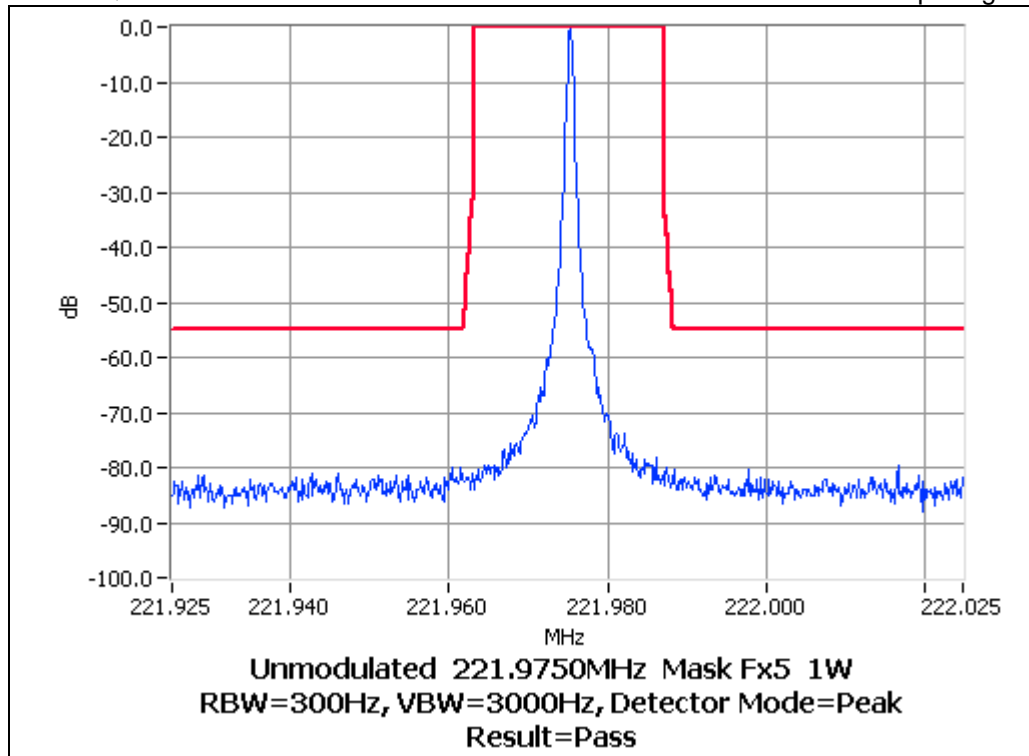
Tx FREQUENCY: 221.975 MHz 25 W 12.5 kHz Channel Spacing





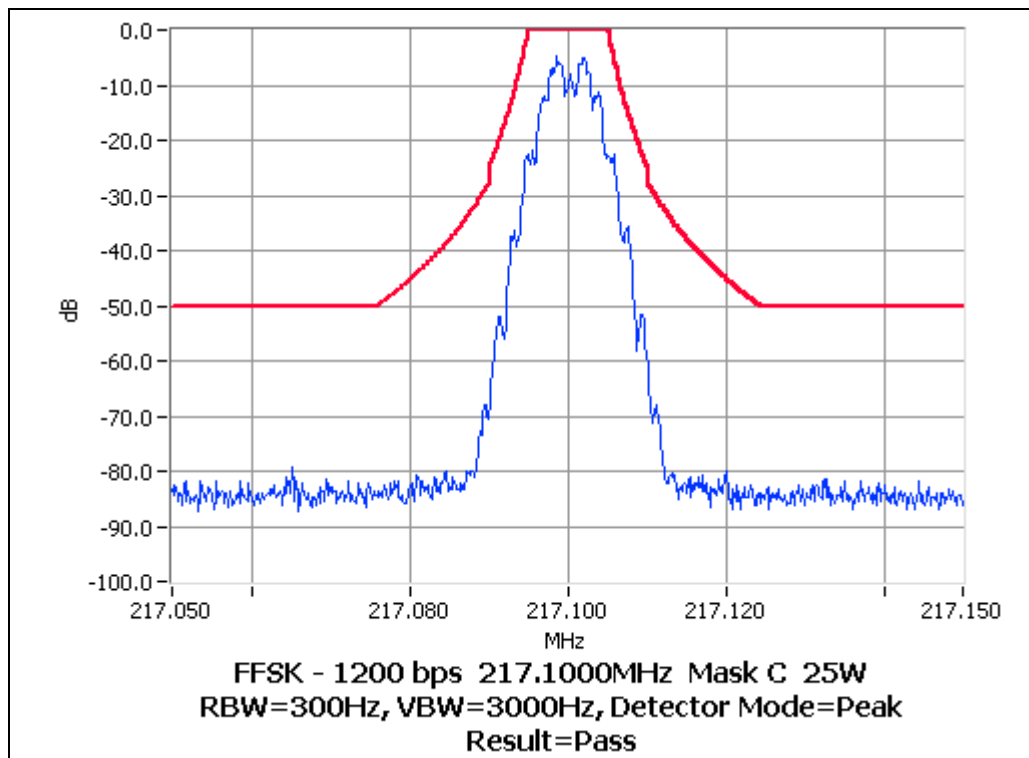
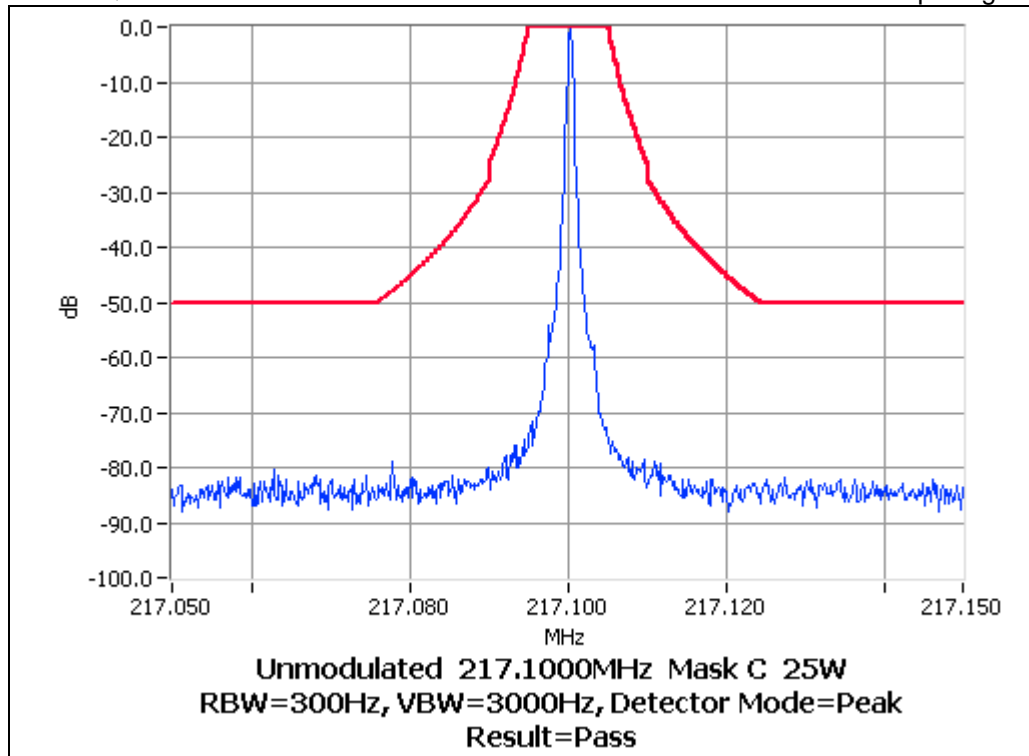
FFSK – 1200 bps

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing



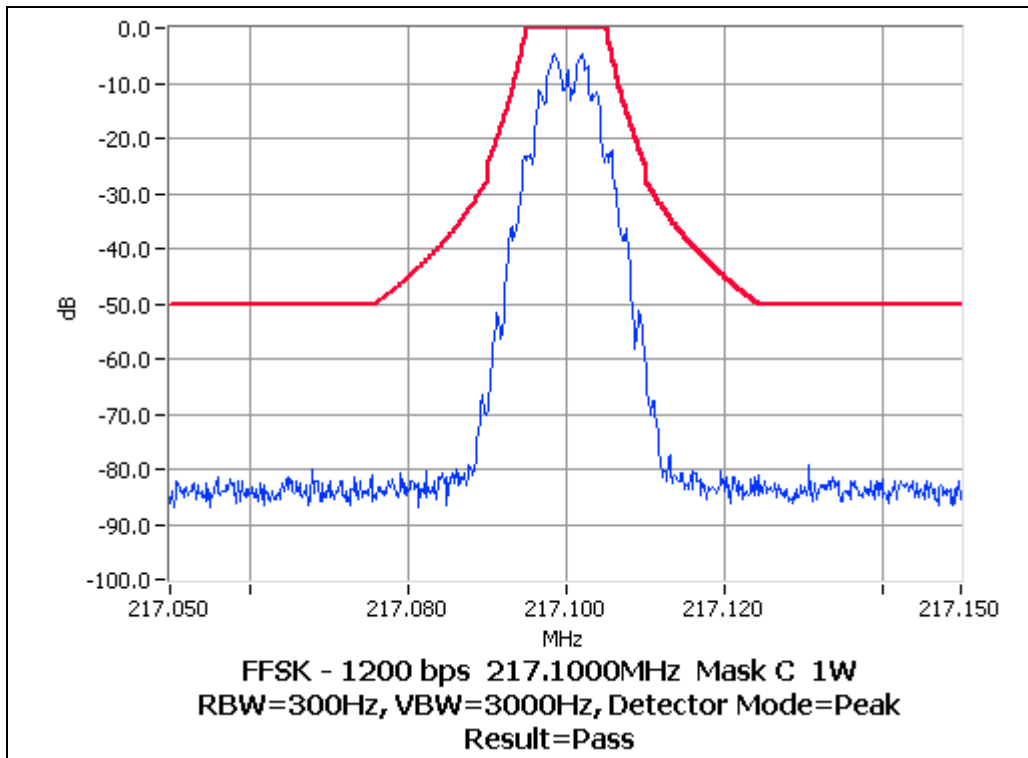
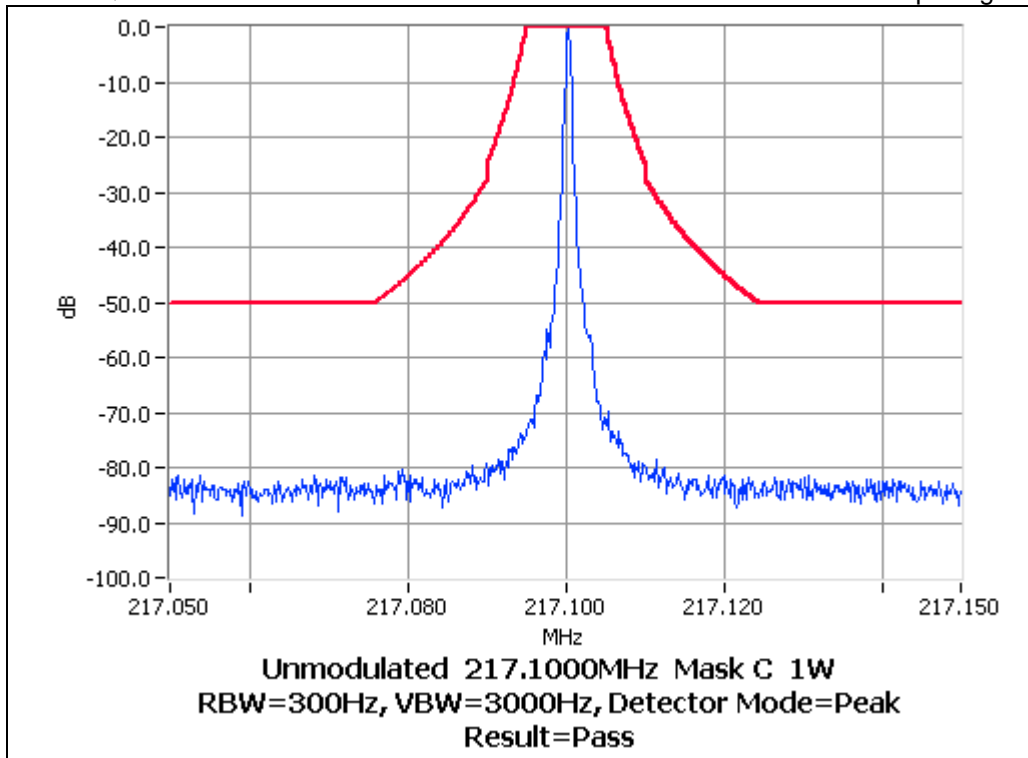
FFSK – 1200 bps

Tx FREQUENCY: 217.1 MHz 25 W 25.0 kHz Channel Spacing



FFSK – 1200 bps

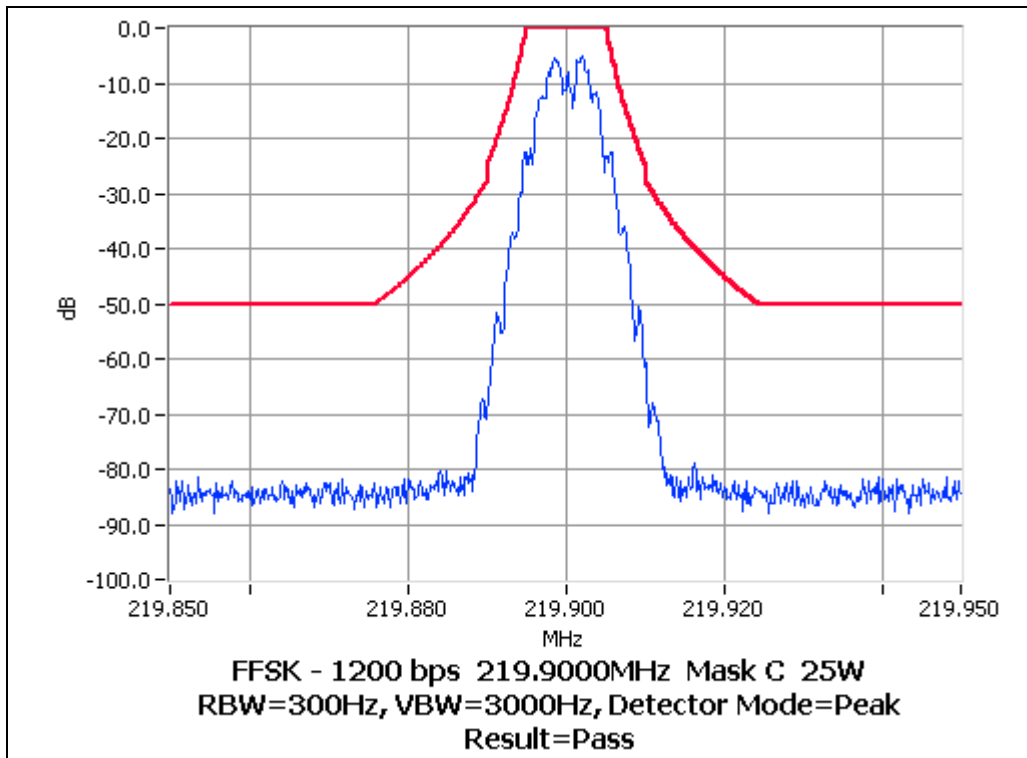
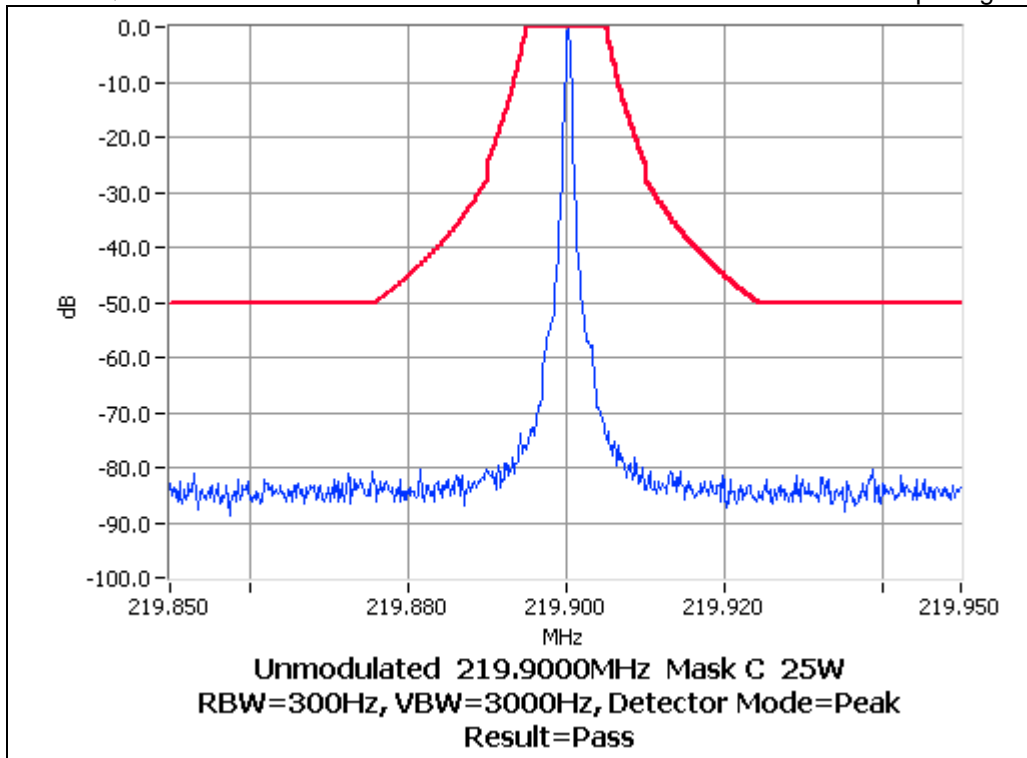
Tx FREQUENCY: 217.1 MHz 1 W 25.0 kHz Channel Spacing



