

REPORT NUMBER 2250

July 2005

## Class II Permissive Change to TARF 2041

On the TBAB1 Base Station Transceiver

### FCC ID: CASTBAB1

In accordance with

FCC 47 CFR Parts 22 and 90

PREPARED BY: Marcus Ludwig \_\_\_\_\_  
Test Technician

CHECKED & APPROVED BY: Hamish Newton \_\_\_\_\_  
Senior Technician



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

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## REPORT ON :

This is a Class II Permissive Change to TARF 2041 dated June 2004 and confirms performance of the Paging capability of the TBAB1 base Station Transceiver, in accordance with:

FCC CFR 47 Parts 22 & 90

FCC ID: CASTBAB1

## PREPARED FOR :

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

## DISTRIBUTION :

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Tait Electronics Ltd	Mr. Des Fox	Copy No 2
Tait Electronics Ltd	Mr. Ian MacKay	Copy No 3

## APPROVED :

Hamish Newton

Senior Technician

Date :

Copy No:

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## 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	120 Vac

## Necessary Bandwidth and Emission Designators

SPECIFICATION: FCC 47 CFR 2.202

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

This is calculated using the following formula.

$B_n = 2M + 2DK$       Where:  $B_n$  = 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. Paging (POCSAG)

12.5kHz Bandwidth	Necessary bandwidth	Emission Designator
512 Baud	$M = 512$ $D = 2.25 \text{ kHz}$ $B_n = 512 + 4500 \times 1.2$ $= 5.9\text{kHz}$	<b>5K90F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier
1200 Baud	$M = 1200$ $D = 2.25 \text{ kHz}$ $B_n = 1200 + 4500 \times 1.2$ $= 6.6 \text{ kHz}$	<b>6K60F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier
2400 Baud	$M = 2400$ $D = 2.25 \text{ kHz}$ $B_n = 2400 + 4500 \times 1.2$ $= 7.8 \text{ kHz}$	<b>7K80F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier
25kHz Bandwidth	Necessary bandwidth	Emission Designator
512 Baud	$M = 512$ $D = 4.5 \text{ kHz}$ $B_n = 512 + 9000 \times 1.2$ $= 11.3 \text{ kHz}$	<b>11K3F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier
1200 Baud	$M = 1200$ $D = 4.5 \text{ kHz}$ $B_n = 1200 + 9000 \times 1.2$ $= 12 \text{ kHz}$	<b>12K0F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier

## Necessary Bandwidth and Emission Designators

25kHz Bandwidth 2400 Baud	Necessary bandwidth  M = 2400 D = 4.5 kHz Bn = 2400 + 9000 x 1.2 = 13.2 kHz	Emission Designator  <b>13K2F1D</b> F1D represents a FM data transmission without the use of a modulating sub carrier
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## Description of Test Sample

Type Code: TBAB1

Description: Base Station Transceiver

Manufacturer: Tait Electronics Limited  
PO Box 1645  
558 Wairakei Road  
Christchurch  
New Zealand

Paging Board: APP TBA PAGING  
220-02078-02

### Module Details:

Reciter	Frequency Range	Serial Number	Software Revisions
TBA40B2-0T10	136 – 156MHz	18004636	HW: 00.02 FW: 02.05
TBA40B3-0T10	148 – 174MHz	18004412	HW: 00.02 FW: 02.05

Power Amplifier	Range	Serial Number	Software Revisions
TBA90B1-0000	136 – 174MHz, 10 – 100 W	18004316	HW: 00.00 FW: 02.05
TBA70B1-0000	136 – 174MHz, 1 – 5 W	18004311	HW: 00.00 FW: 02.05

Power Management Unit	Subrack	Serial Number	Software Revisions
TBA30A0-0000	100 W	18004653	HW: 00.03 FW: 02.05
TBA30A0-0000	5 W	18004354	HW: 00.03 FW: 02.05

## Test Results

### OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603B 2.2.11

#### MEASUREMENT PROCEDURE:

1. Refer Appendix A for Equipment Set up.
2. The EUT was modulated with an externally generated bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

Emission Mask 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  
FCC 47 CFR 22.359

#### EMISSION MASKS

Emission Mask C	25.0 kHz Channel Spacing	Paging (POCSAG)
Emission Mask C	12.5 kHz Channel Spacing	Paging (POCSAG)

#### DATA SPEED

Paging (POCSAG)	512 Baud	25.0 kHz Channel Spacing
	512 Baud	12.5 kHz Channel Spacing
	1200 Baud	25.0 kHz Channel Spacing
	1200 Baud	12.5 kHz Channel Spacing
	2400 Baud	25.0 kHz Channel Spacing
	2400 Baud	12.5 kHz Channel Spacing

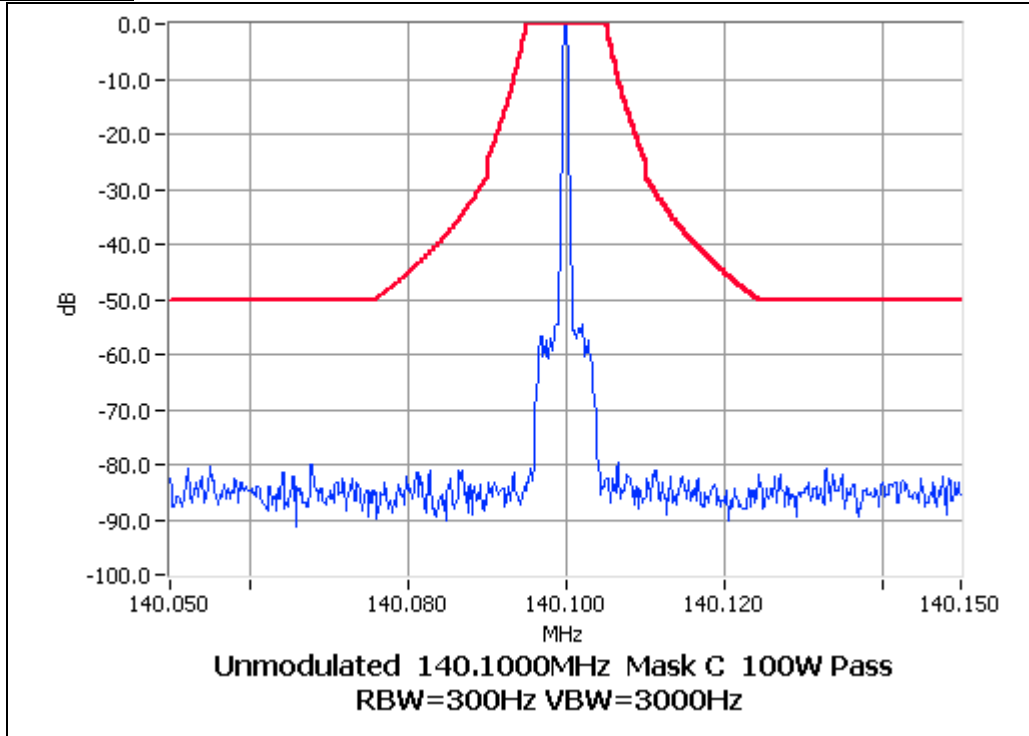
OCCUPIED BANDWIDTH

PAGING (POCSAG)

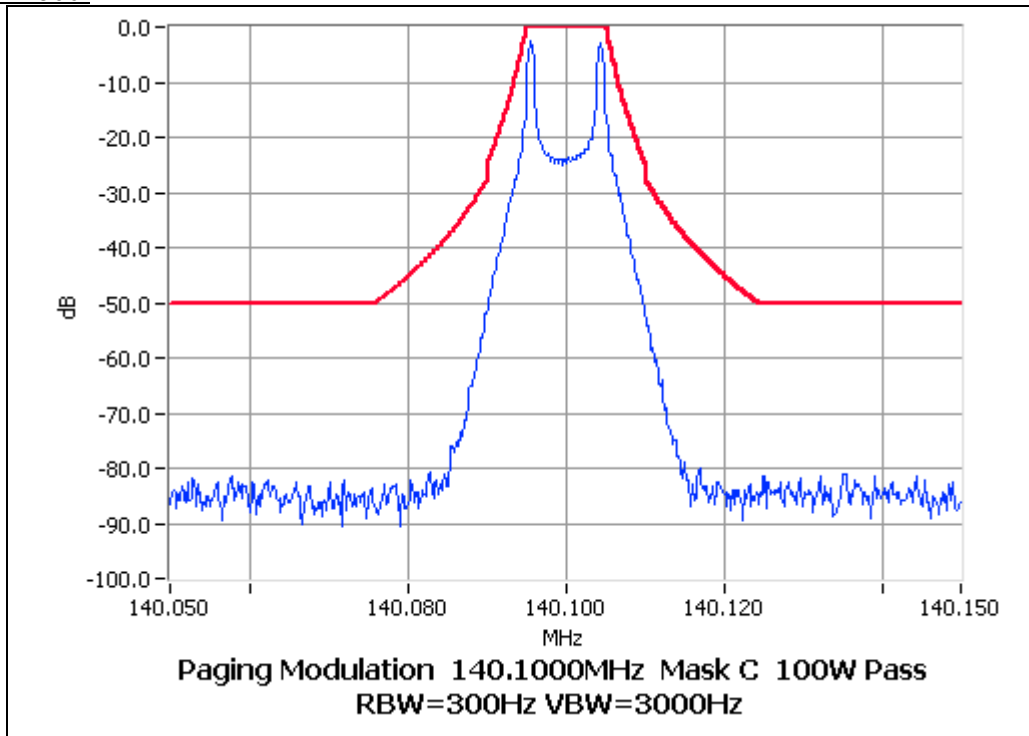
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 100W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