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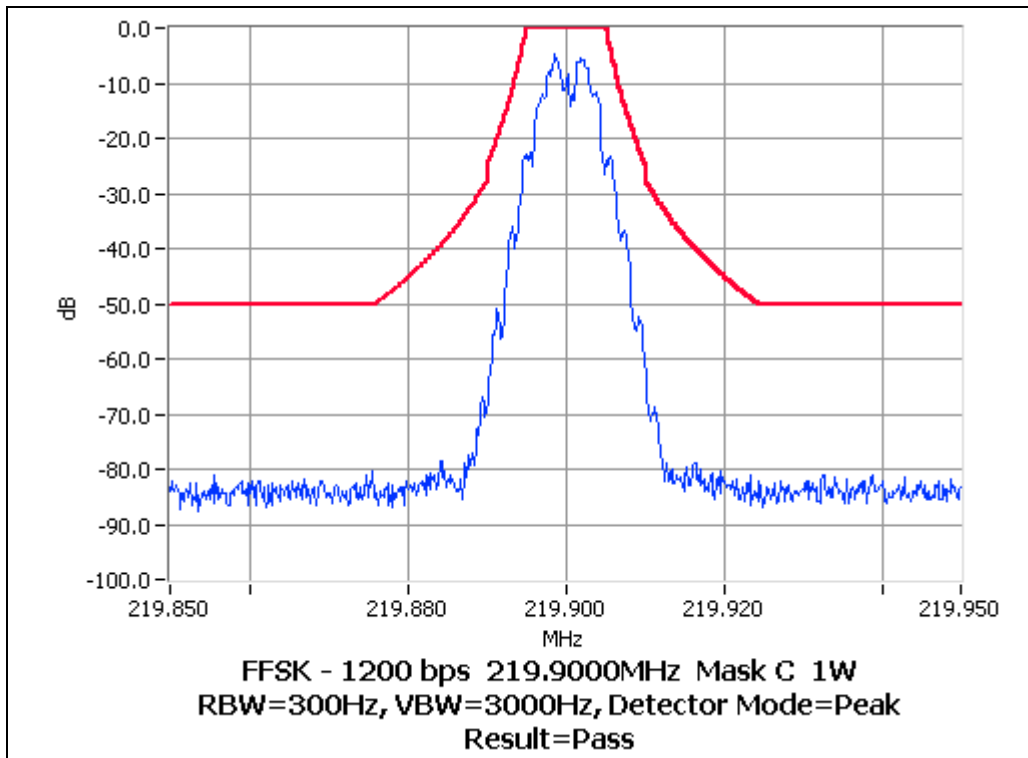
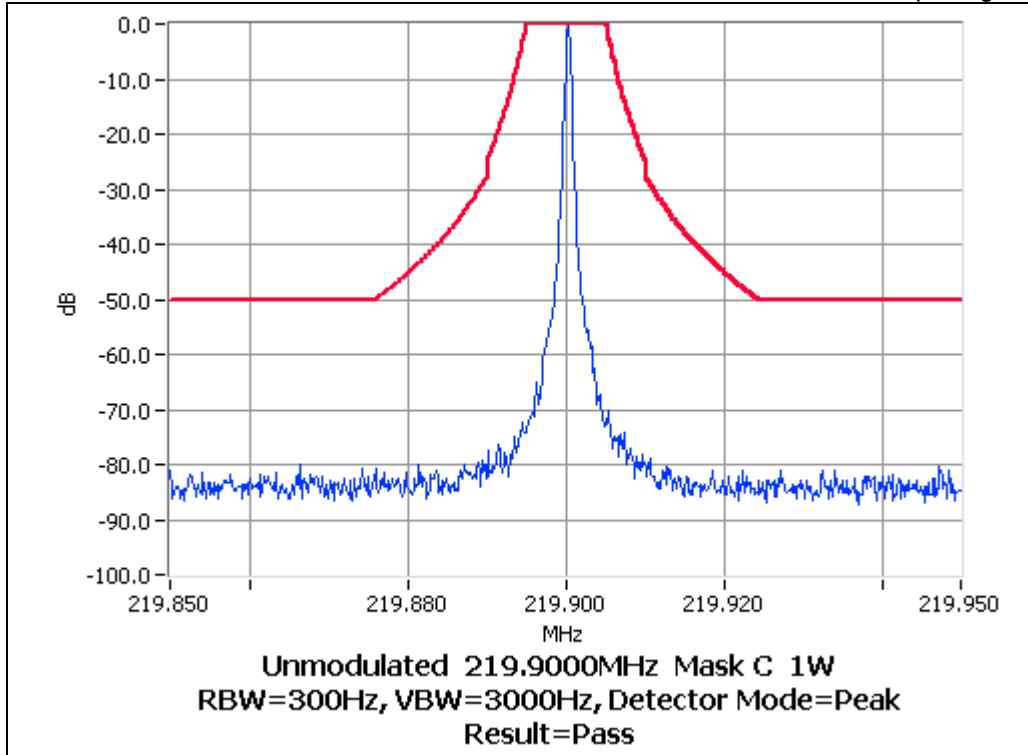
FFSK – 1200 bps

Tx FREQUENCY: 219.9 MHz 25 W 25.0 kHz Channel Spacing



FFSK – 1200 bps

Tx FREQUENCY: 219.9 MHz 1 W 25.0 kHz Channel Spacing

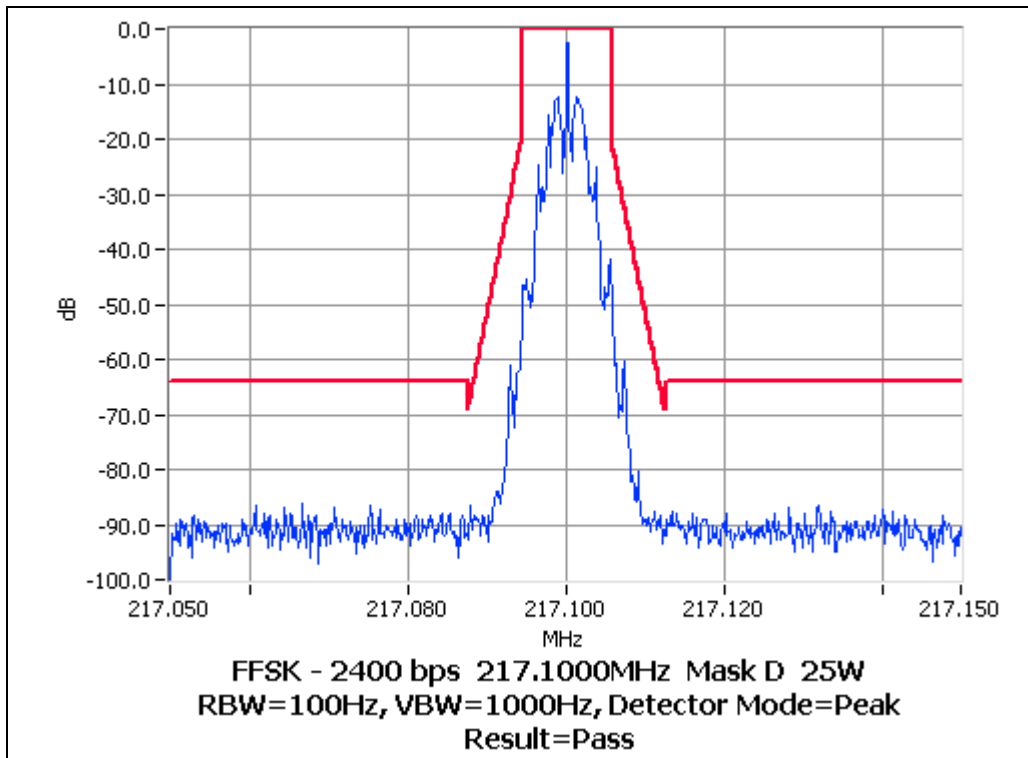
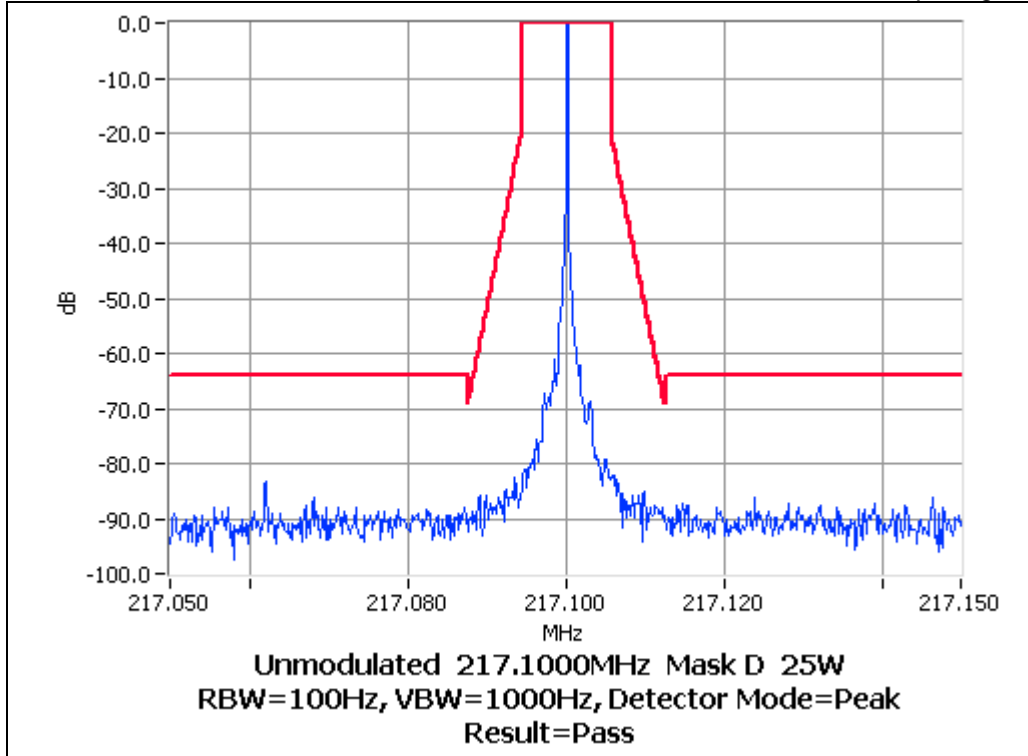


OCCUPIED BANDWIDTH

FFSK – 2400 bps

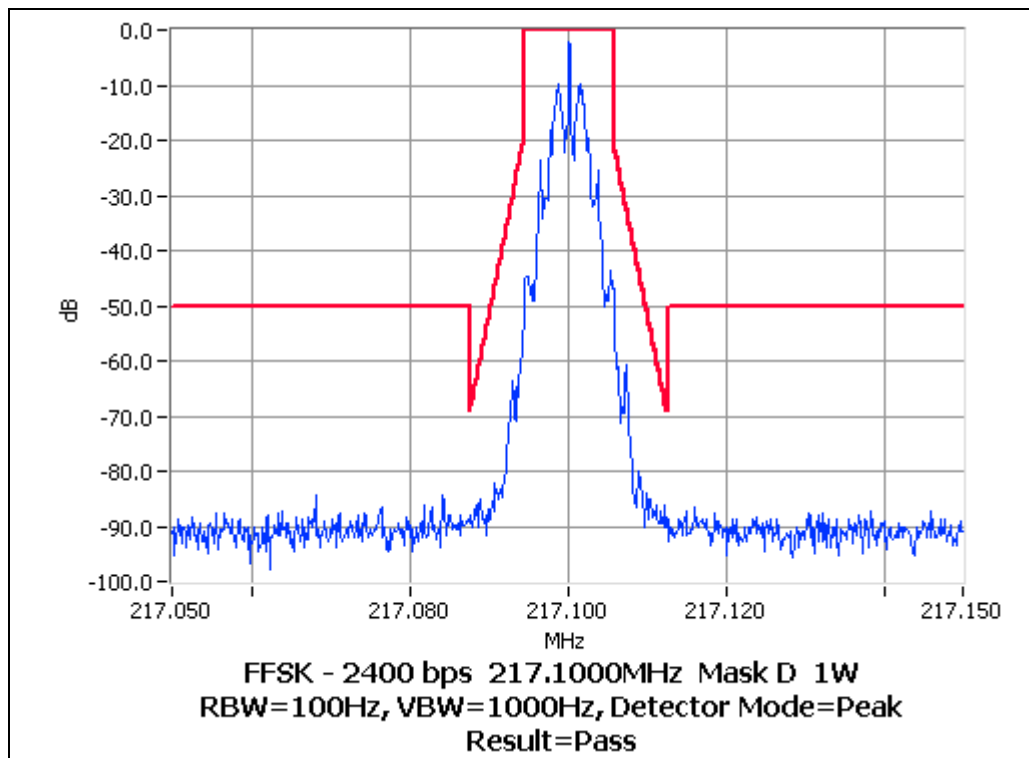
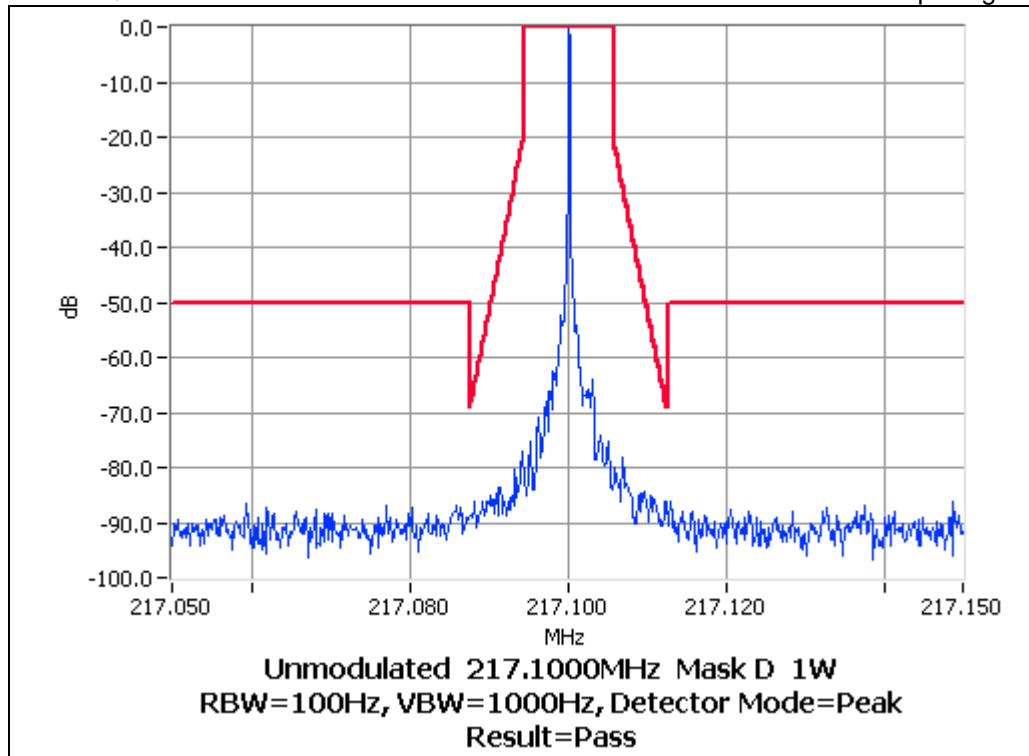
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 217.1 MHz 25 W 12.5 kHz Channel Spacing



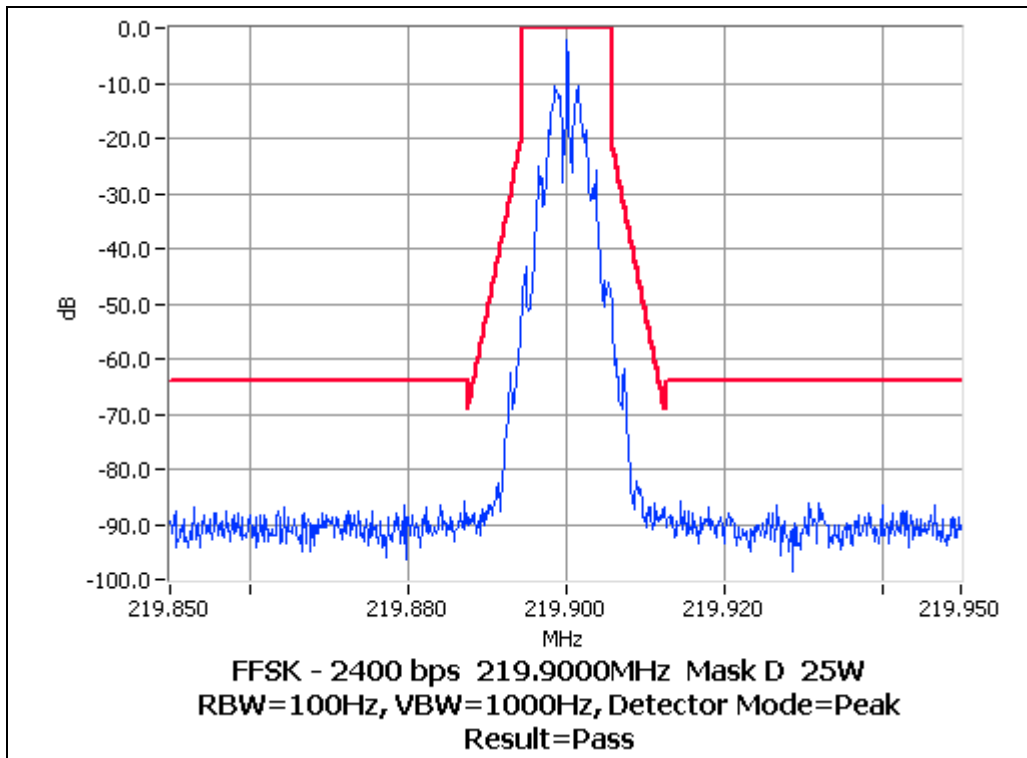
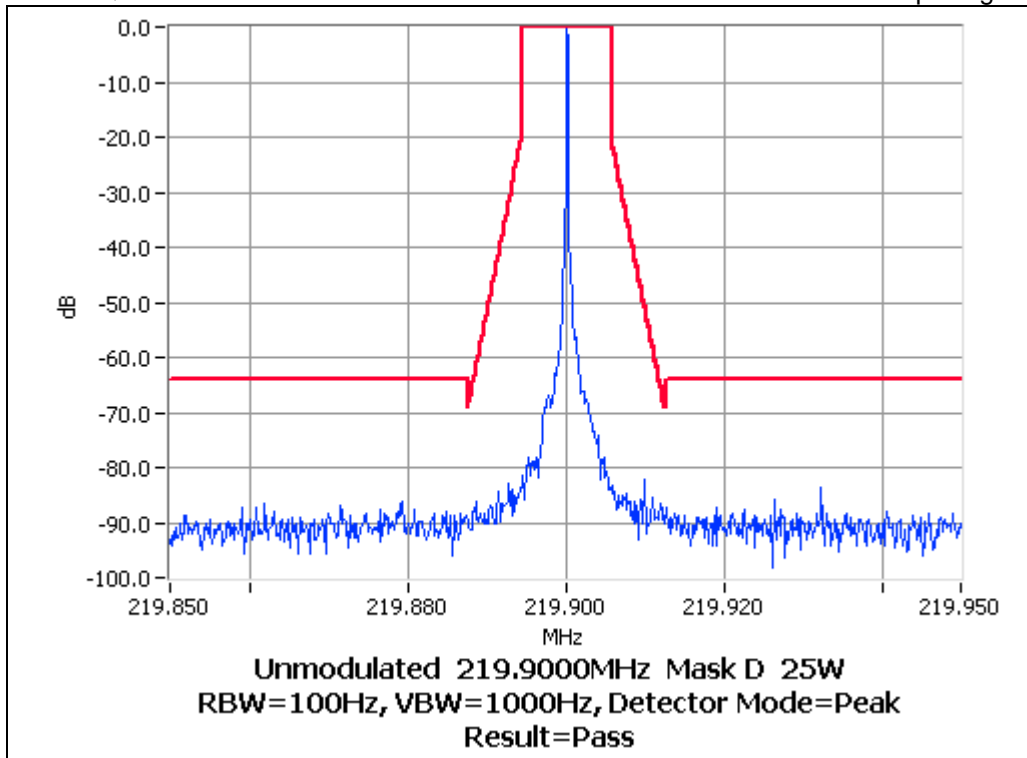
FFSK – 2400 bps

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing



FFSK – 2400 bps

Tx FREQUENCY: 219.9 MHz 25 W 12.5 kHz Channel Spacing

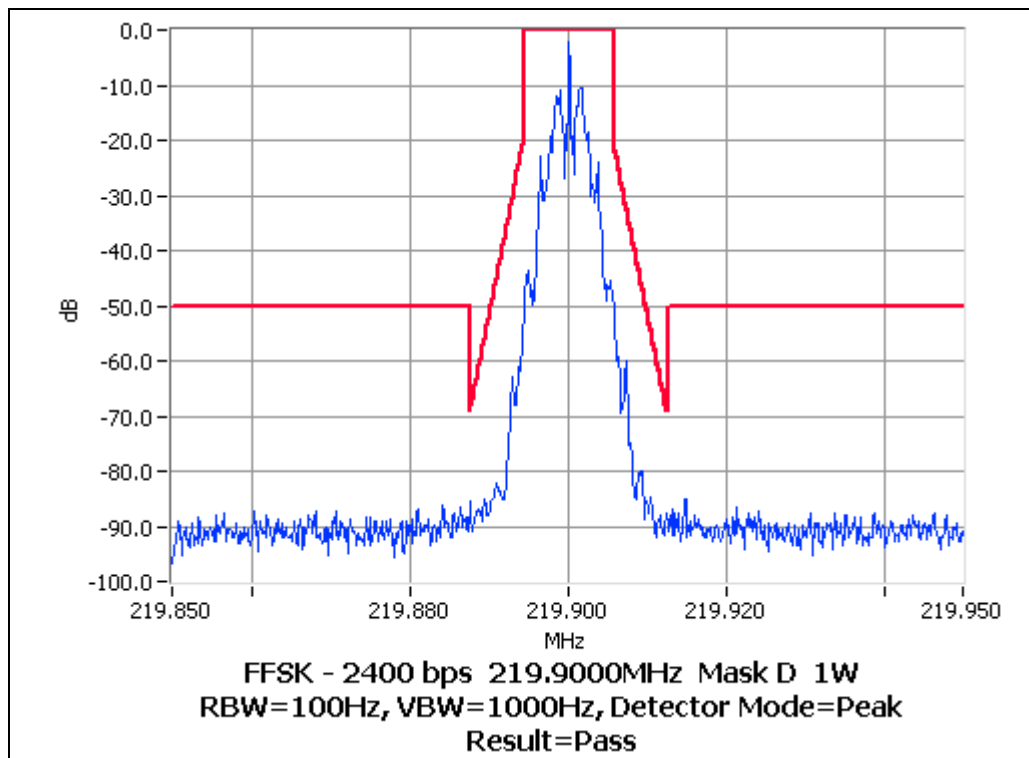
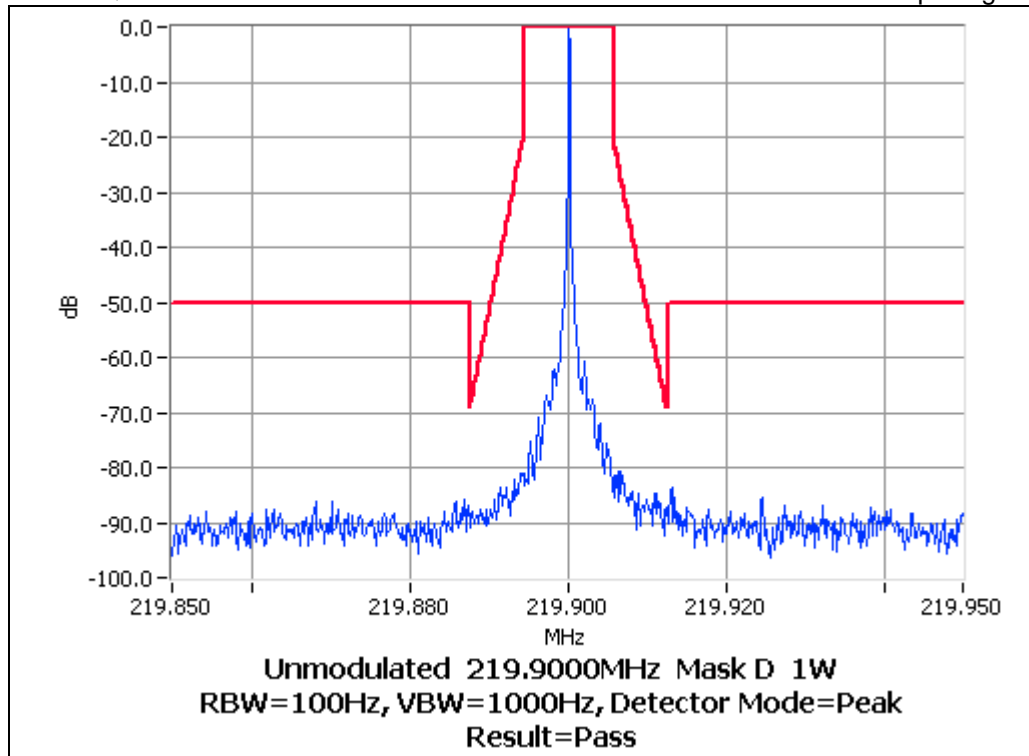




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FFSK – 2400 bps

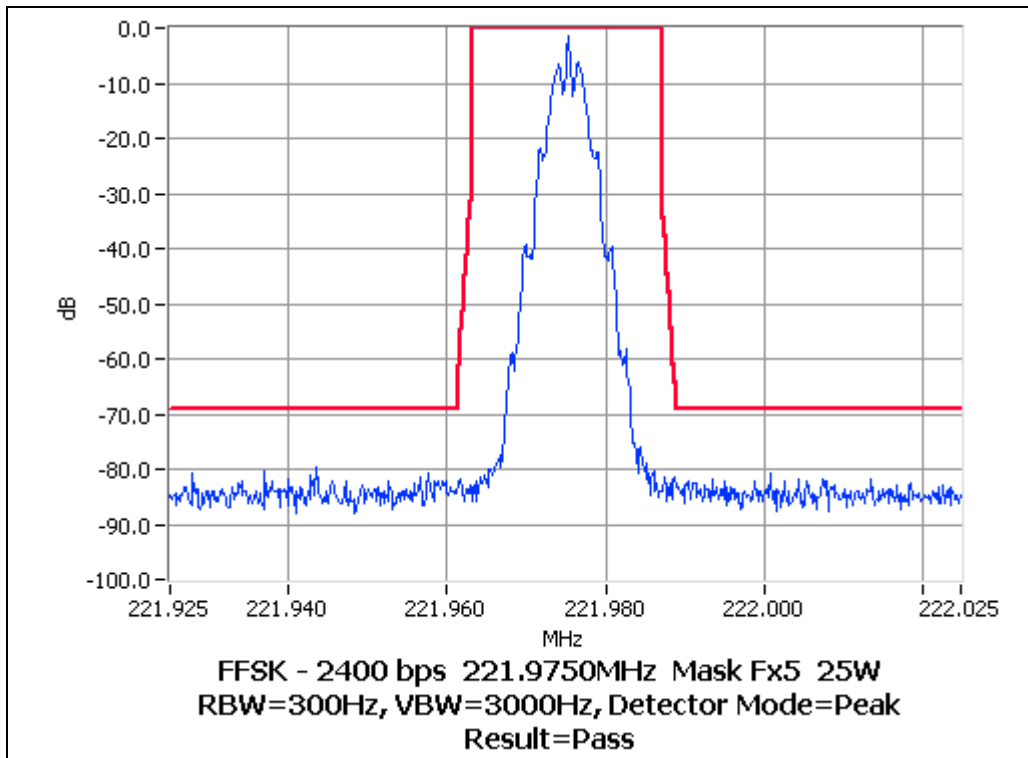
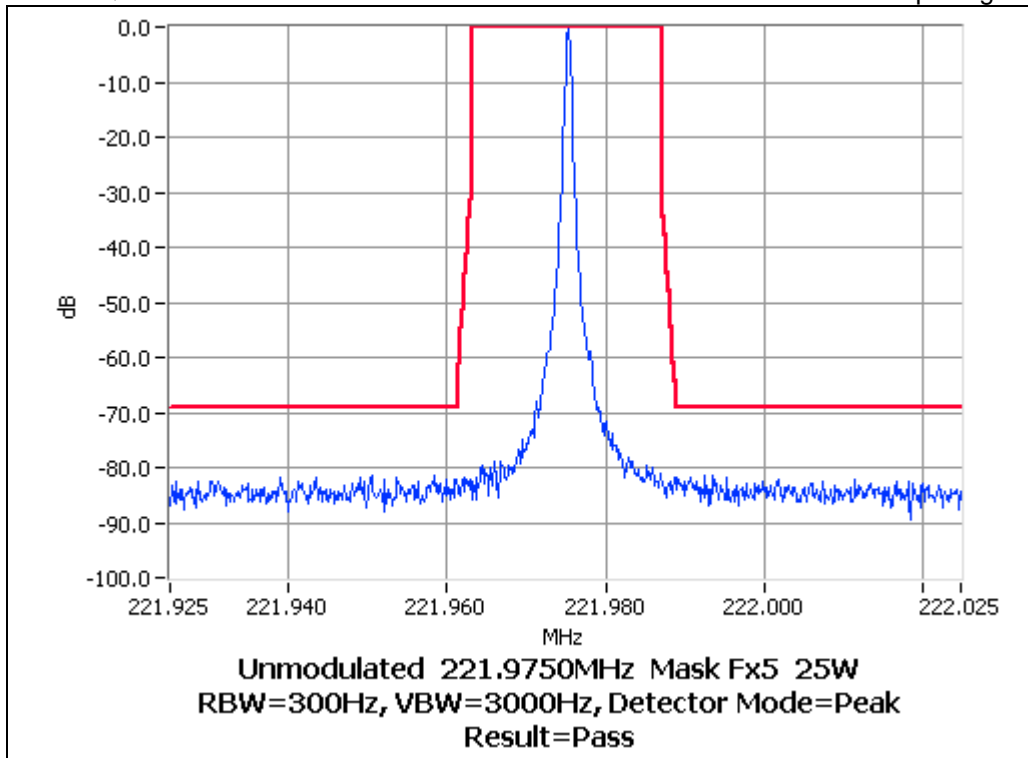
Tx FREQUENCY: 219.9 MHz 1 W 12.5 kHz Channel Spacing



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FFSK – 2400 bps

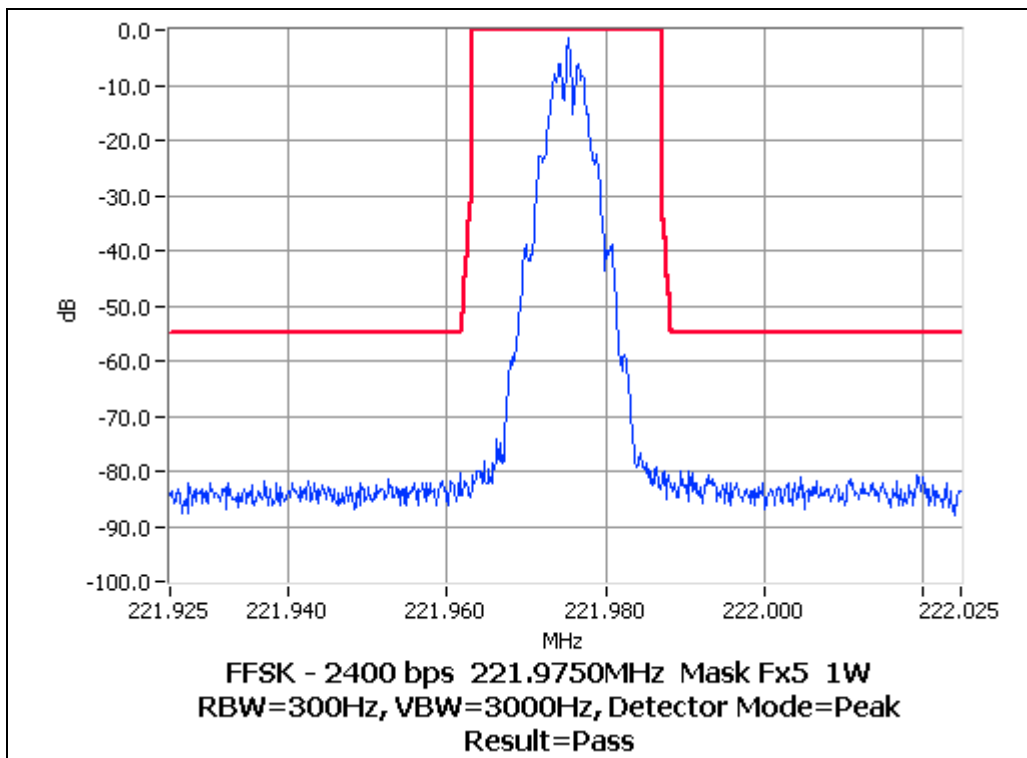
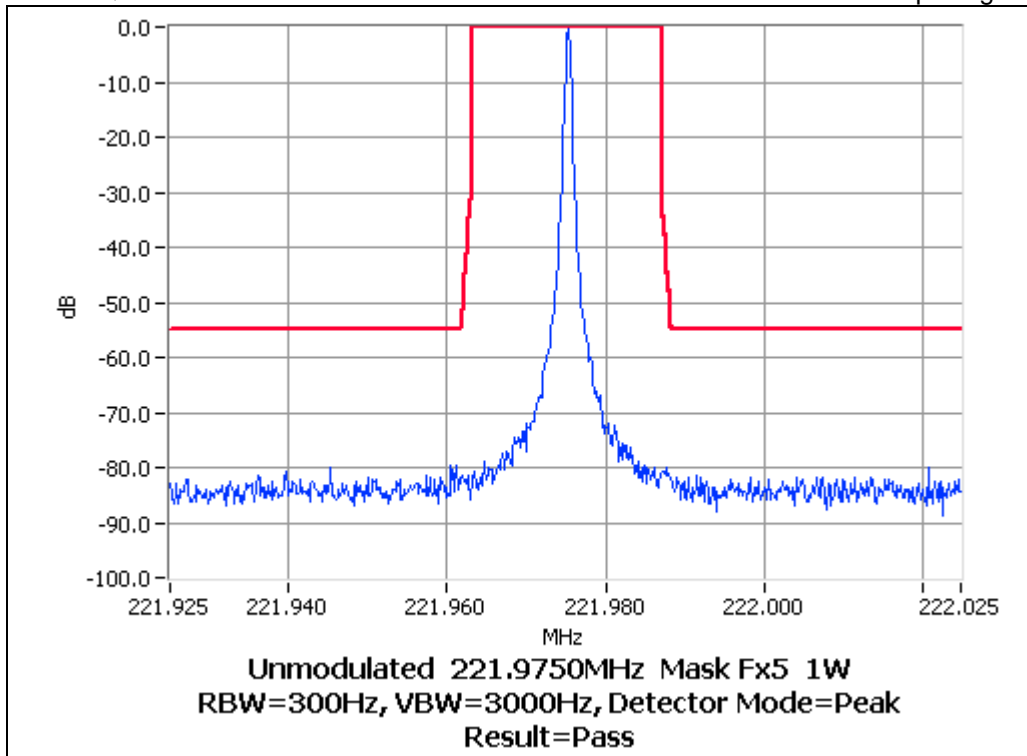
Tx FREQUENCY: 221.975 MHz 25 W 12.5 kHz Channel Spacing