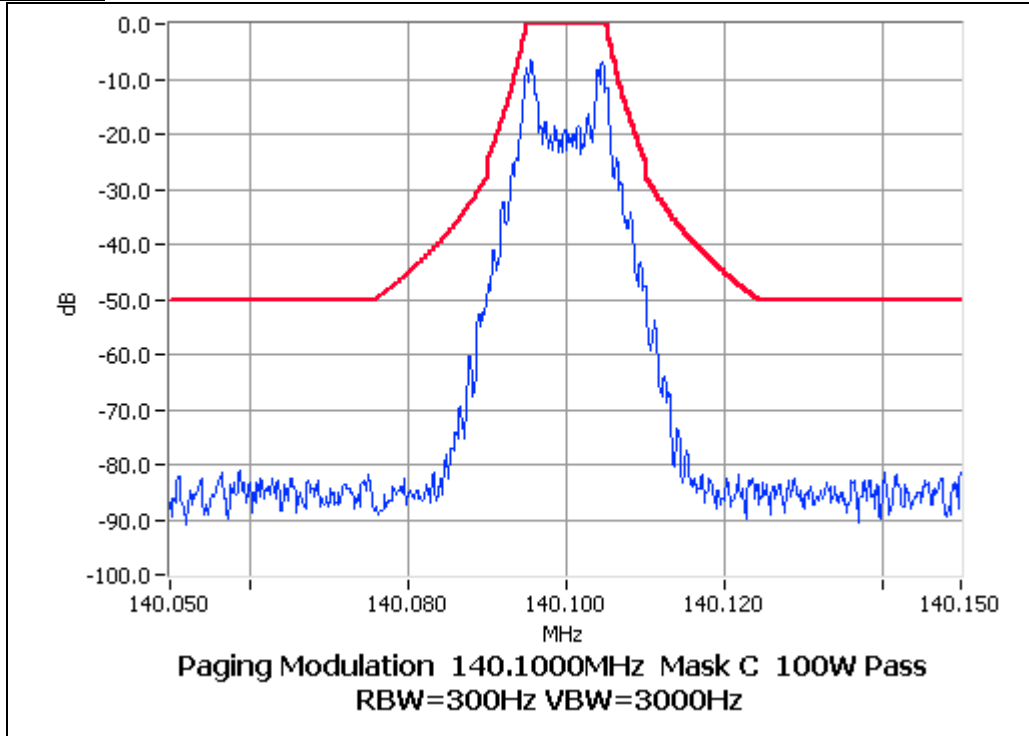
OCCUPIED BANDWIDTH

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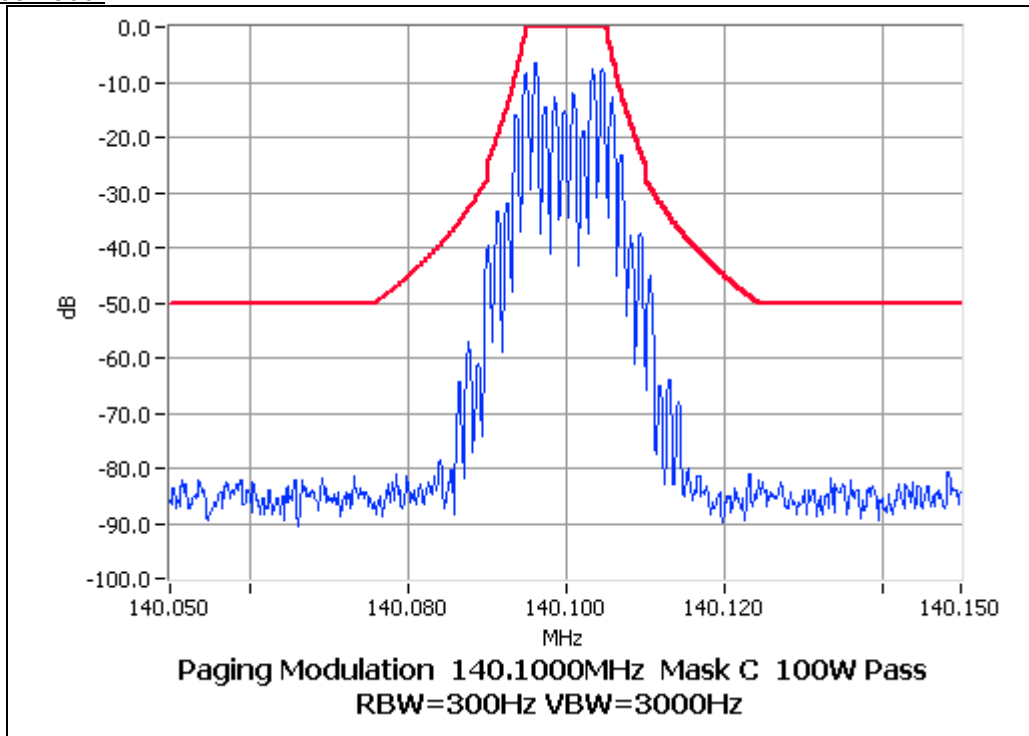
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 100W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:





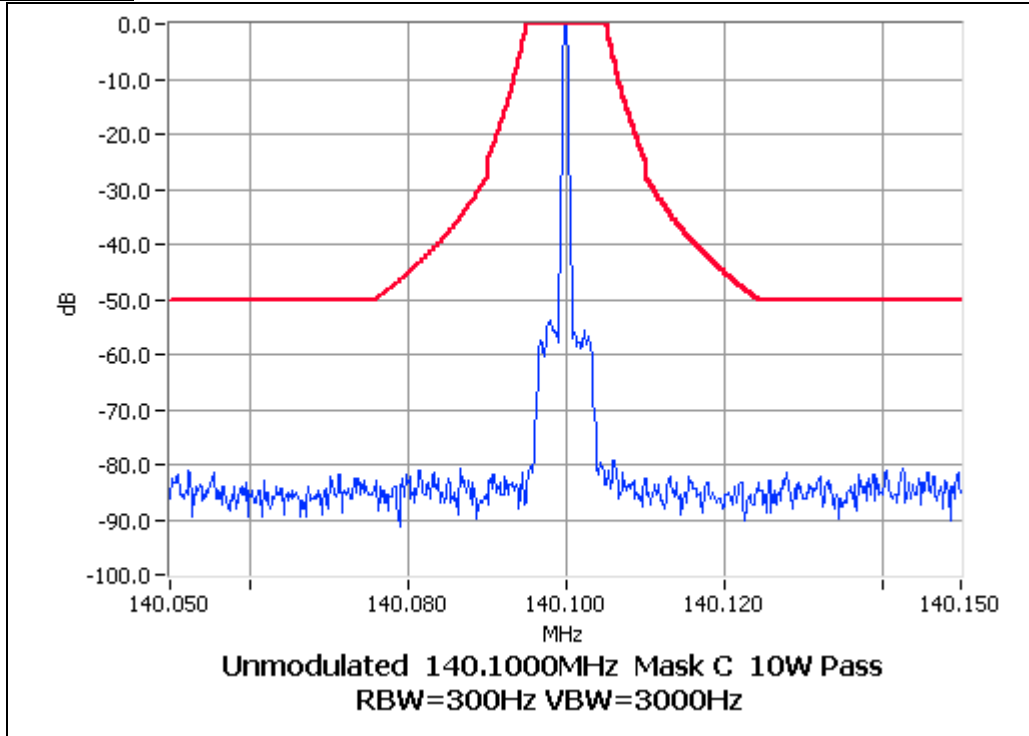
OCCUPIED BANDWIDTH

PAGING (POCSAG)