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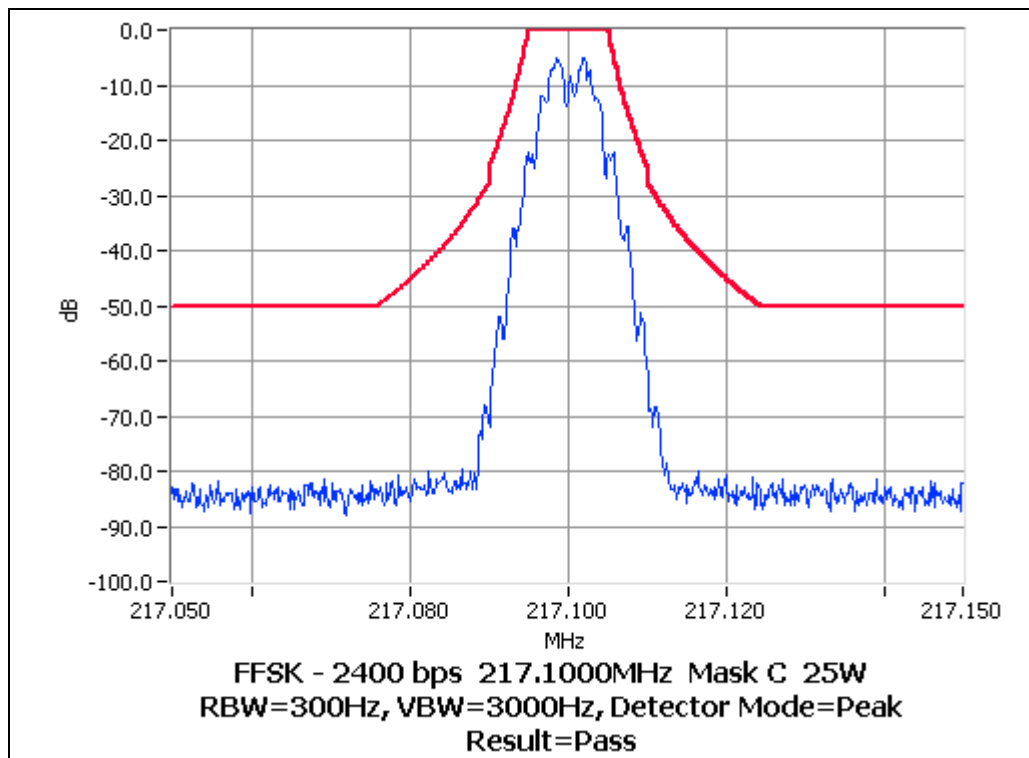
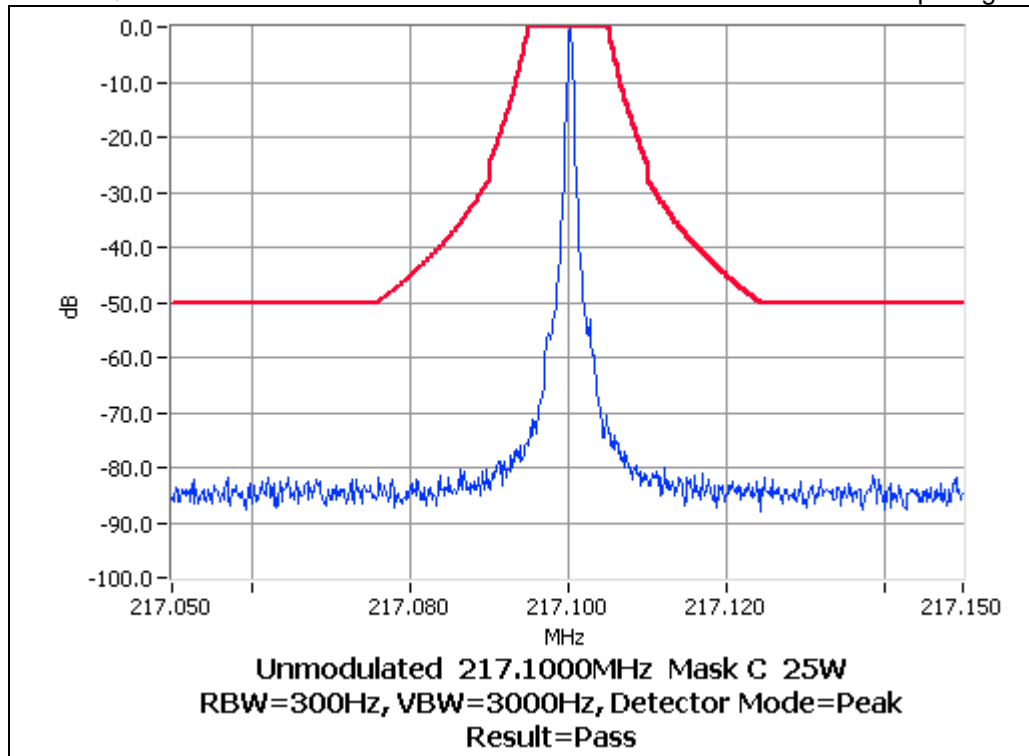
FFSK – 2400 bps

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing



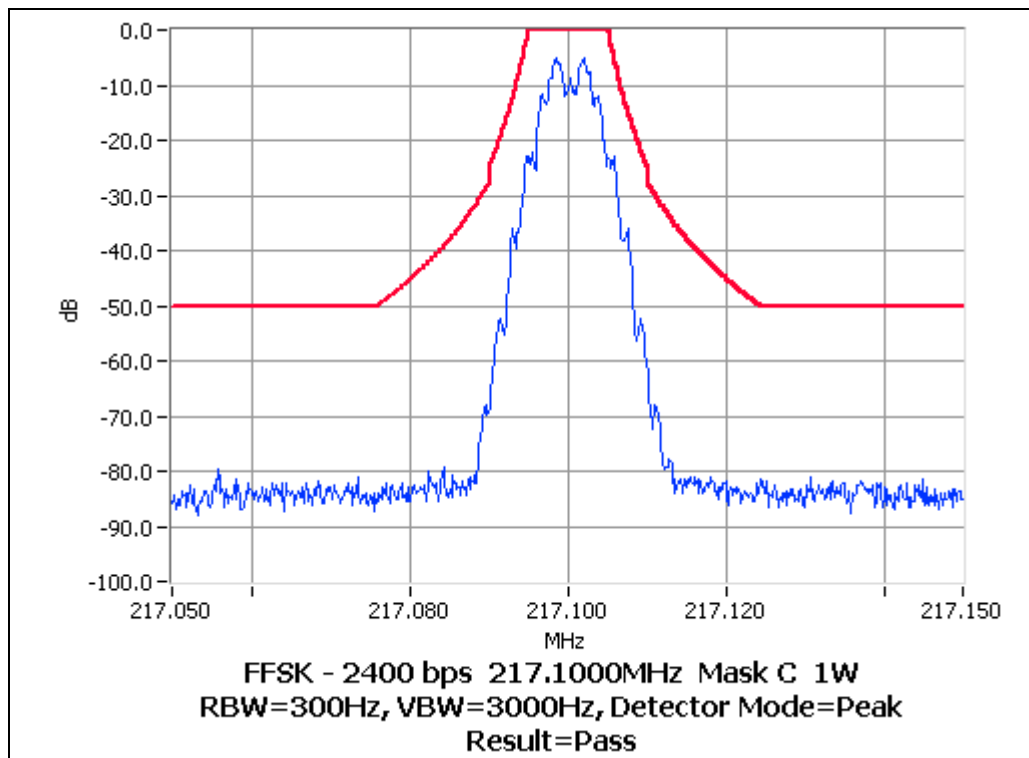
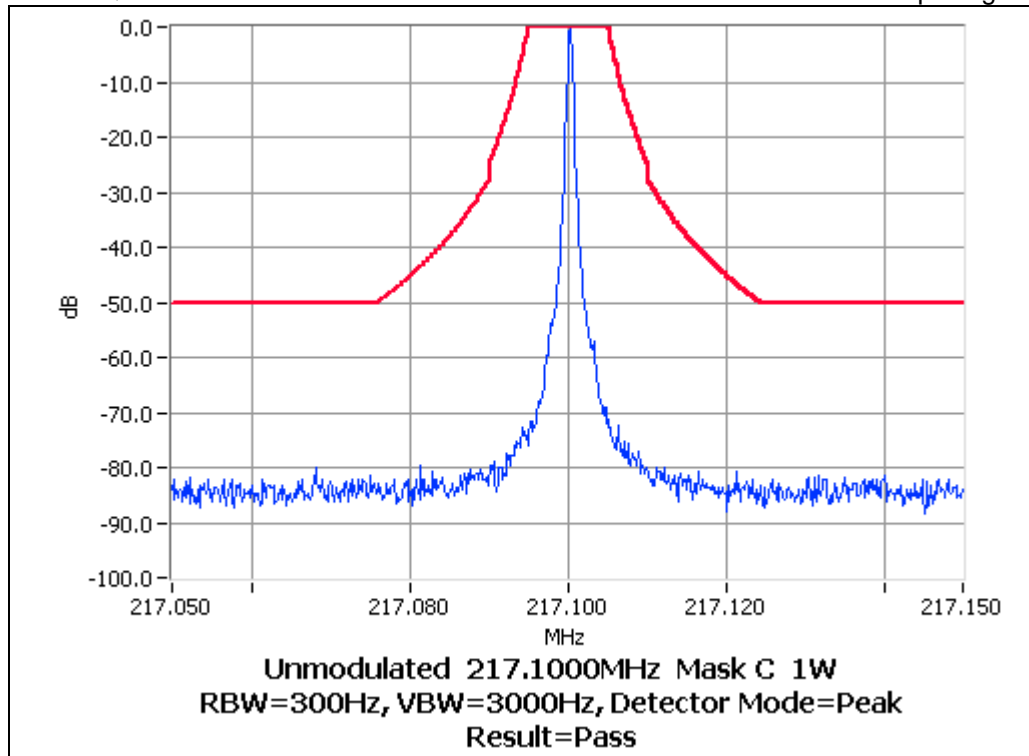
FFSK – 2400 bps

Tx FREQUENCY: 217.1 MHz 25 W 25.0 kHz Channel Spacing



FFSK – 2400 bps

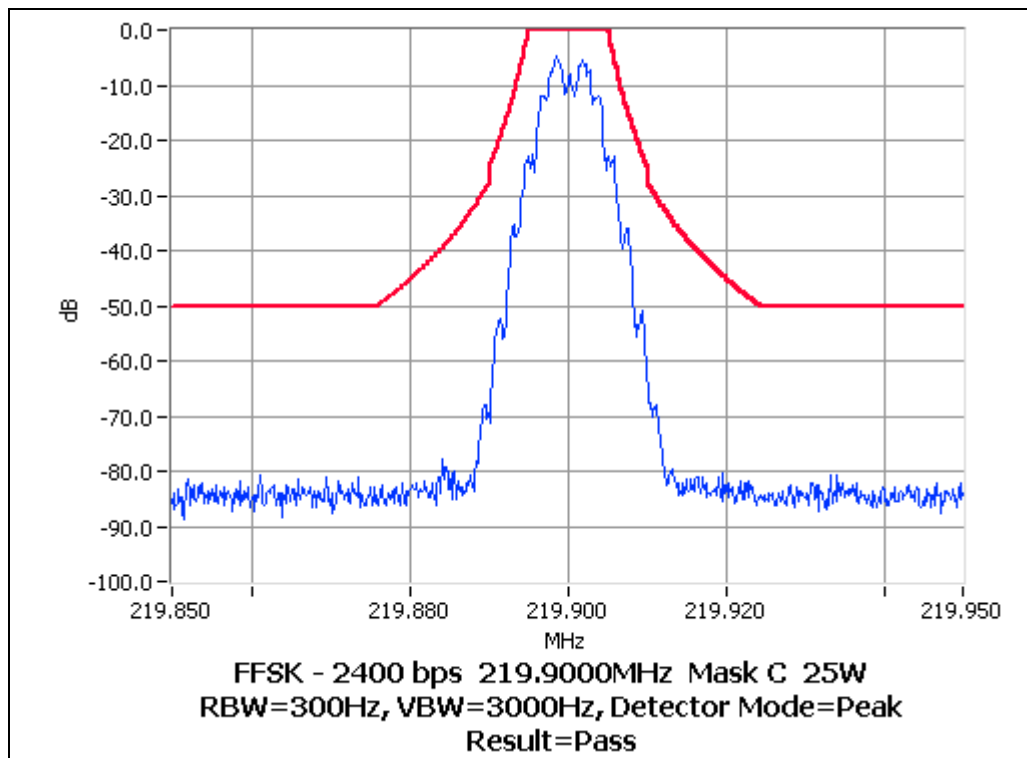
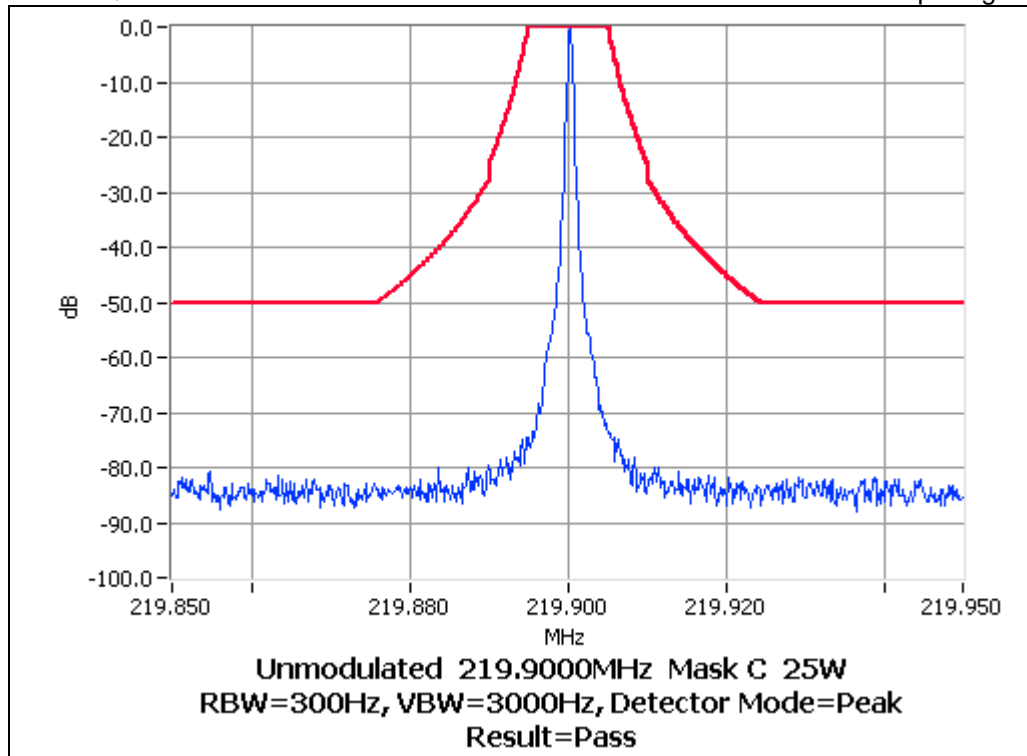
Tx FREQUENCY: 217.1 MHz 1 W 25.0 kHz Channel Spacing



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FFSK – 2400 bps

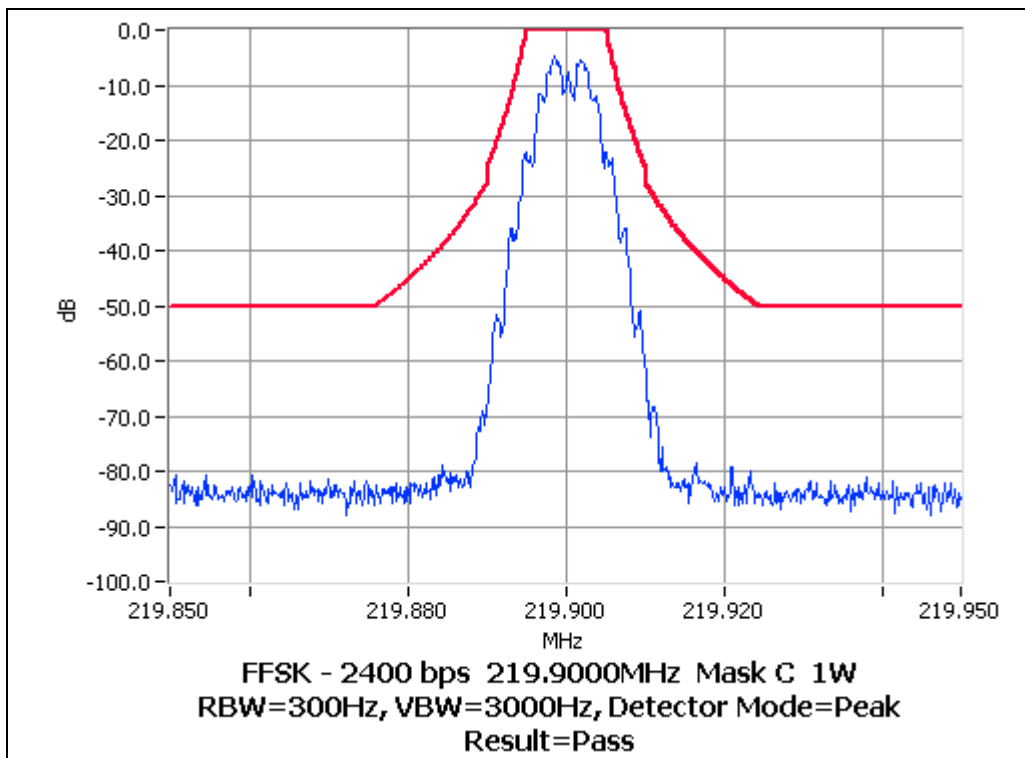
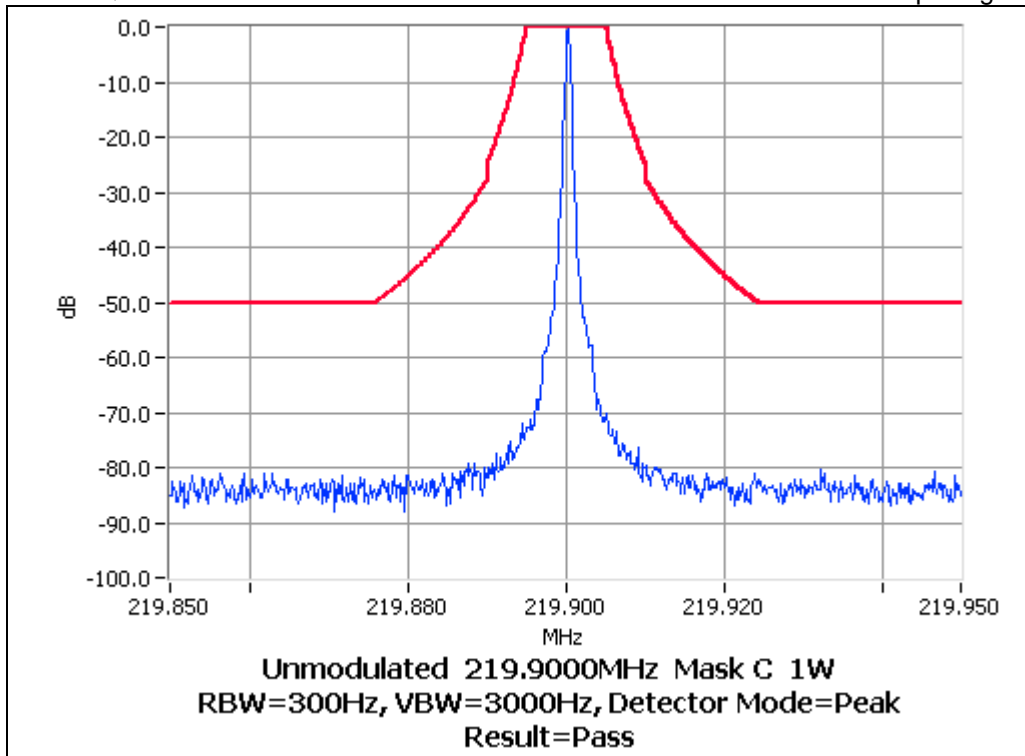
Tx FREQUENCY: 219.9 MHz 25 W 25.0 kHz Channel Spacing



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FFSK – 2400 bps

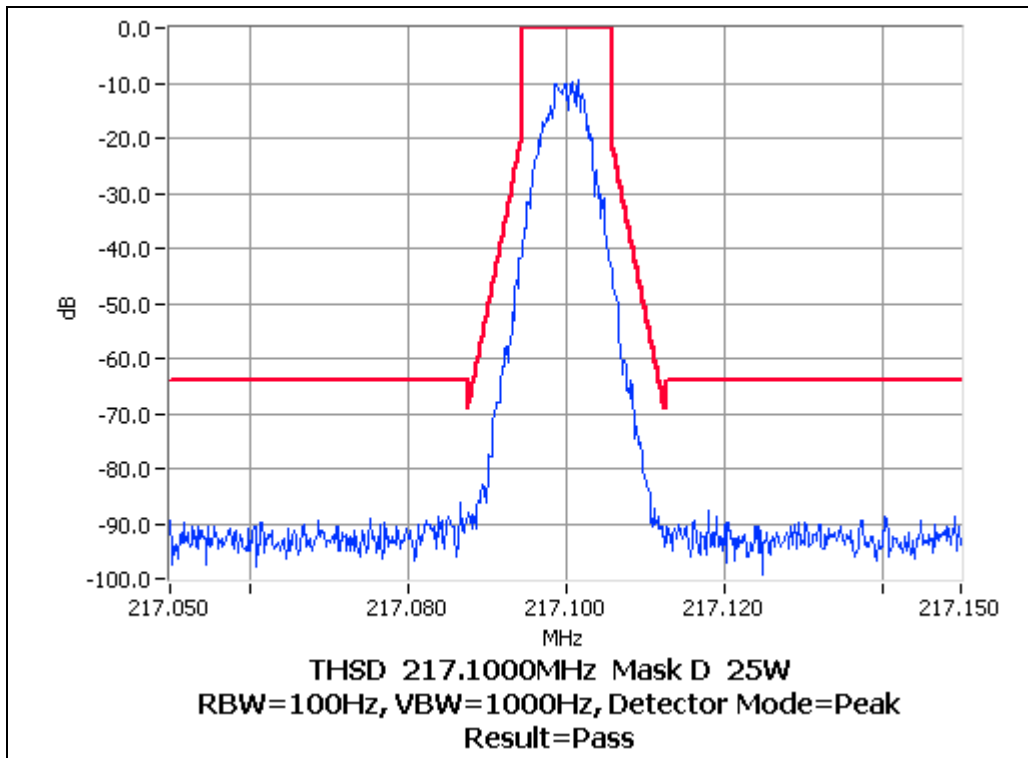
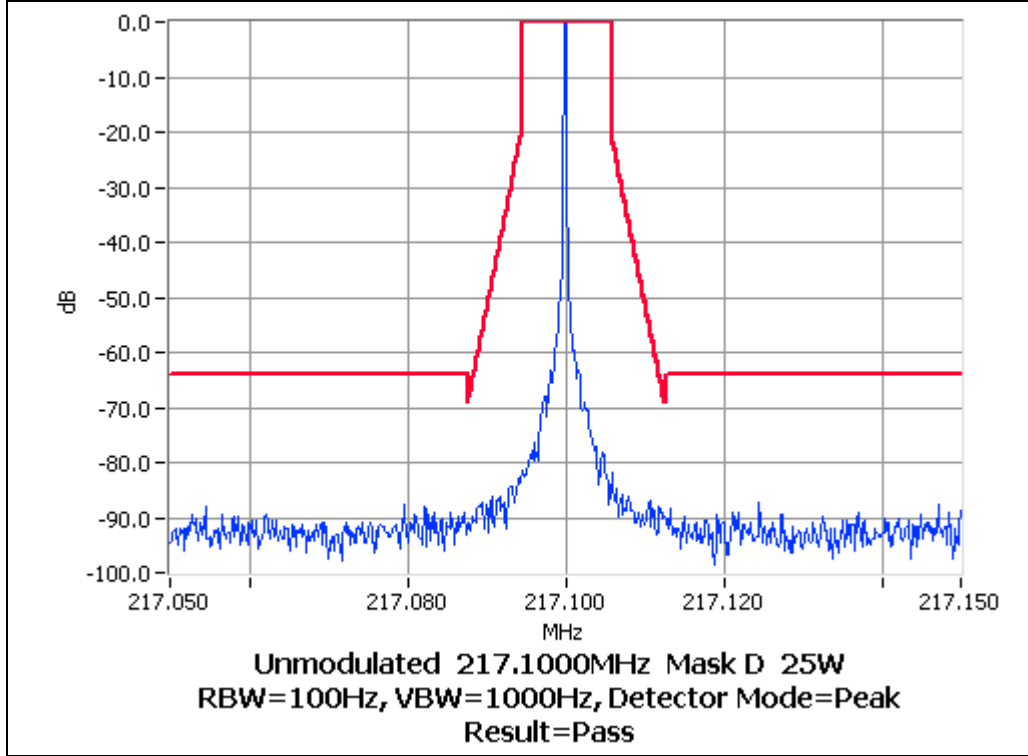
Tx FREQUENCY: 219.9 MHz 1 W 25.0 kHz Channel Spacing



OCCUPIED BANDWIDTH

THSD

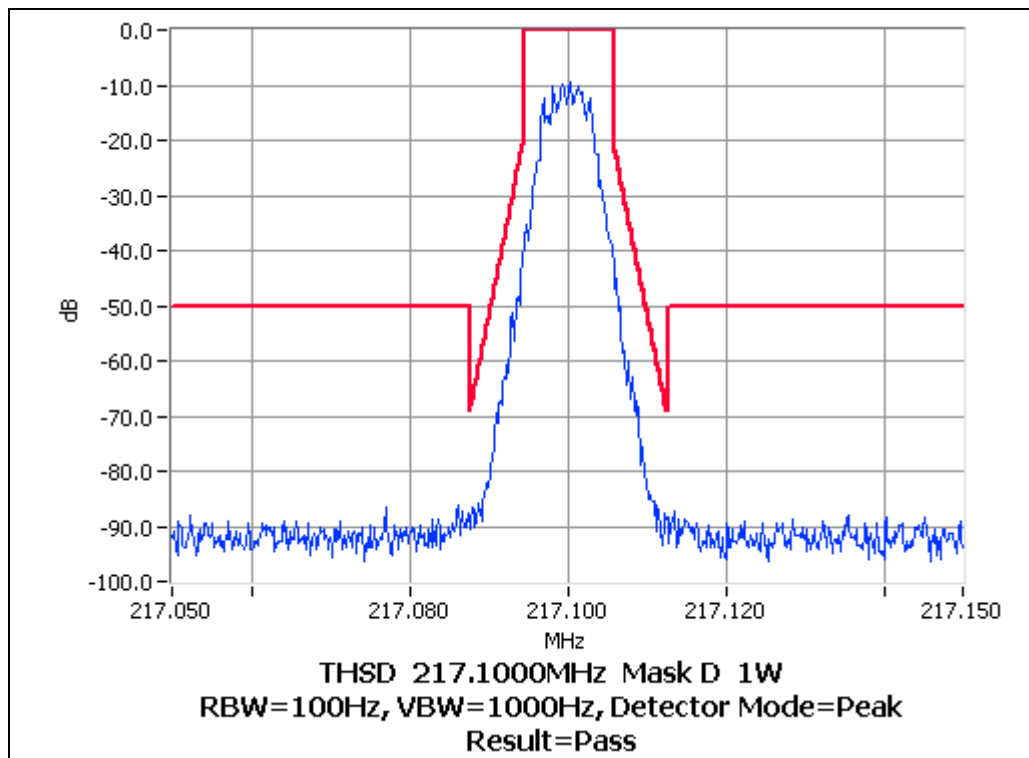
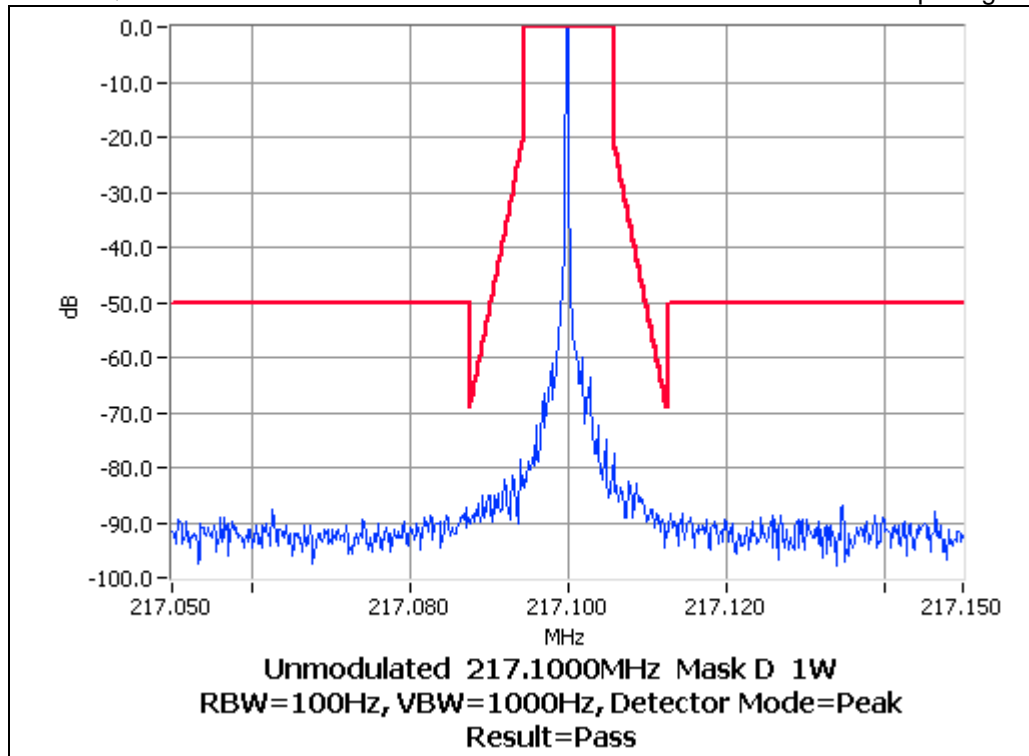
Tx FREQUENCY: 217.1 MHz 25 W 12.5 kHz Channel Spacing





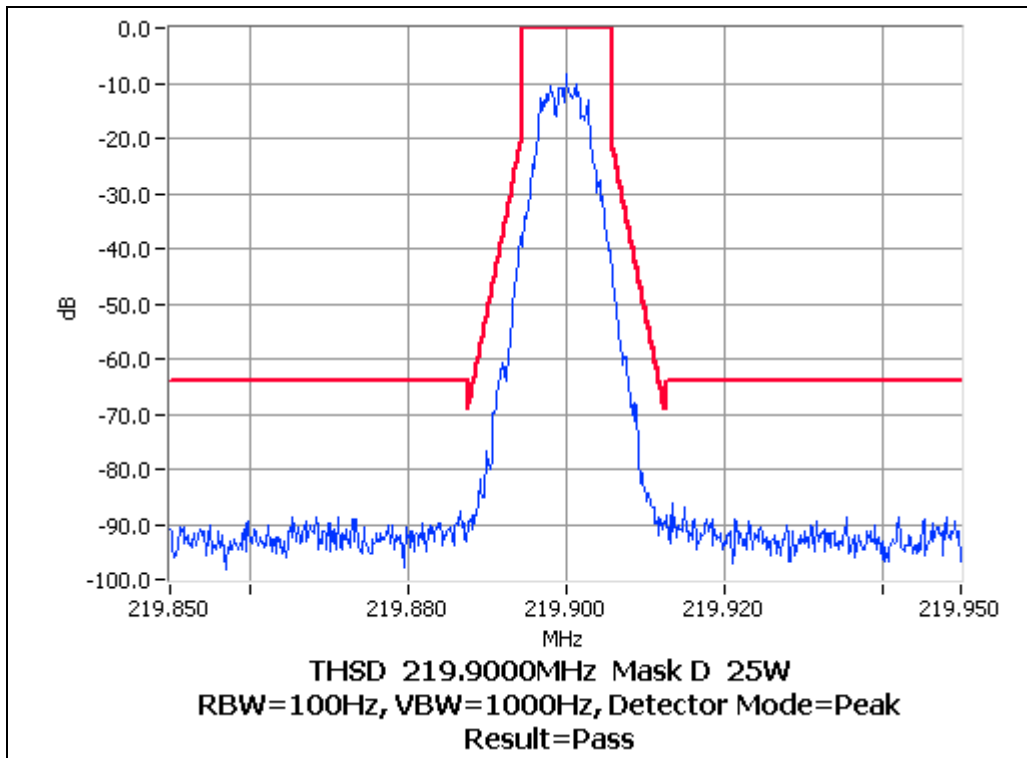
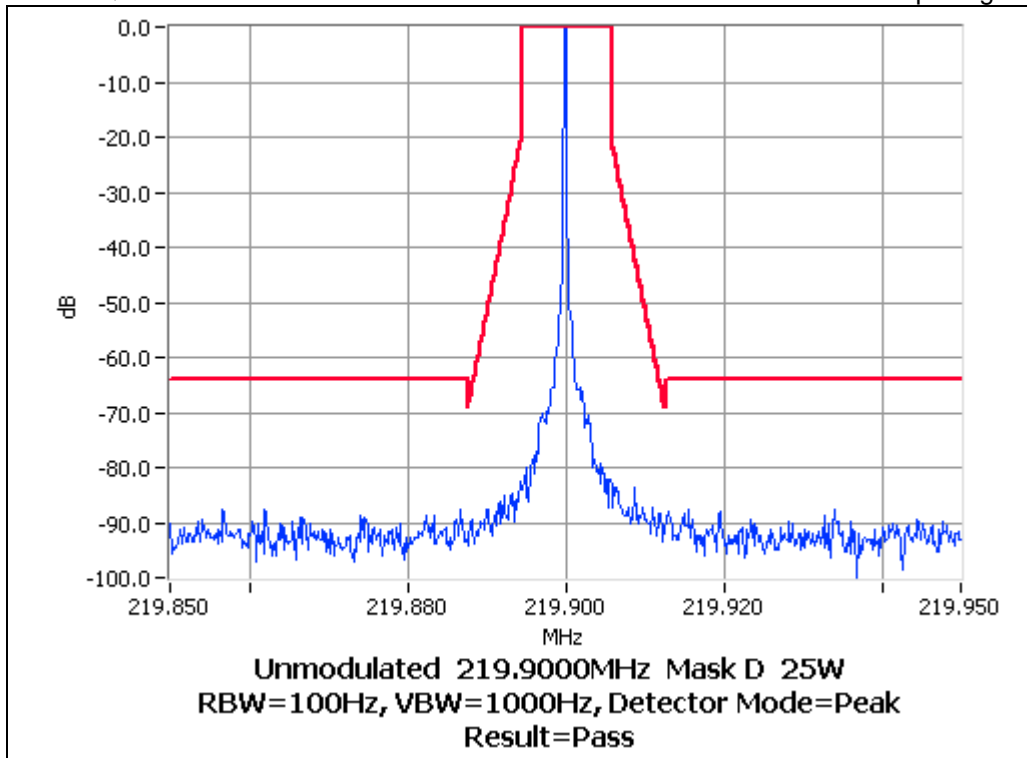
THSD