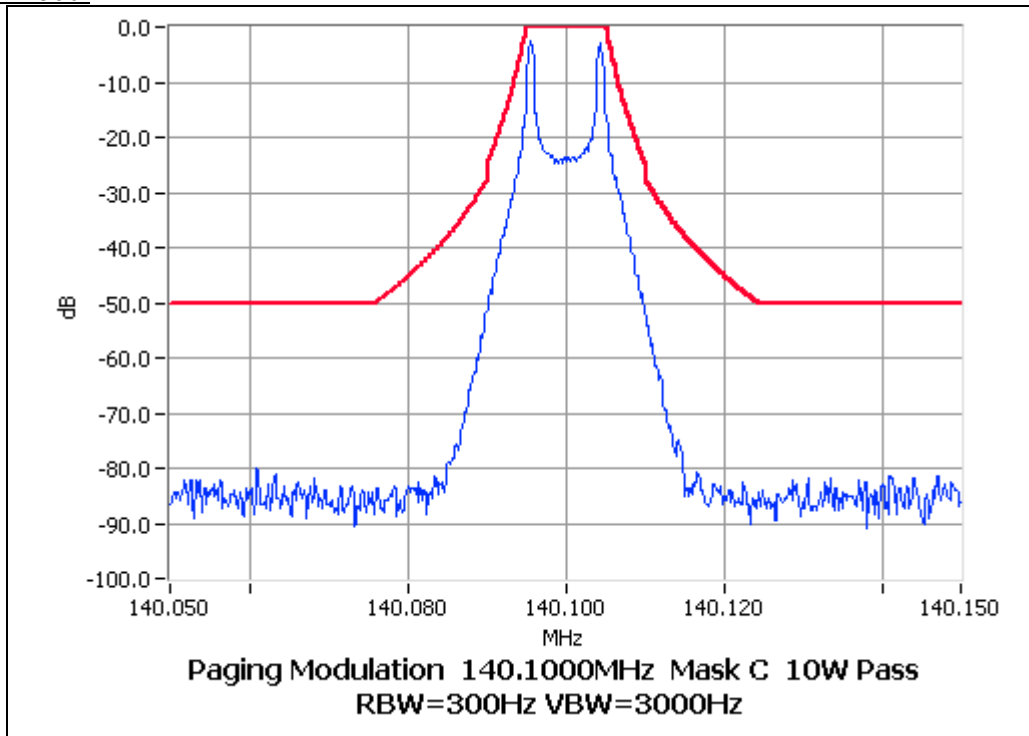
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 10W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



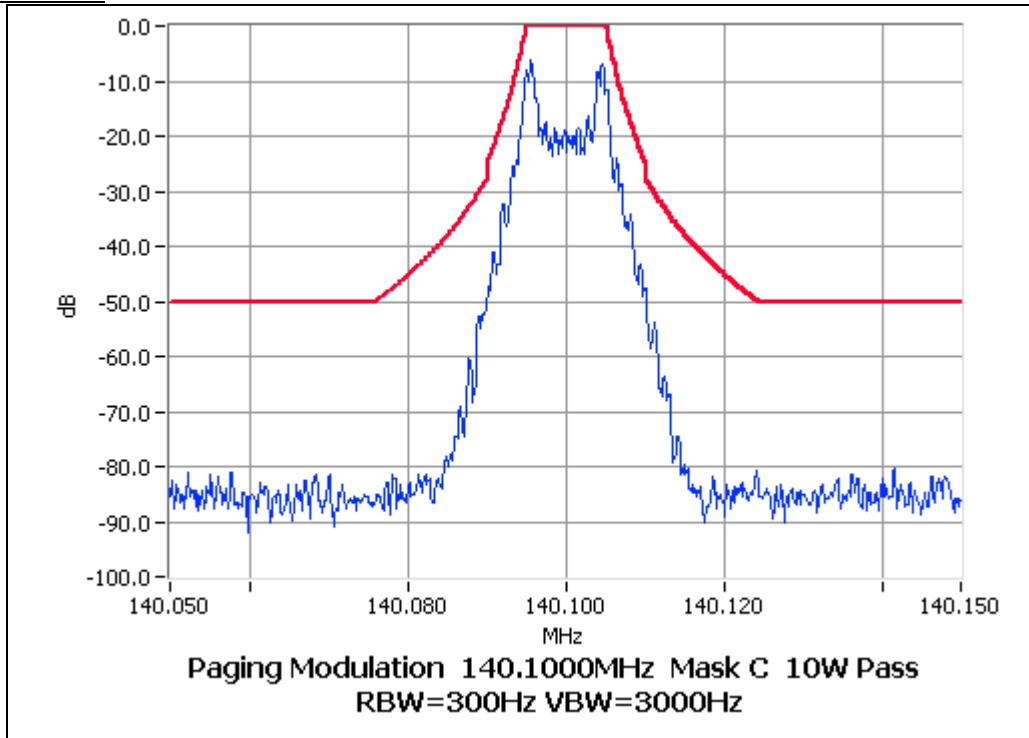
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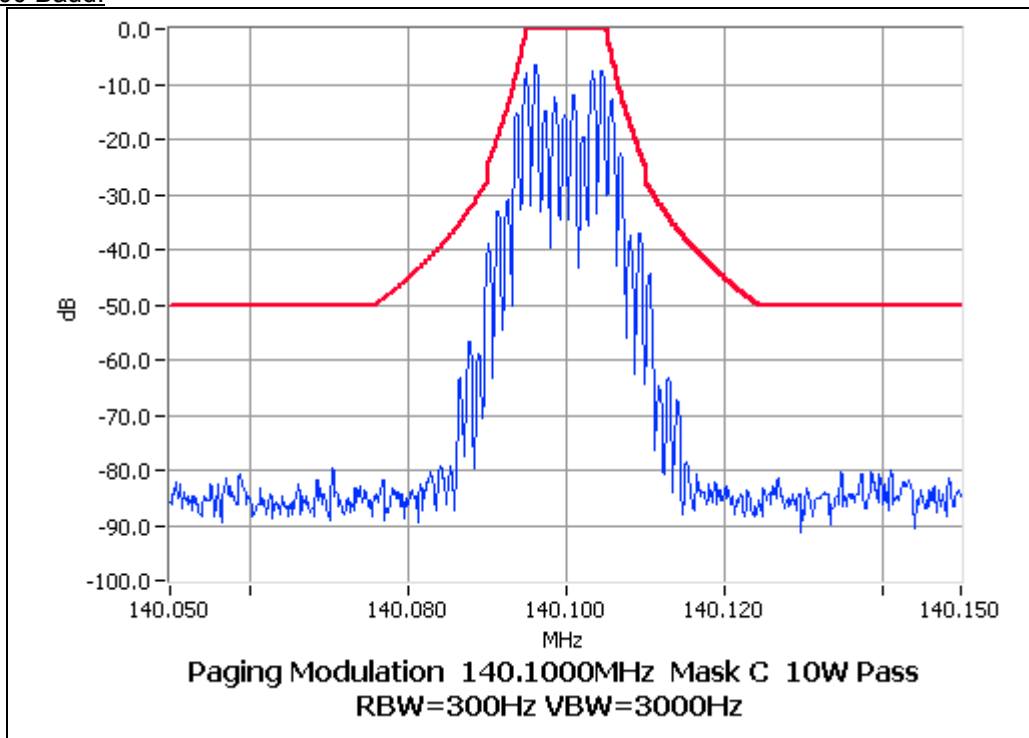
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 10W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:



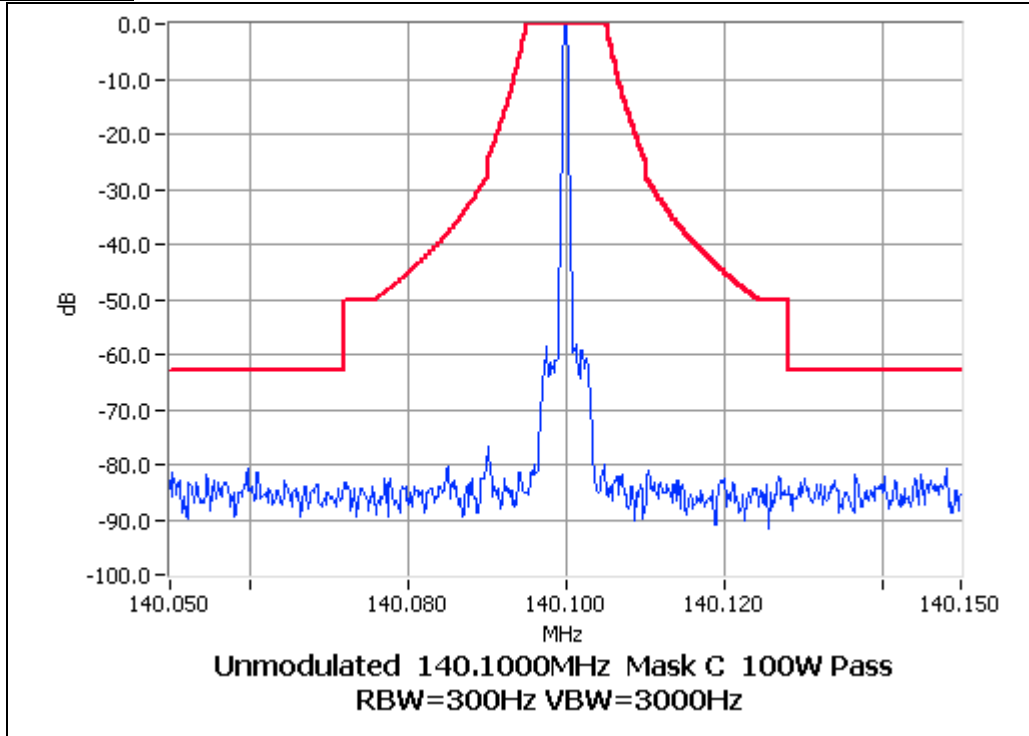
OCCUPIED BANDWIDTH

PAGING (POCSAG)

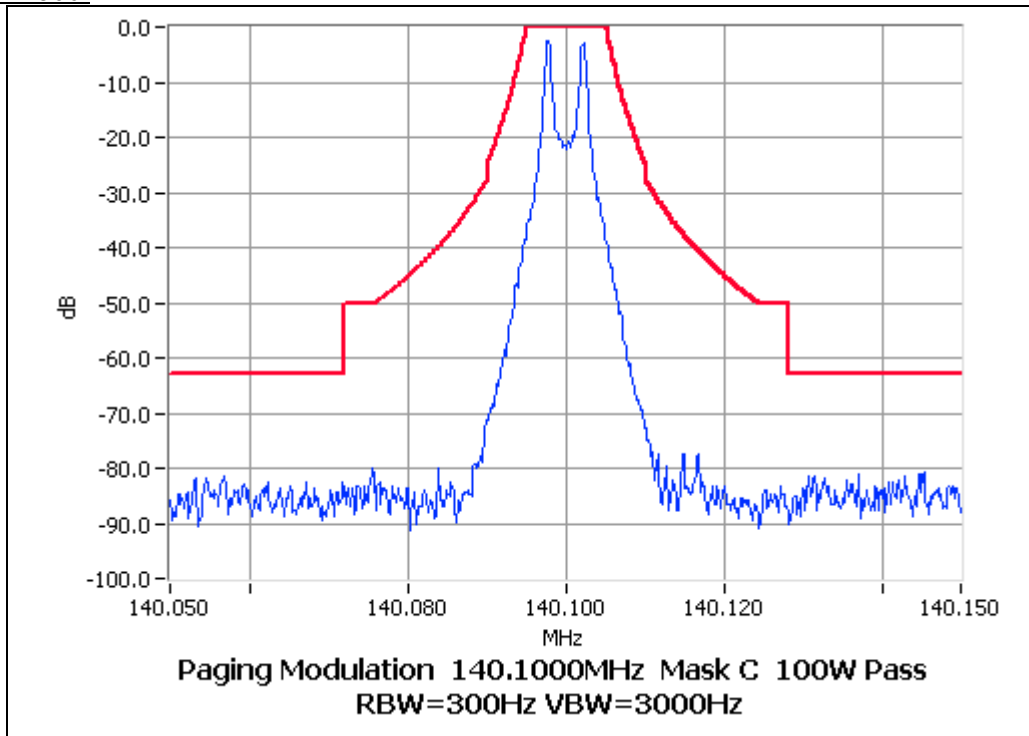
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Tx FREQUENCY: 140.1MHz 100W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



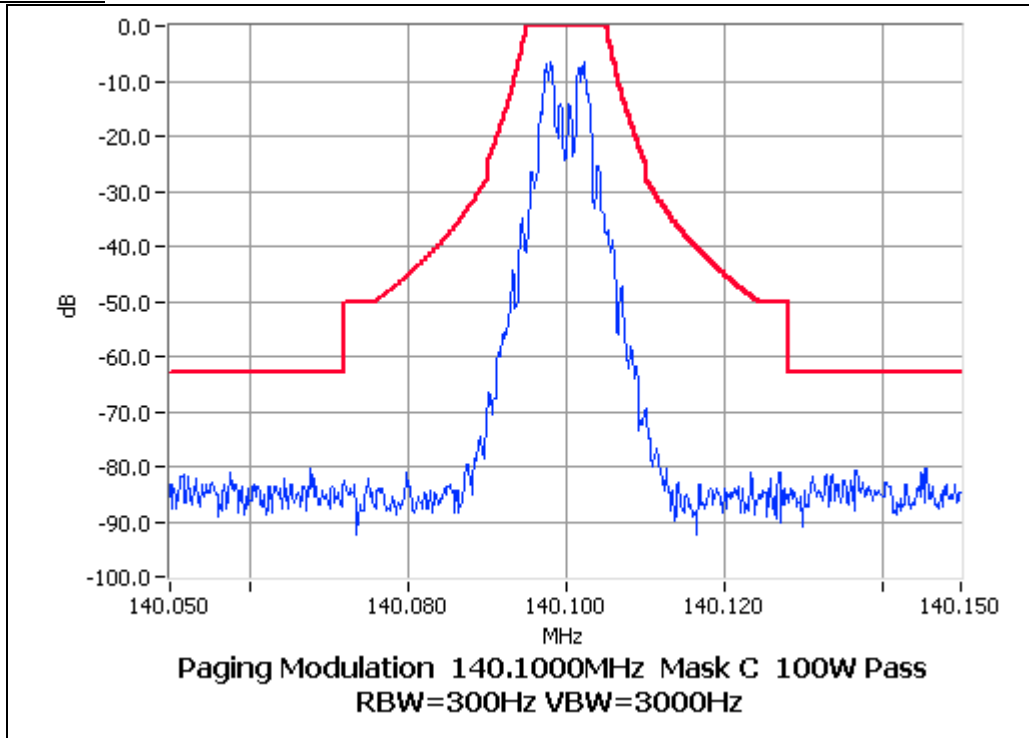
OCCUPIED BANDWIDTH

PAGING (POCSAG)

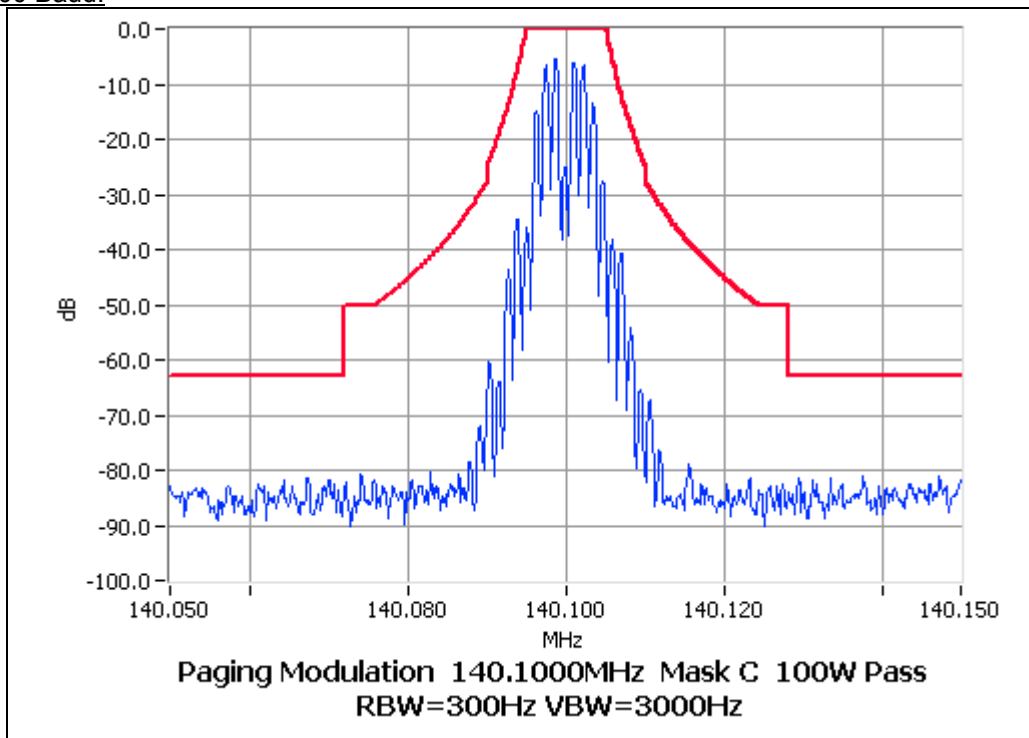
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Tx FREQUENCY: 140.1MHz 100W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



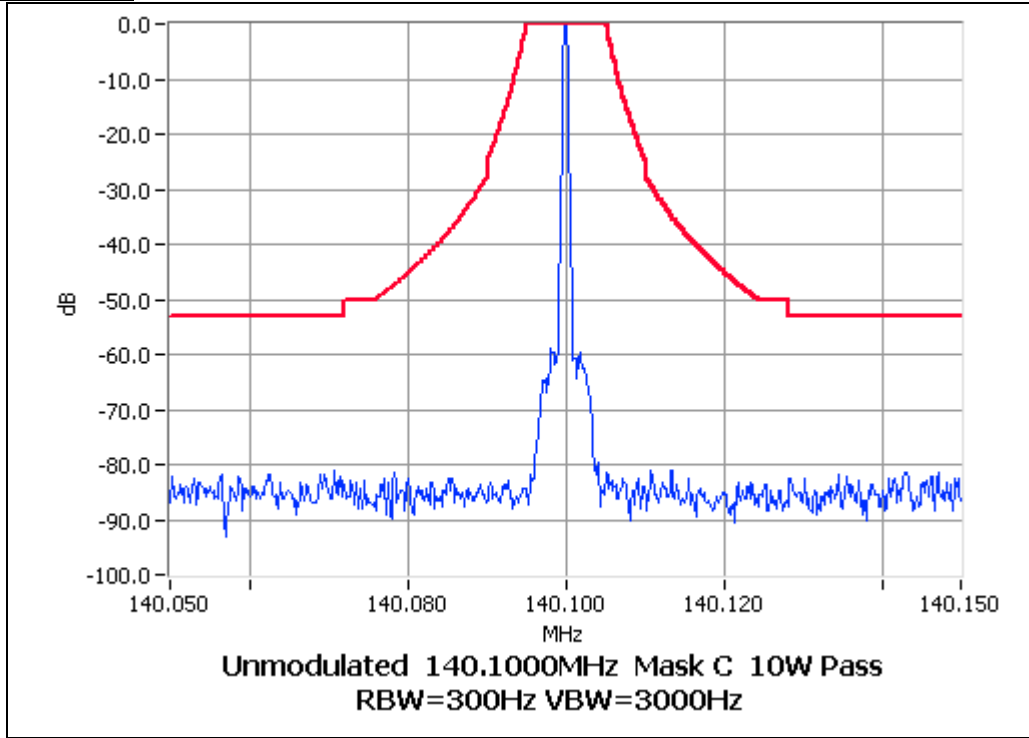
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PAGING (POCSAG)