Tx FREQUENCY: 217.1 MHz 1 W 12.5 kHz Channel Spacing



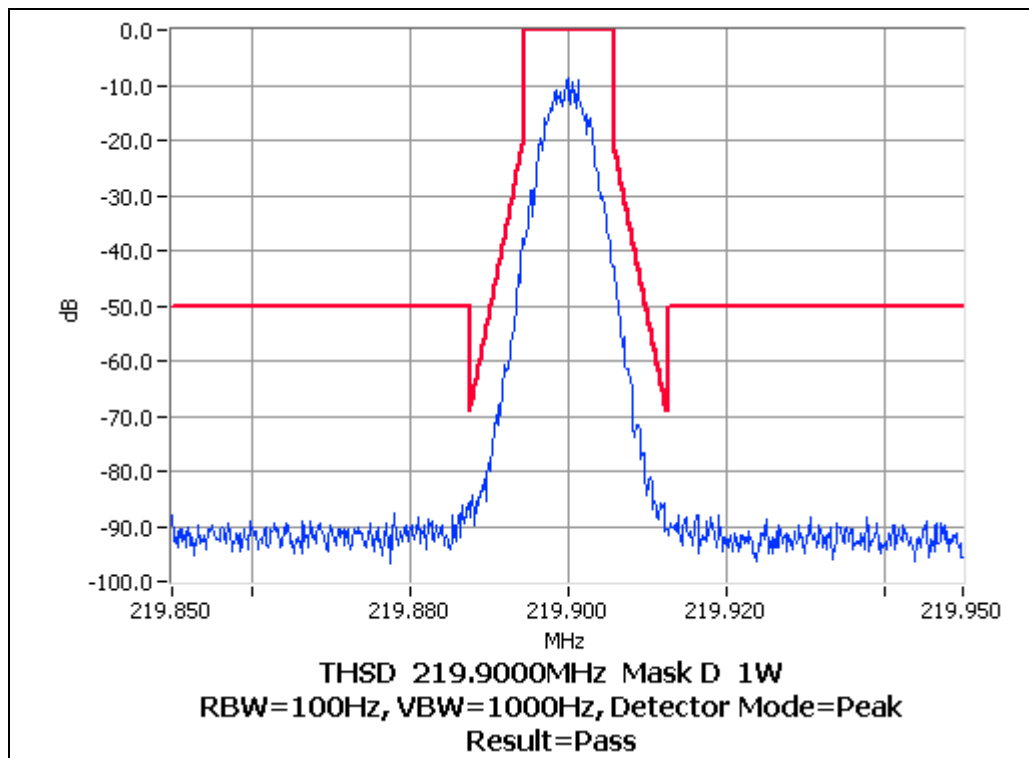
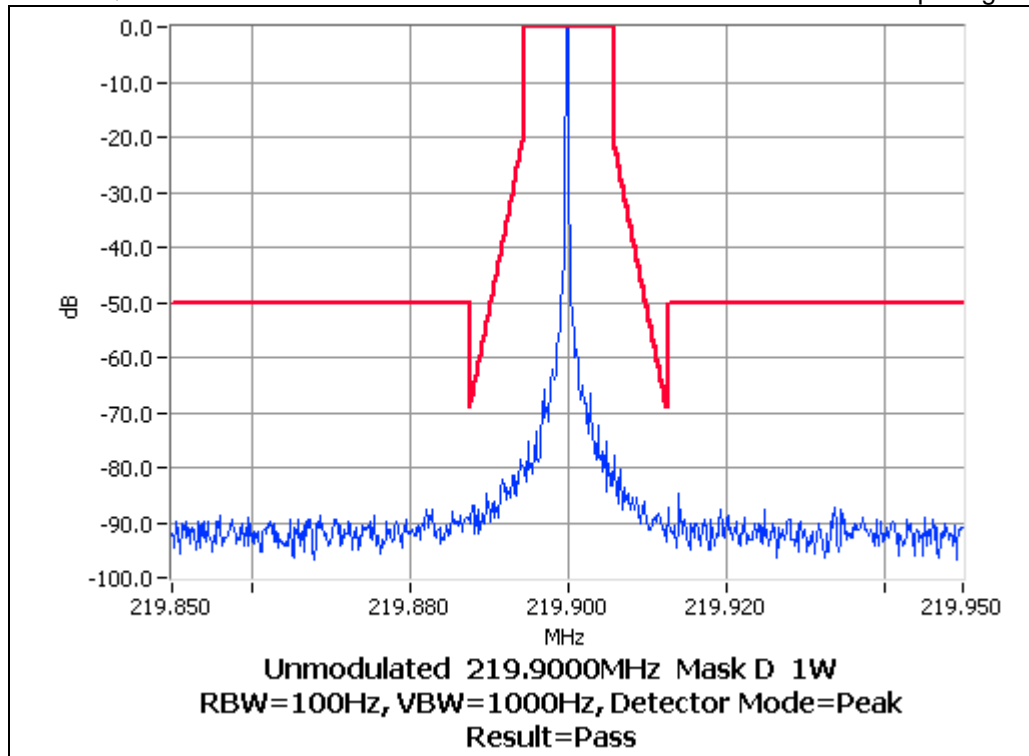
THSD

Tx FREQUENCY: 219.9 MHz 25 W 12.5 kHz Channel Spacing



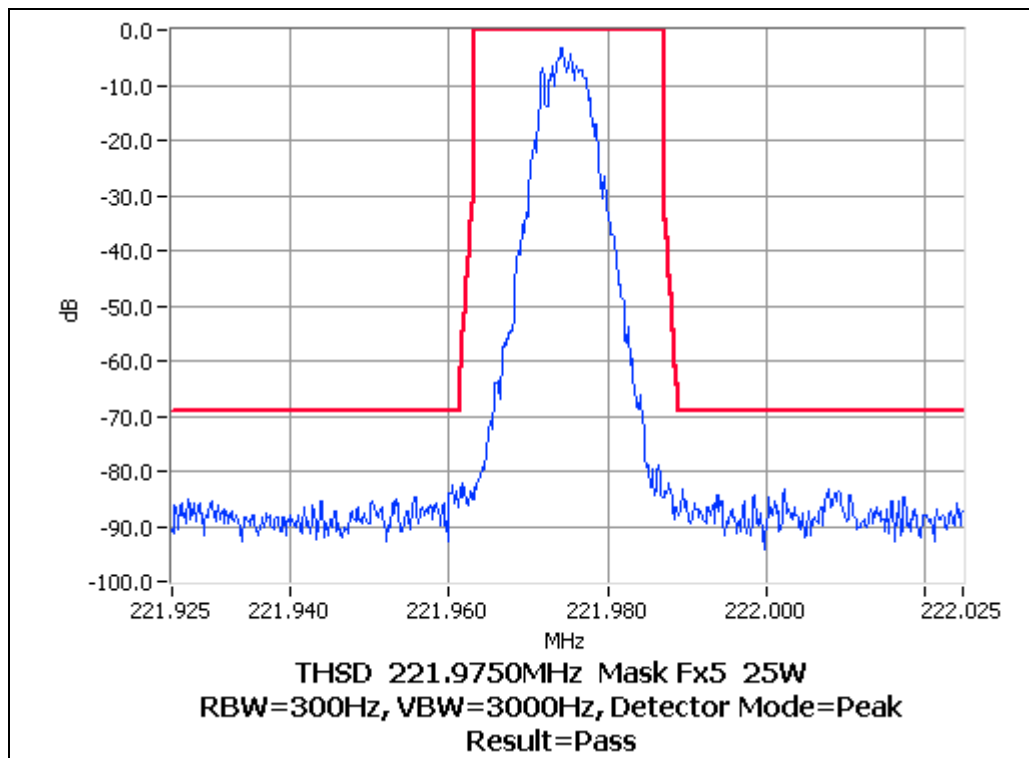
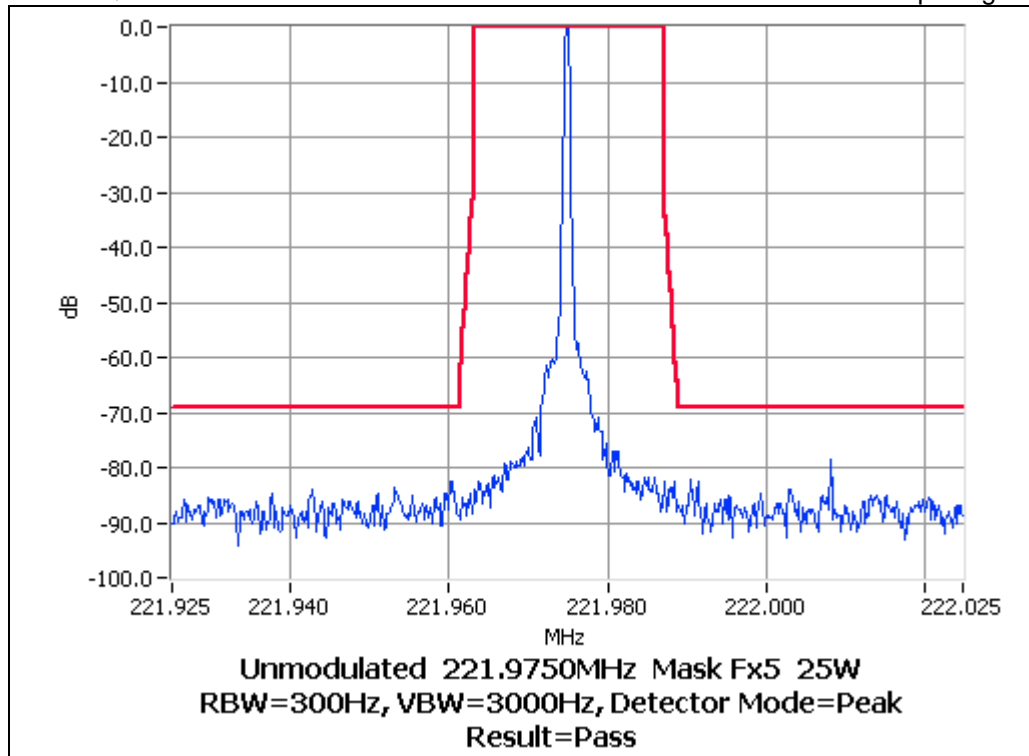
THSD

Tx FREQUENCY: 219.9 MHz 1 W 12.5 kHz Channel Spacing



THSD

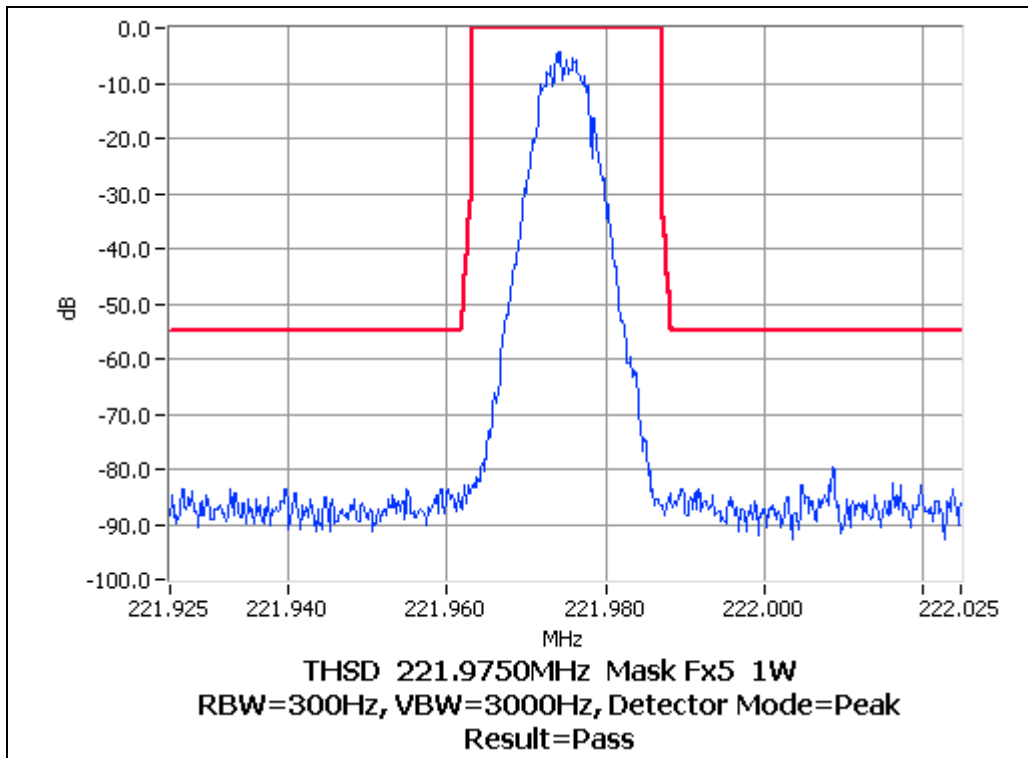
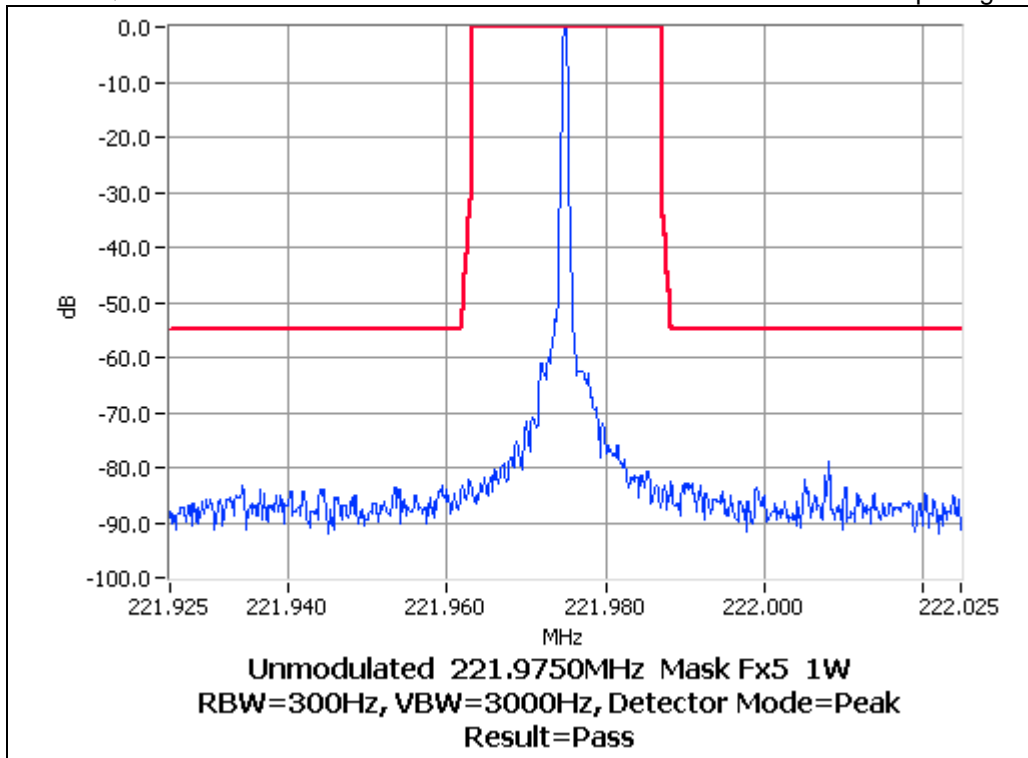
Tx FREQUENCY: 221.975 MHz 25 W 12.5 kHz Channel Spacing