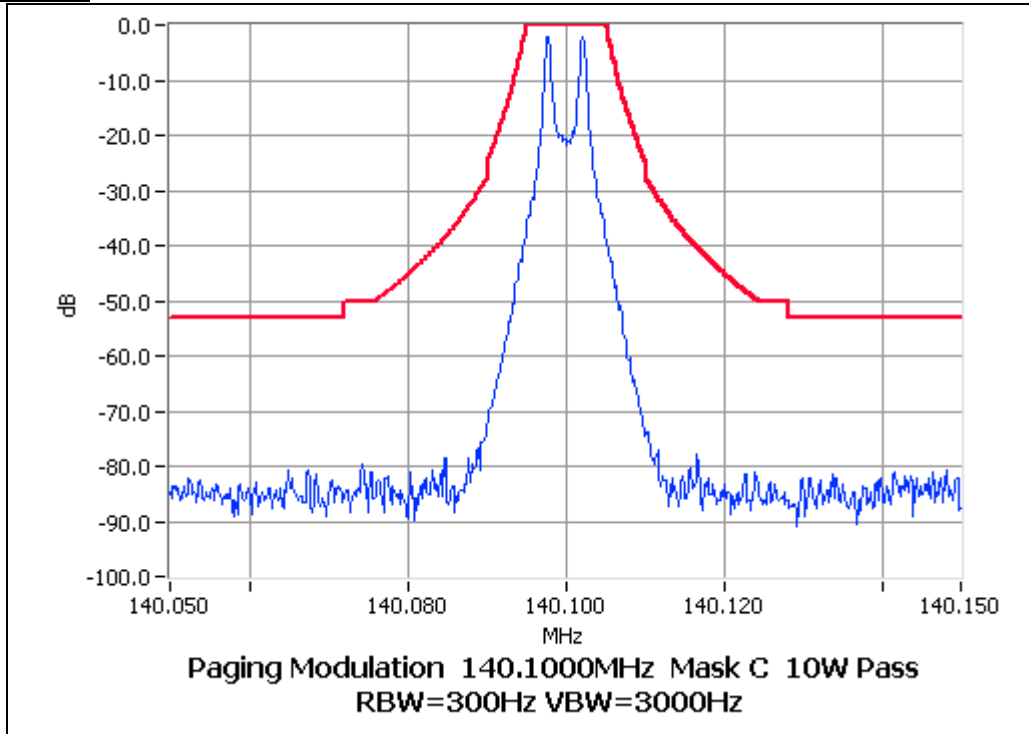
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 10W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



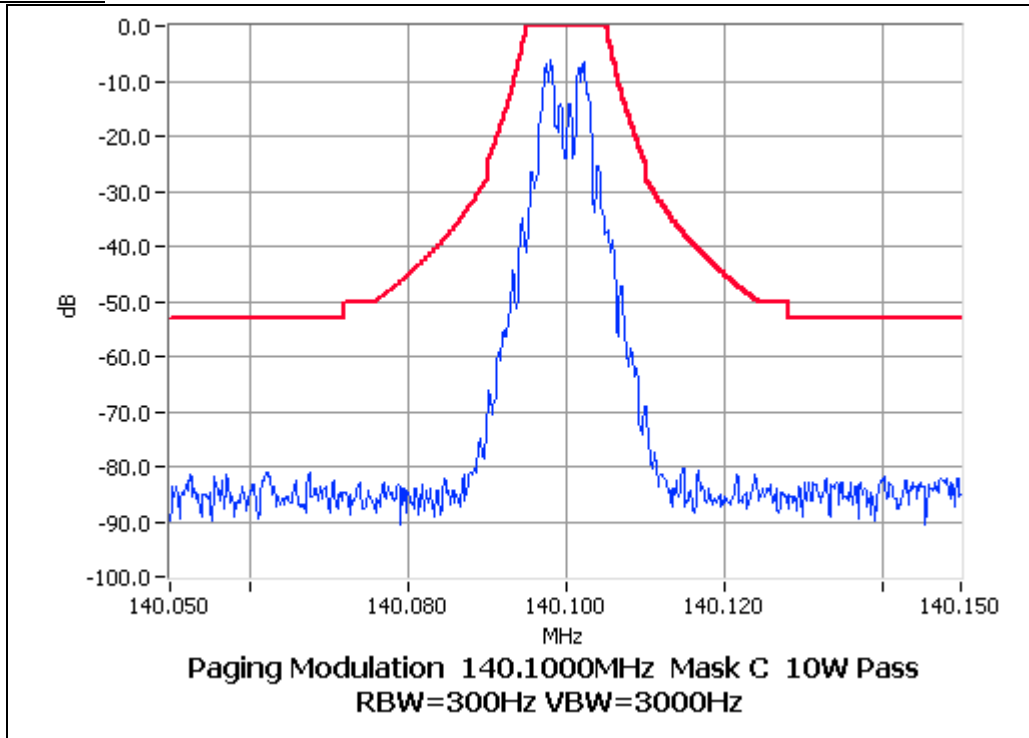
OCCUPIED BANDWIDTH

PAGING (POCSAG)

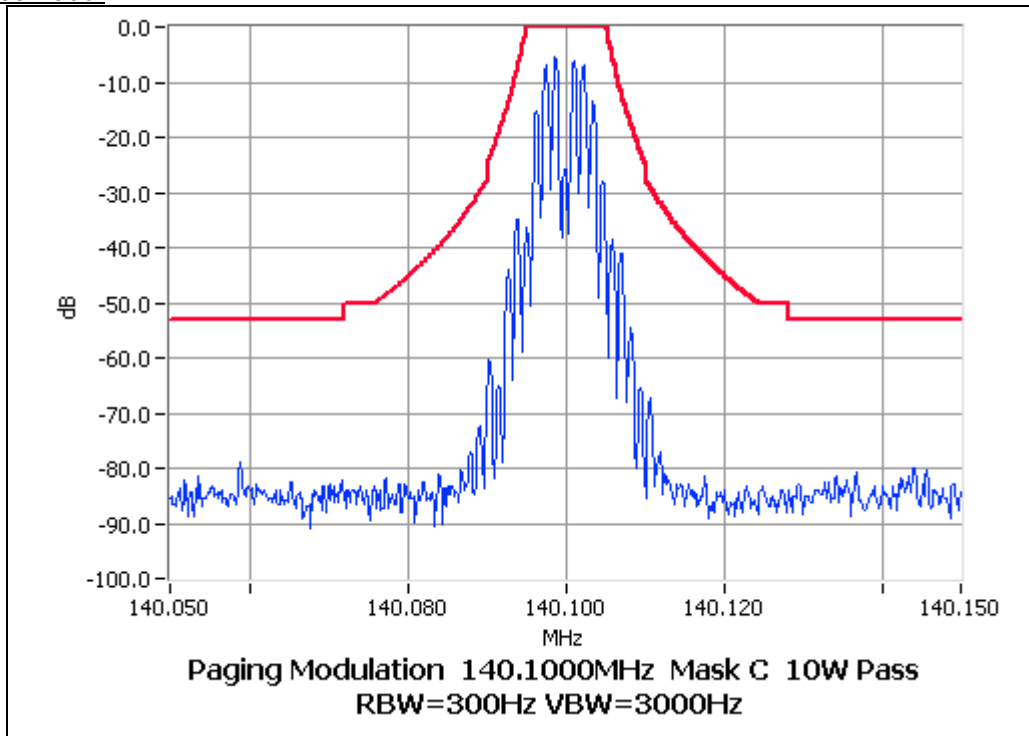
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1MHz 10W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