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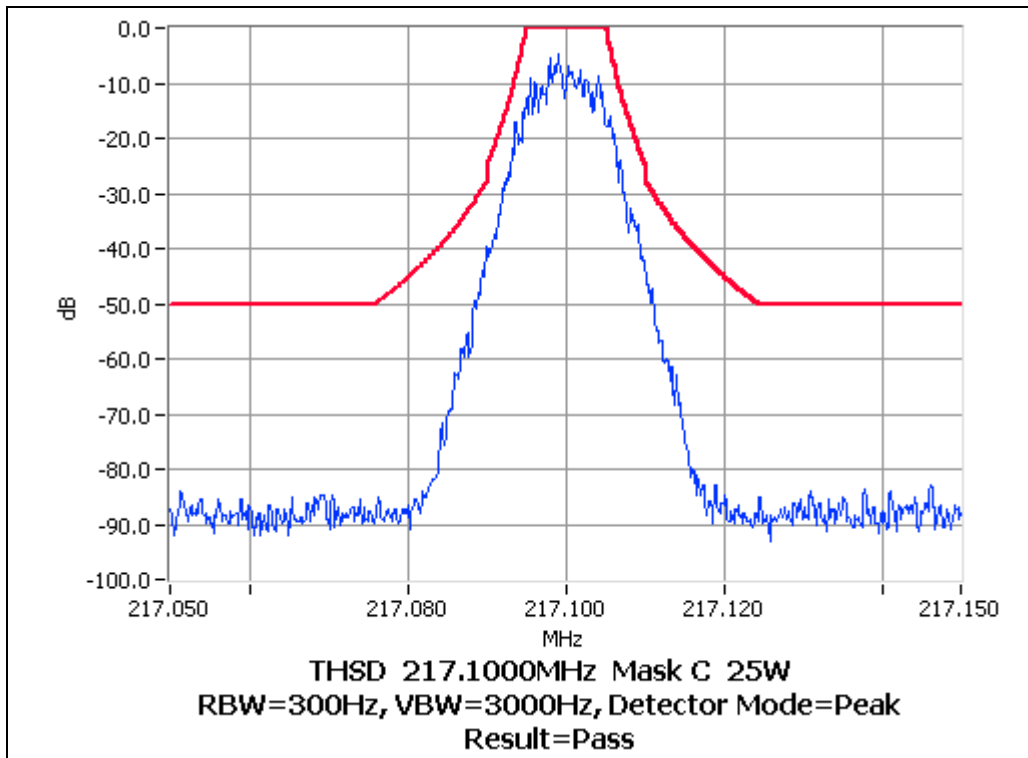
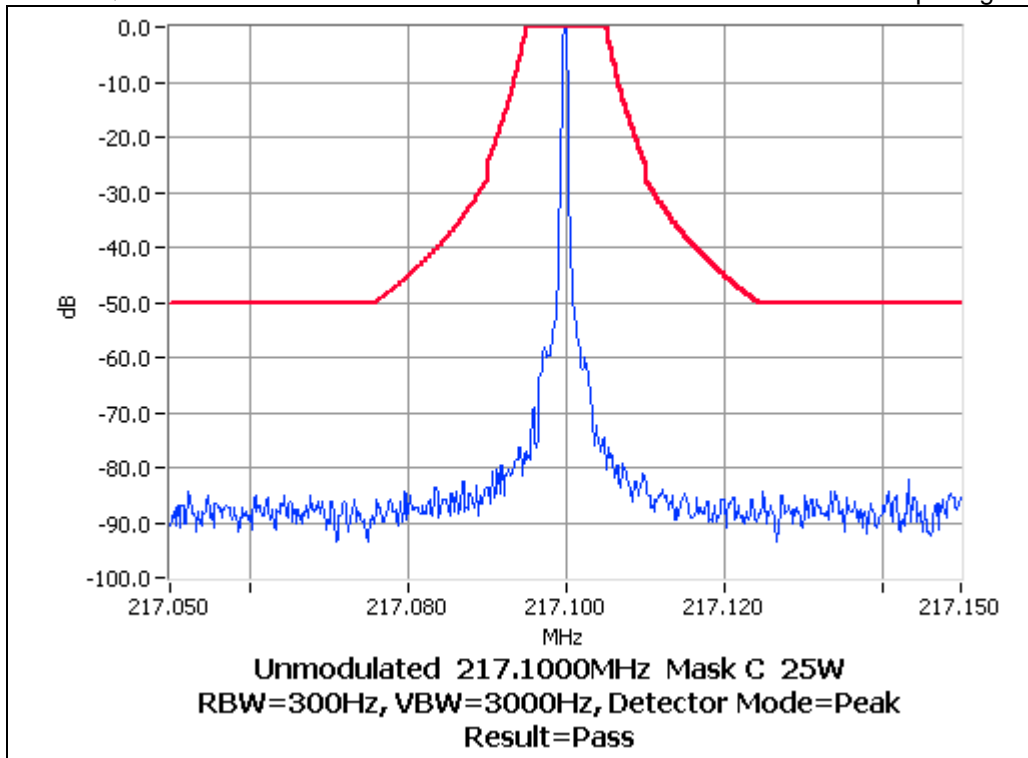
THSD

Tx FREQUENCY: 221.975 MHz 1 W 12.5 kHz Channel Spacing



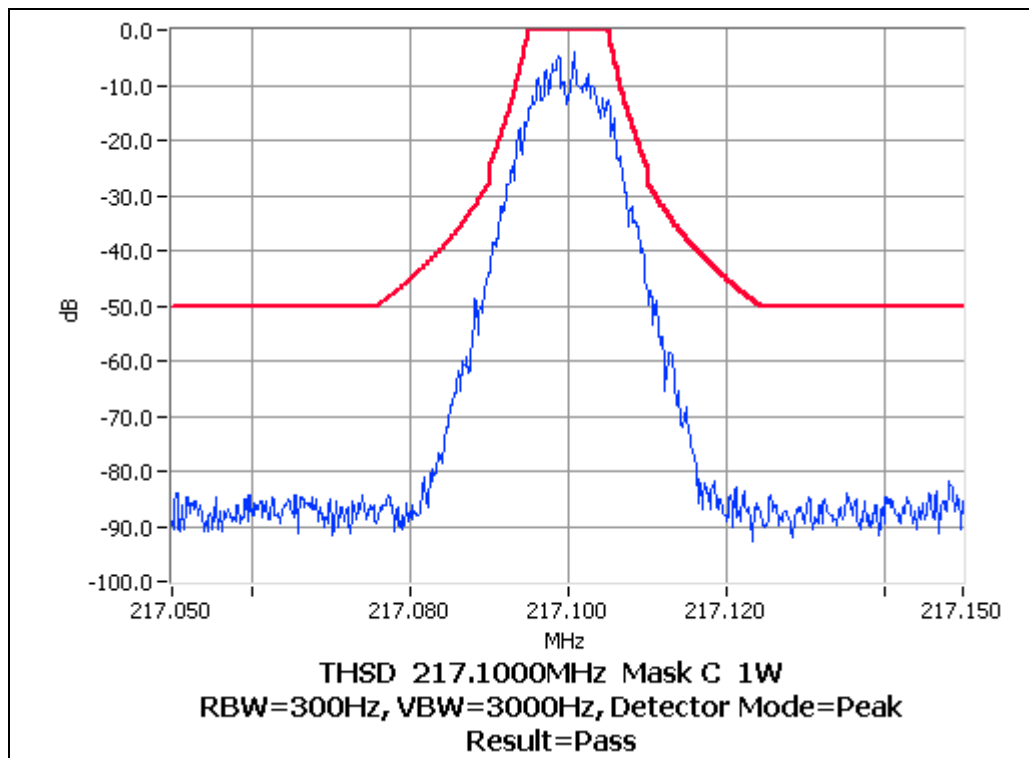
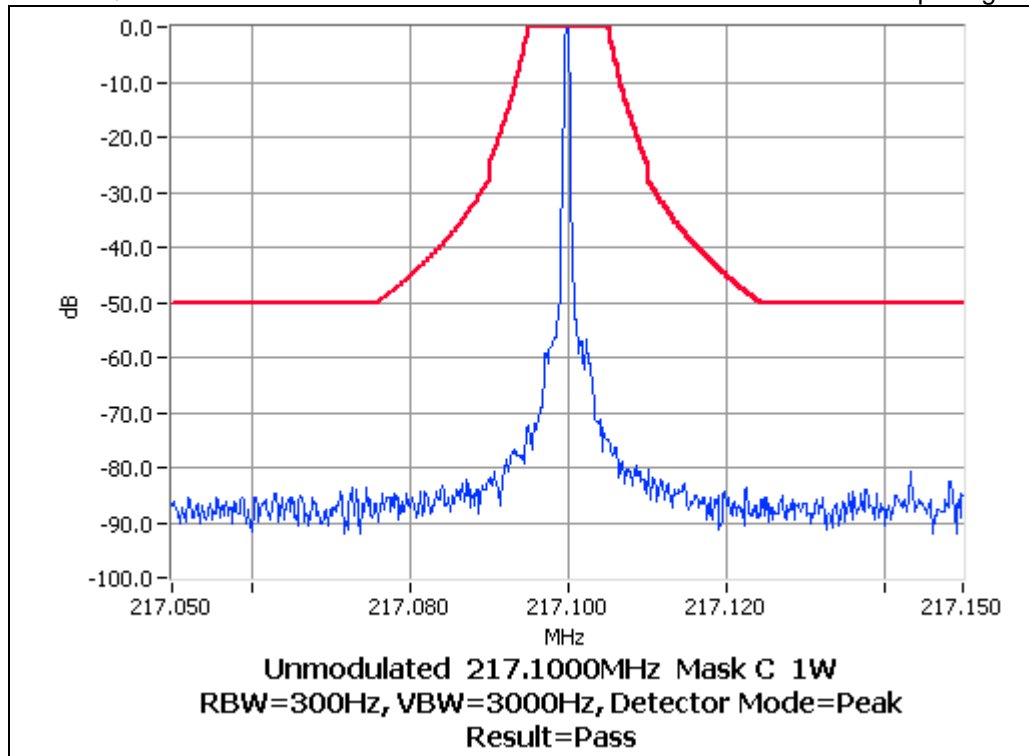
THSD

Tx FREQUENCY: 217.1 MHz 25 W 25.0 kHz Channel Spacing



THSD

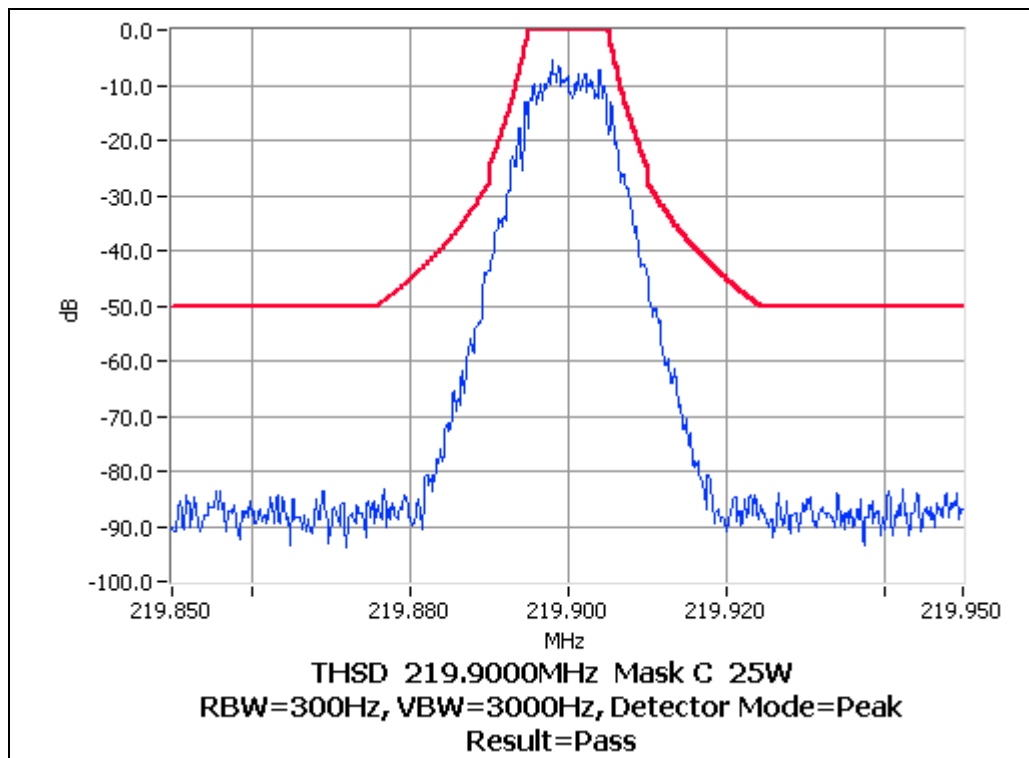
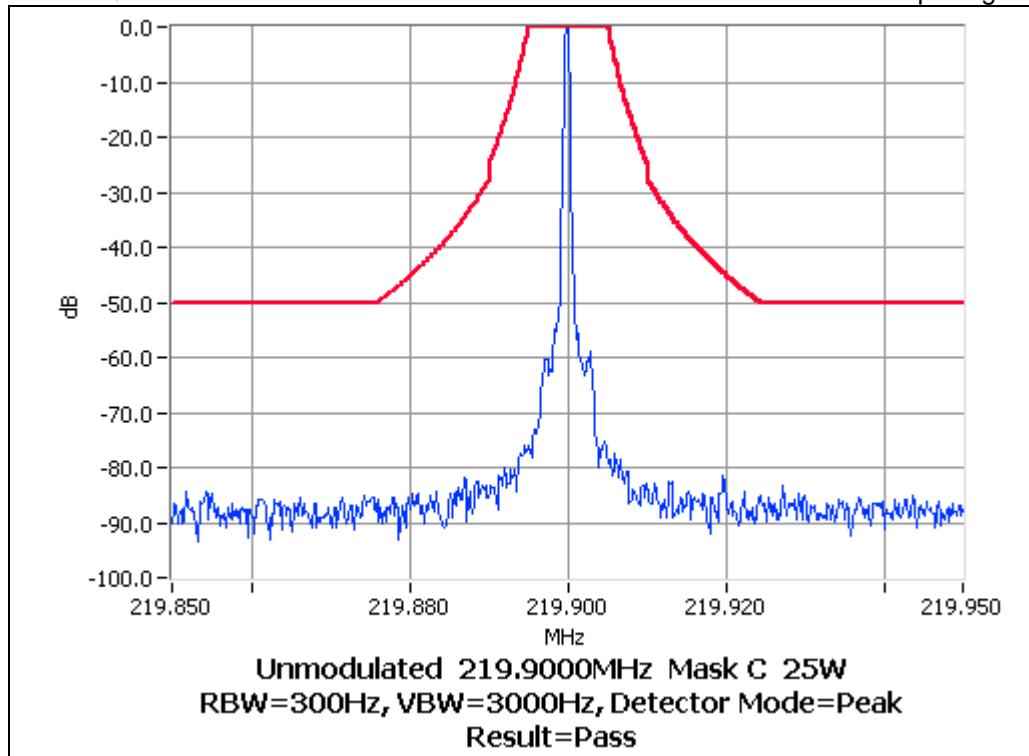
Tx FREQUENCY: 217.1 MHz 1 W 25.0 kHz Channel Spacing



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THSD

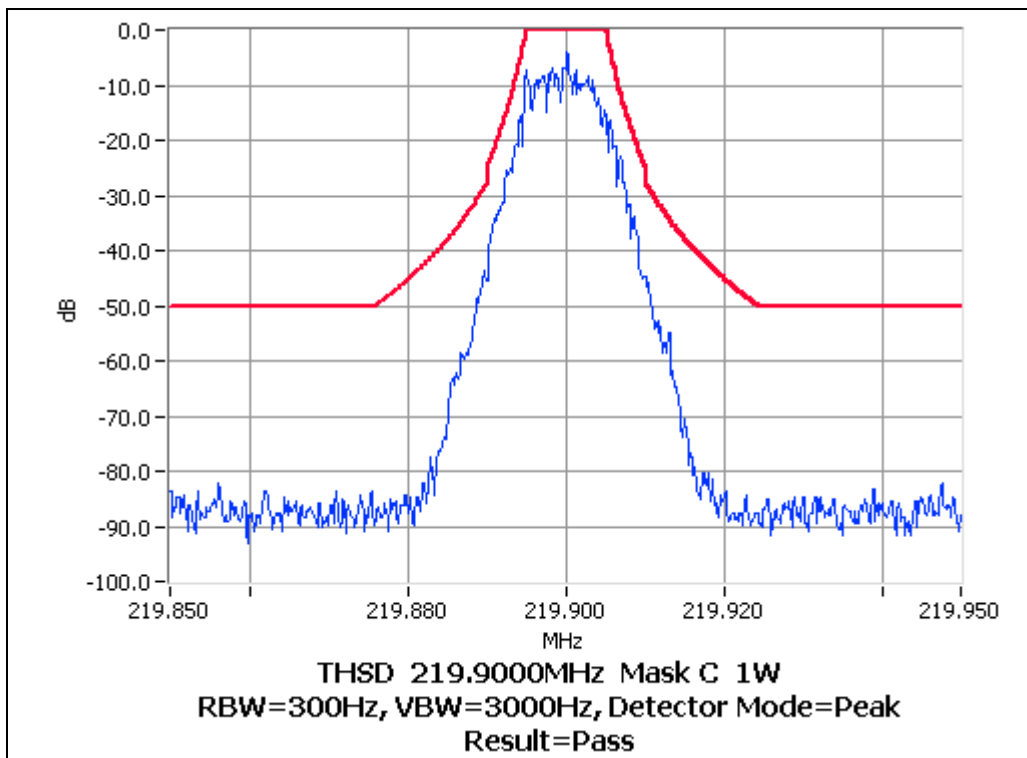
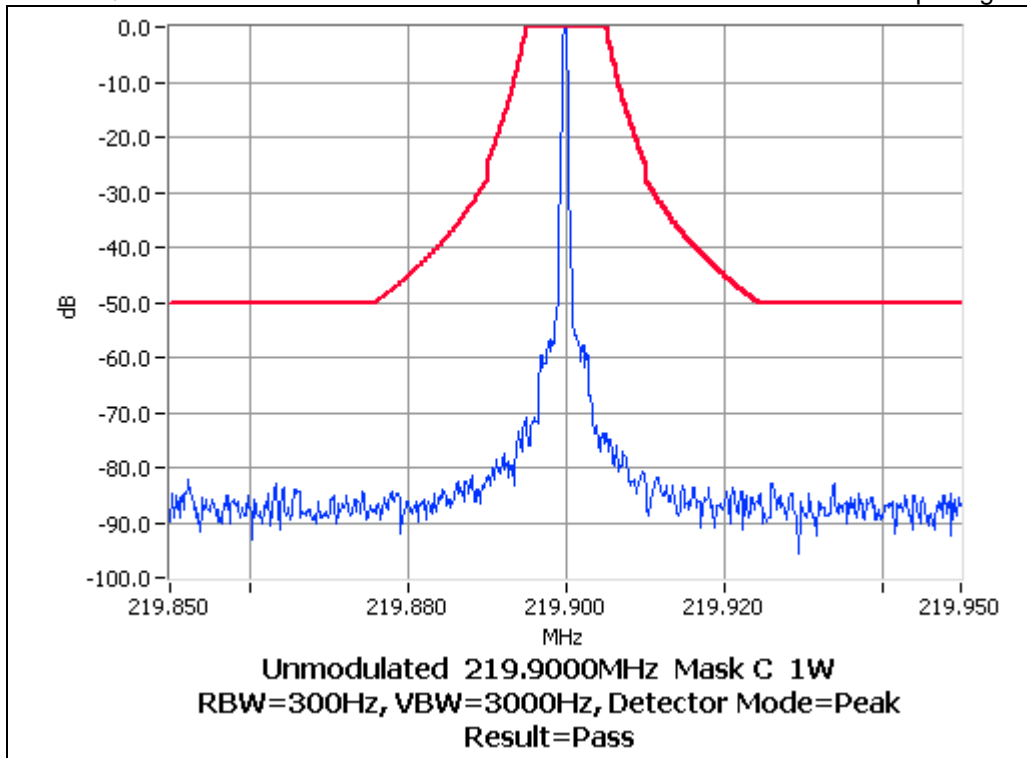
Tx FREQUENCY: 219.9 MHz 25 W 25.0 kHz Channel Spacing





THSD

Tx FREQUENCY: 219.9 MHz 1 W 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 channel spacing.