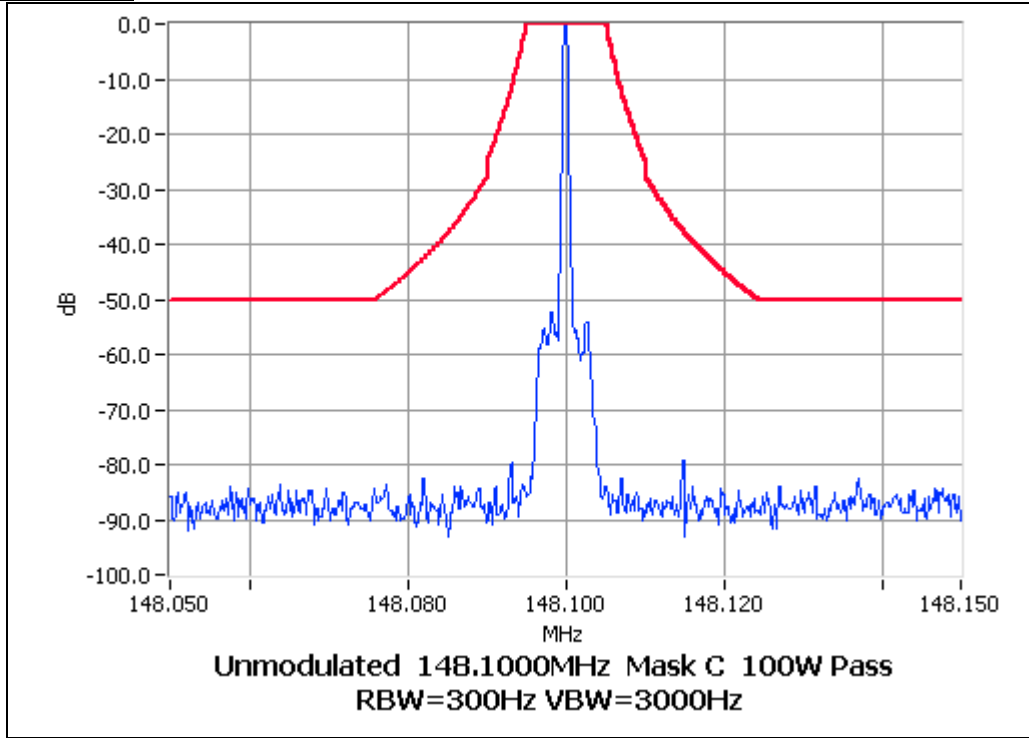
OCCUPIED BANDWIDTH

PAGING (POCSAG)

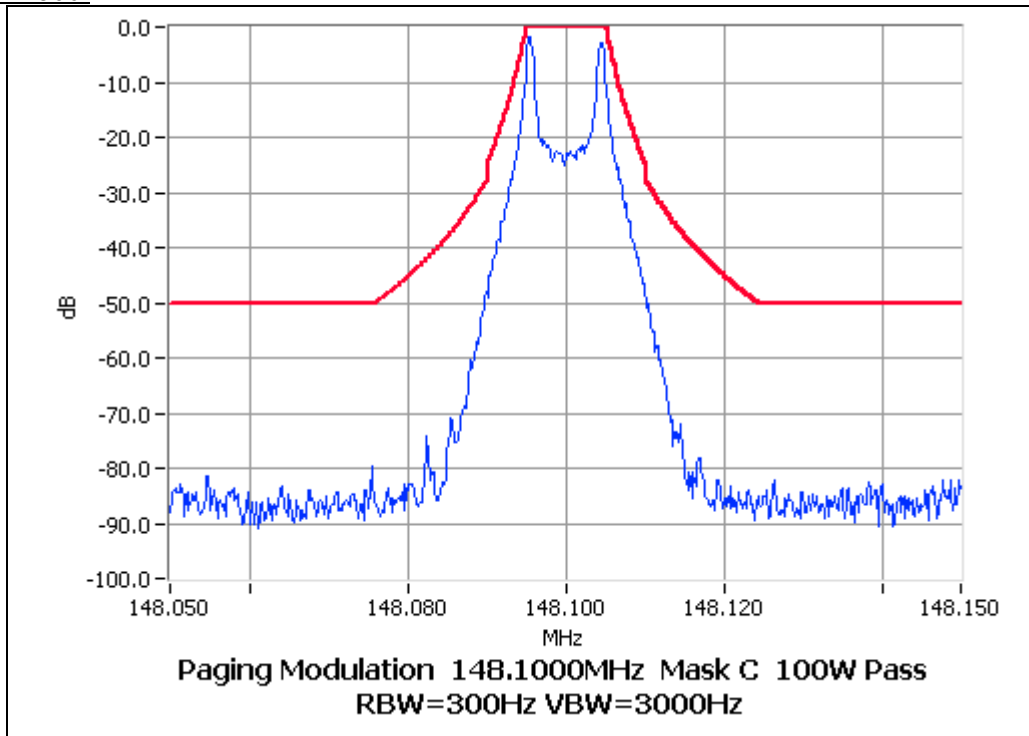
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 100W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



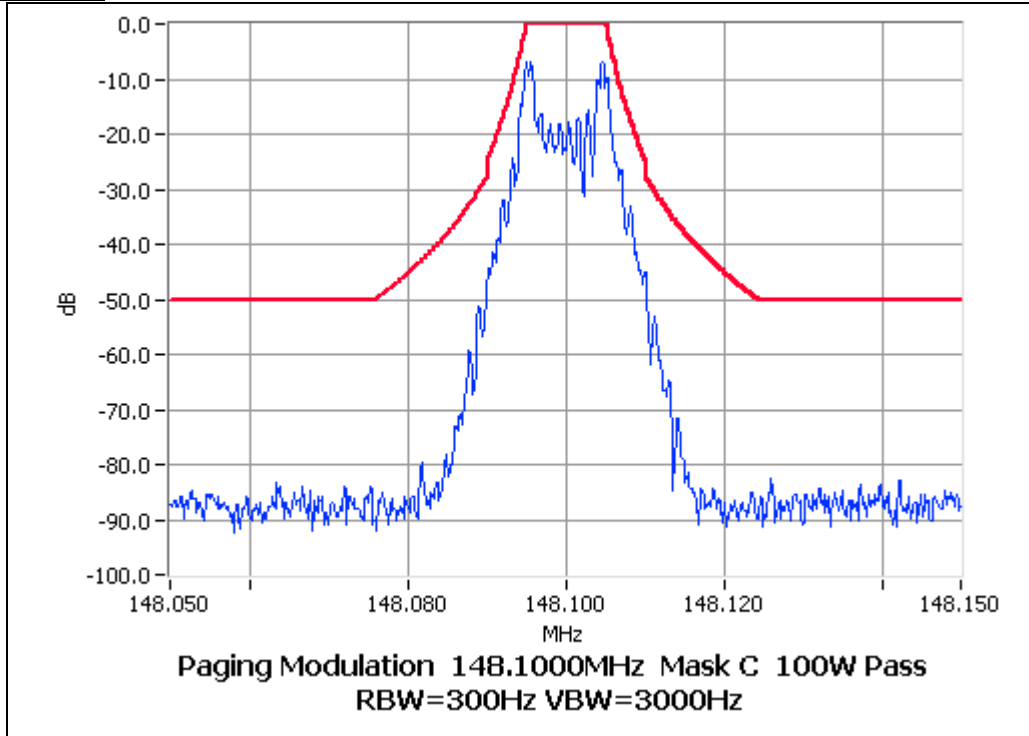
OCCUPIED BANDWIDTH

PAGING (POCSAG)

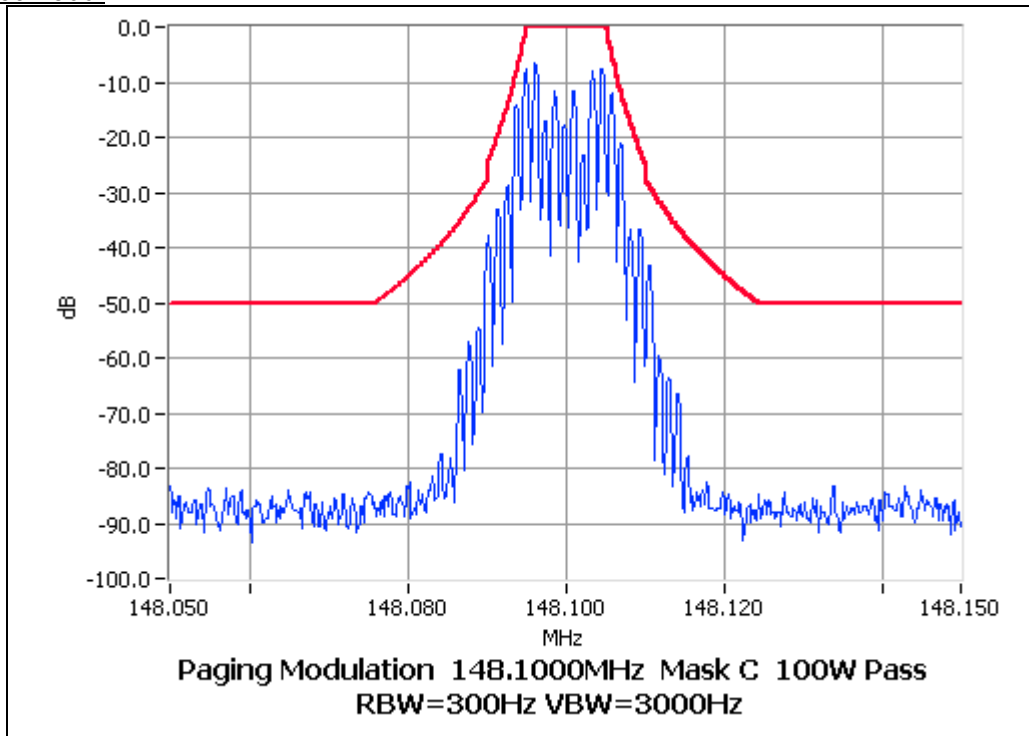
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 100W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:





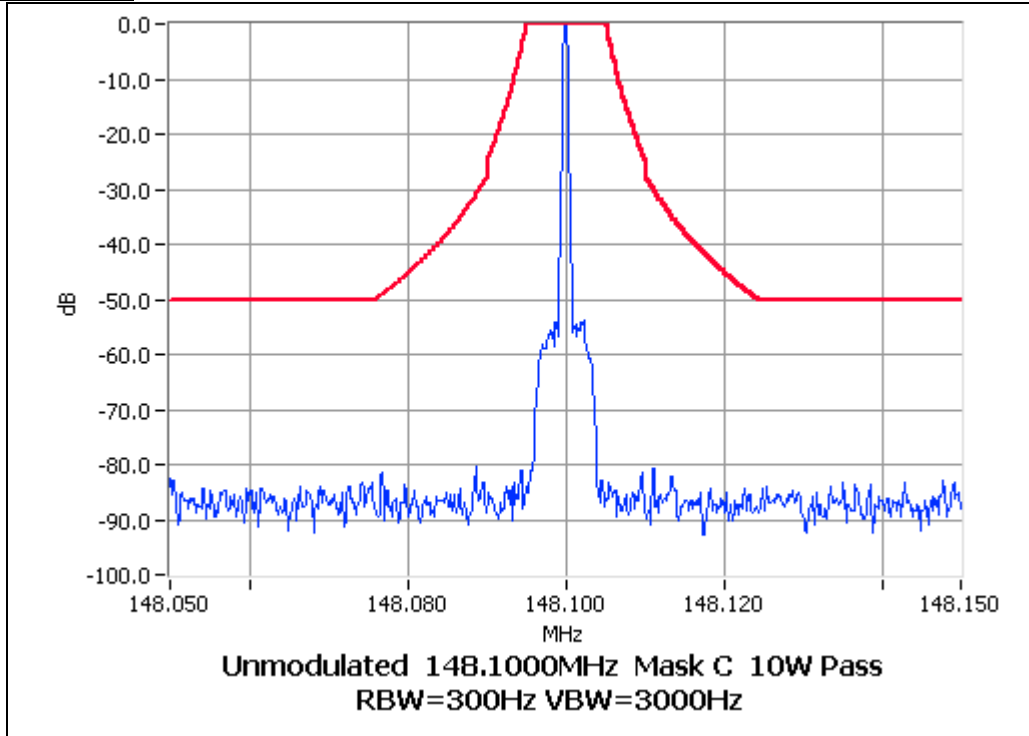
OCCUPIED BANDWIDTH

PAGING (POCSAG)

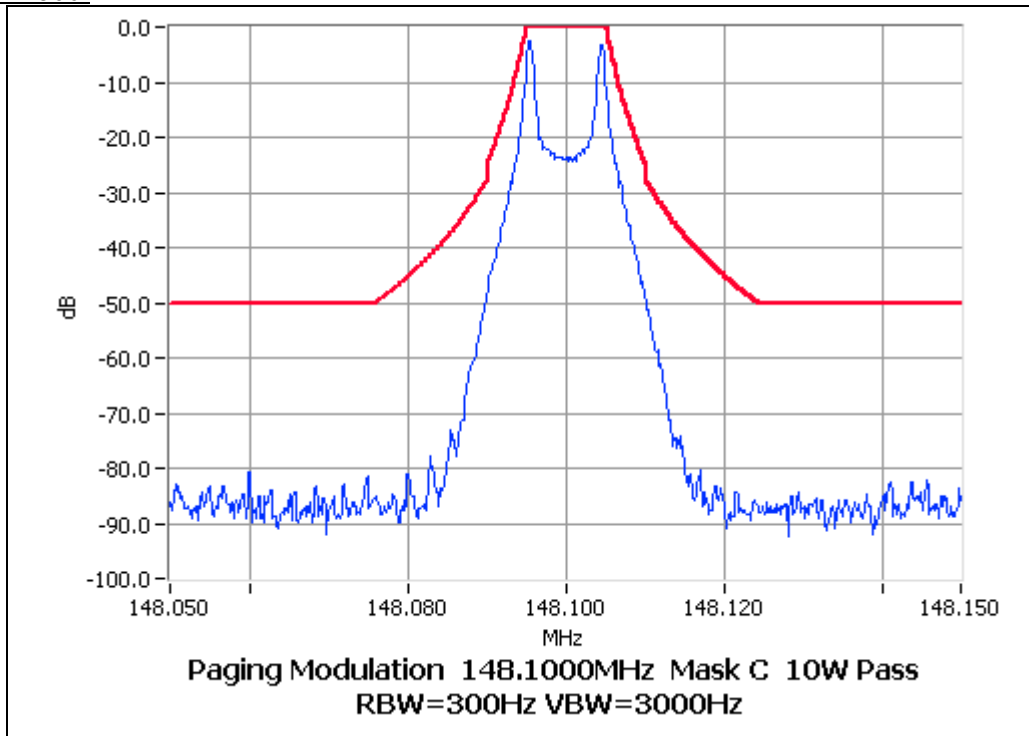
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Tx FREQUENCY: 148.1MHz 10W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



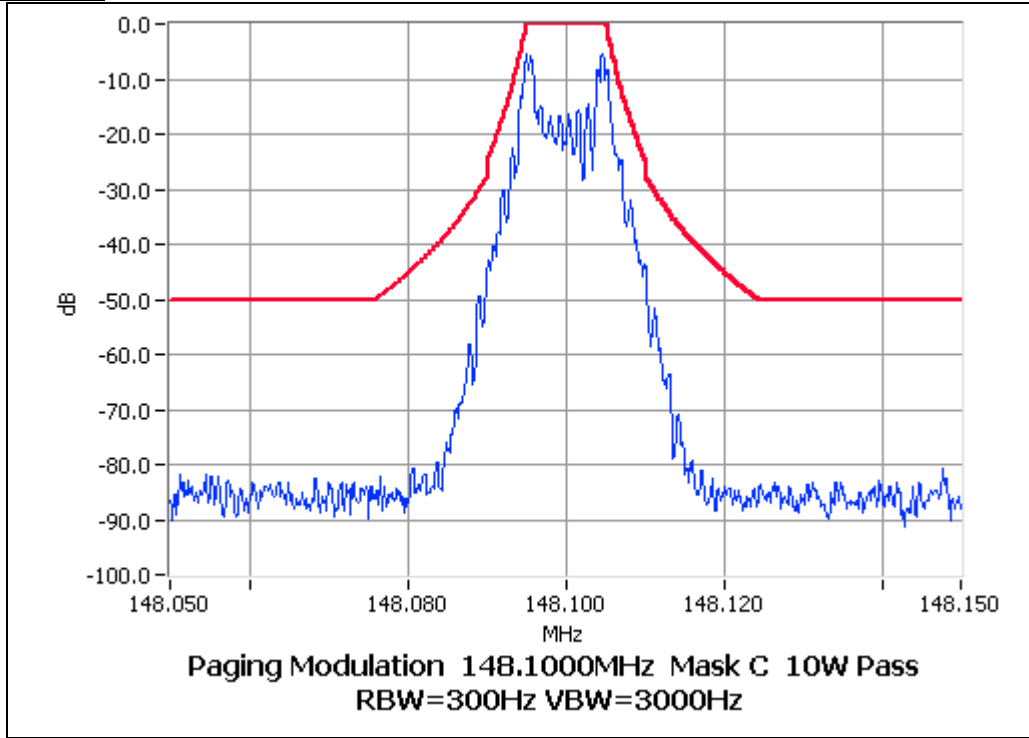
OCCUPIED BANDWIDTH

PAGING (POCSAG)