LIMIT CLAUSE: FCC 47 CFR 90.210

**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION:                      FCC CFR 2.1051

12.5 kHz Channel Spacing		217.1 MHz @ 25 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.			

12.5 kHz Channel Spacing		219.9 MHz @ 25 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		219.9 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.			

**SPURIOUS EMISSIONS (CONDUCTED)**

SPECIFICATION:                      FCC CFR 2.1051

12.5 kHz Channel Spacing		221.975 MHz @ 25 W	Emission Mask F x 5
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 x 5
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 $55 + 10 \text{Log}_{10} (P_{\text{Watts}})$	
25 W	-25 dBm	68.98 dBc
1 W	-25 dBm	55.00 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

12.5 kHz Channel Spacing		217.1 MHz @ 25 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.			

12.5 kHz Channel Spacing		219.9 MHz @ 25 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		219.9 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.			

**SPURIOUS EMISSIONS (RADIATED)**

SPECIFICATION:                      FCC CFR 2.1053

12.5 kHz Channel Spacing	221.975 MHz @ 25 W	Emission Mask F x 5
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 x 5
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 $55 + 10 \text{ Log}_{10} (P_{\text{Watts}})$	
25 W	-25 dBm	68.98 dBc
1 W	-25 dBm	55.00 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

Frequency Range: 216 MHz ~ 220 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5
25.0	5.0

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range: 220 MHz ~ 222 MHz

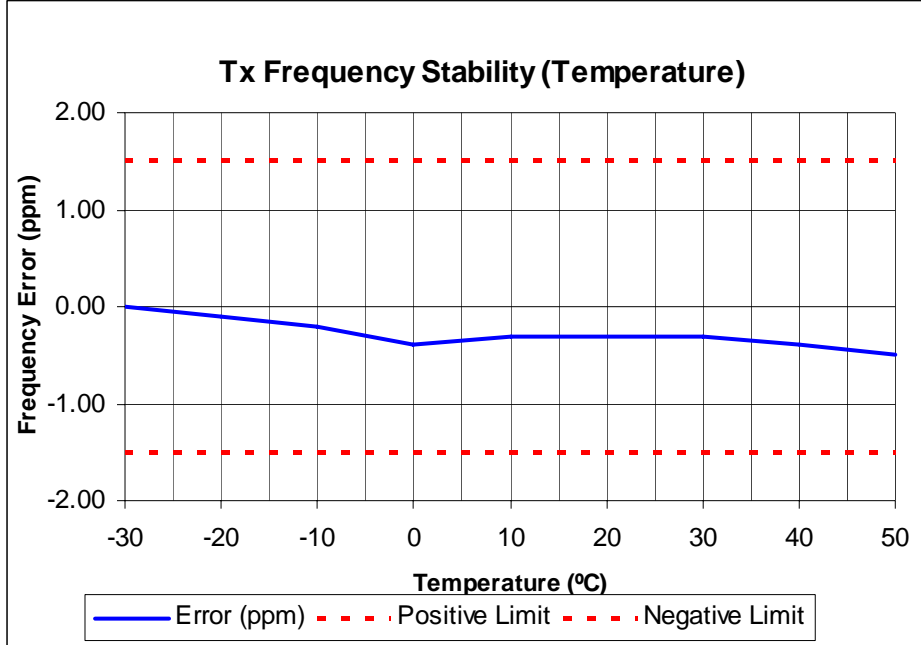
Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5



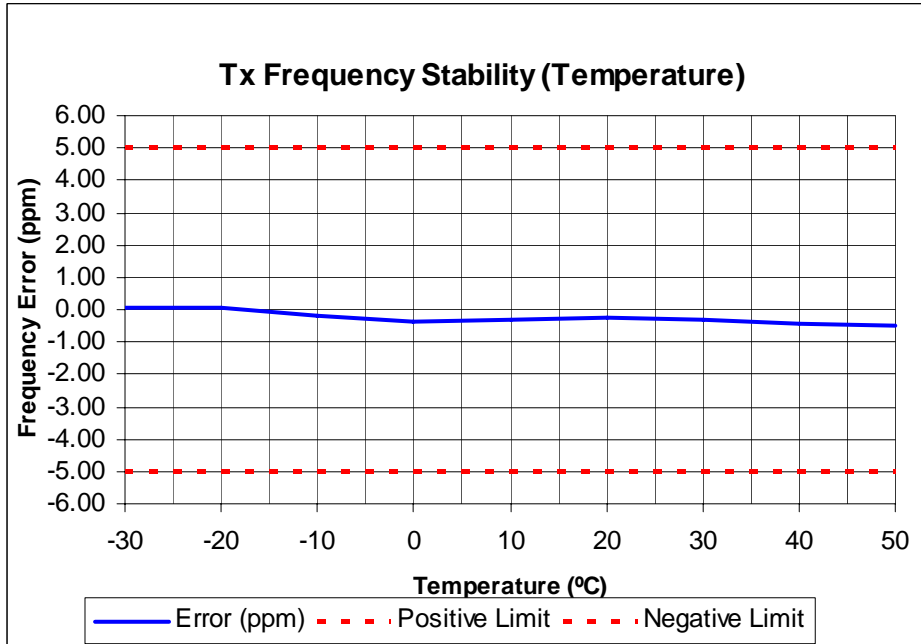
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

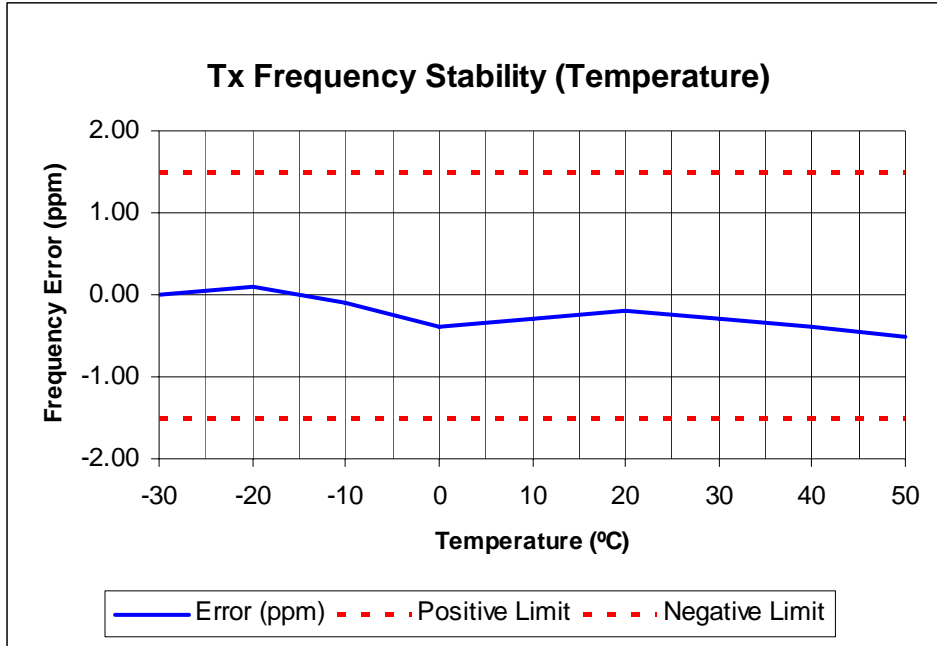
Tx FREQUENCY: 217.1 MHz 25 W 12.5 kHz channel Spacing



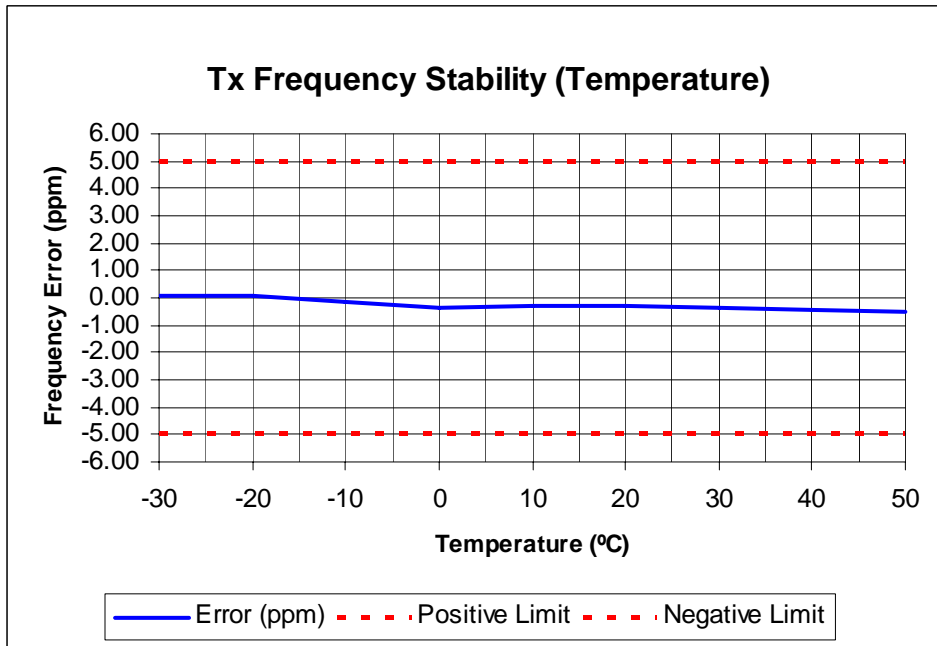
Tx FREQUENCY: 217.1 MHz 25 W 25.0 kHz channel Spacing



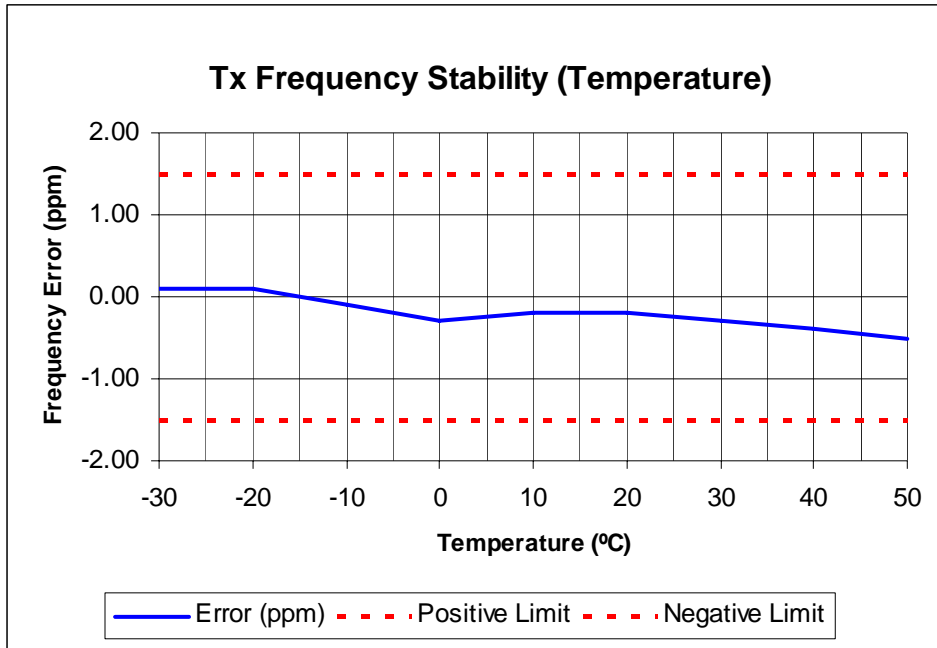
Tx FREQUENCY: 219.9 MHz 25 W 12.5 kHz channel Spacing



Tx FREQUENCY: 219.9 MHz 25 W 25.0 kHz channel Spacing



Tx FREQUENCY: 221.975 MHz 25 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	219.9 MHz	221.975 MHz
13.80 V <sub>DC</sub>	-0.28	-0.30	-0.26
15.87 V <sub>DC</sub>	-0.28	-0.32	-0.27
11.73 V <sub>DC</sub>	-0.29	-0.34	-0.26

Voltage	FREQUENCY ERROR (ppm) for 25.0 kHz		
	217.1 MHz	219.9 MHz	~
13.80 V <sub>DC</sub>	-0.30	-0.30	~
15.87 V <sub>DC</sub>	-0.30	-0.31	~
11.73 V <sub>DC</sub>	-0.31	-0.28	~

LIMIT CLAUSE: FCC 47 CFR 80.209

Frequency Range: 216 MHz ~ 220 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5
25.0	5.0

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range: 220 MHz ~ 222 MHz

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

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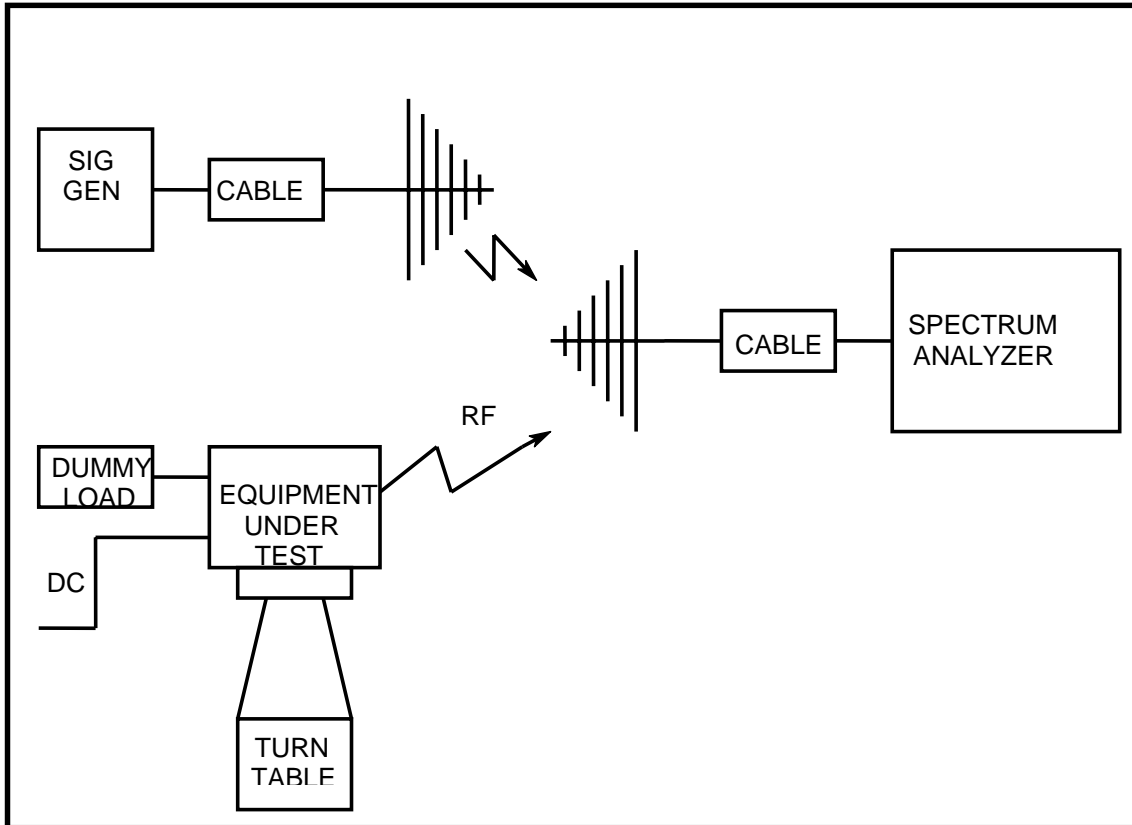
**TEST EQUIPMENT USED**

<b>No#</b>	<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Serial No#</b>	<b>Tait ID</b>	<b>Cal Due</b>
24	Environ. Chamber	Contherm	Chest	E3397	E3397	8-Dec-10
24	Environ. Chamber	Contherm	ChestI	E3397	E3397	12-Jul-12
38	Power Supply	Agilent	N5767A	US09F4901H	E4656	7-Oct-11
43	Horn Antenna	Emco	DRG3115	2084	E3076	6-Jan-13
46	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	15-Jun-12
52	Amplifier +21.7 dB	Tait	ZFL-1000LN	E3660	E3360	
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	5-Oct-11
71	RF Load 50W	Weinschel	F1426	BF0487	E3675	4-Oct-11
83	2m Coax (Black2)	Suhner	RG214HF/Nm/Nm/2000	Black2	E4623	5-Oct-11
85	3m Coax Cable	Suhner	Sucoflex 104A	44611/4A	E4620	4-Oct-11
86	2m Coax (Black4)	Suhner	RG214HF/Nm/Nm/2000	Black4	E4653	5-Oct-11
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	6-Oct-11
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	5-Oct-11
90	Power Supply	Hewlett Packard	HP6012B	2524A00616	E3712	6-Oct-11
111	Mod Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	6-Oct-11
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	26-Aug-12
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	4-Oct-11

ANNEX A

TEST SETUP DETAILS

Radiated Emissions Set up.



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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.