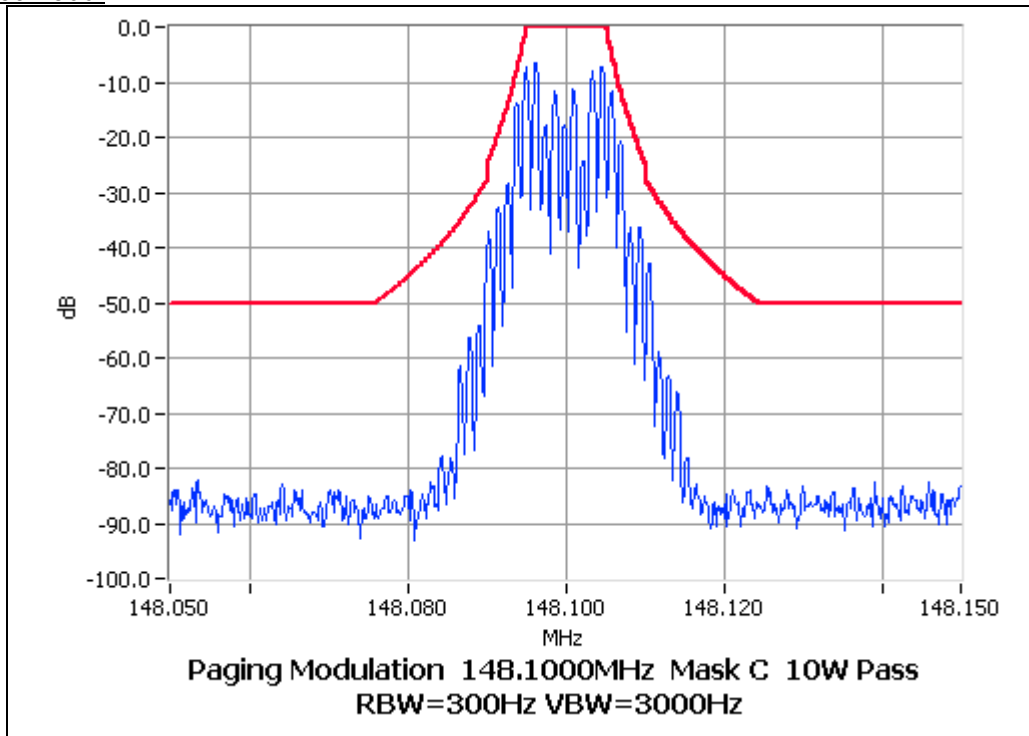
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 10W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:



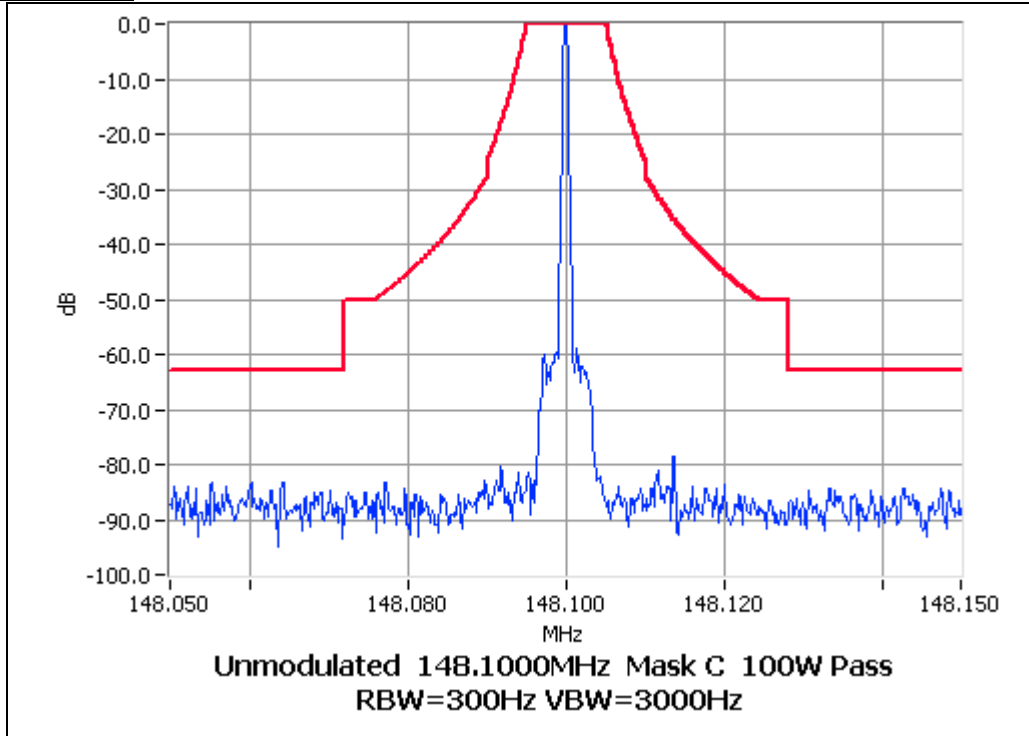
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PAGING (POCSAG)

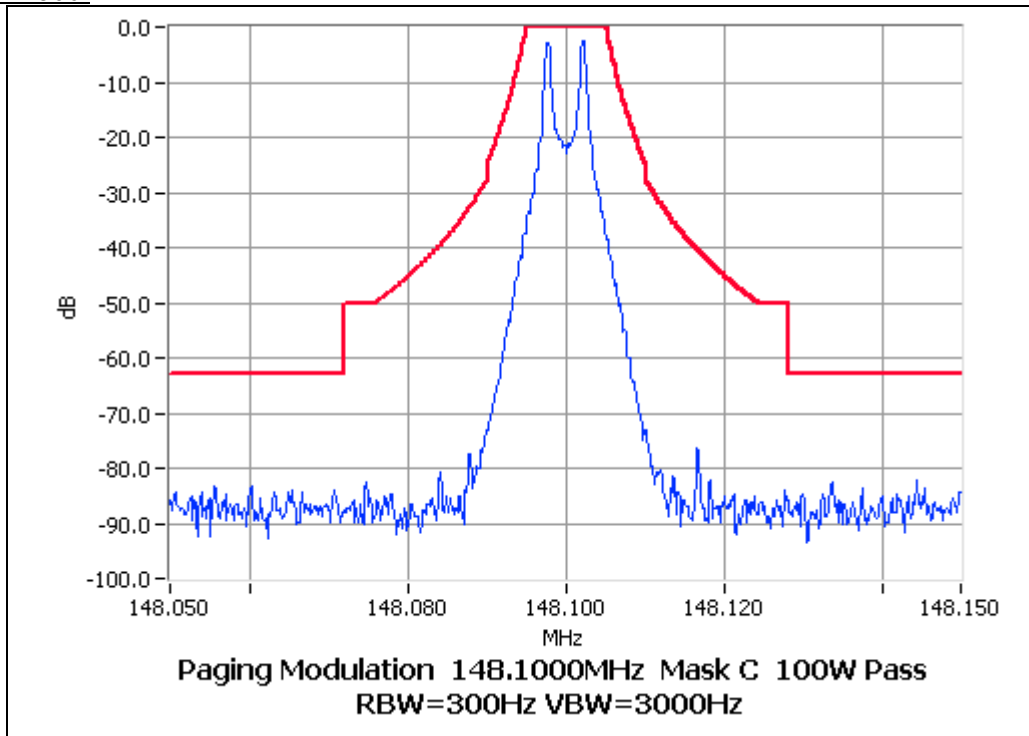
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 100W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



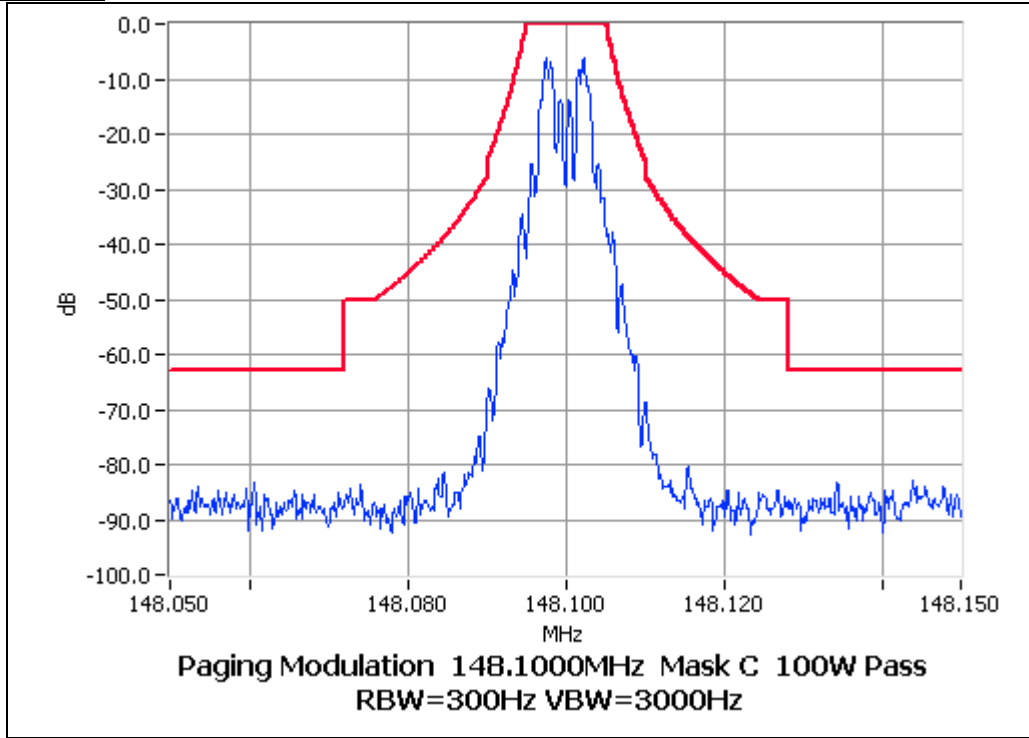
OCCUPIED BANDWIDTH

PAGING (POCSAG)

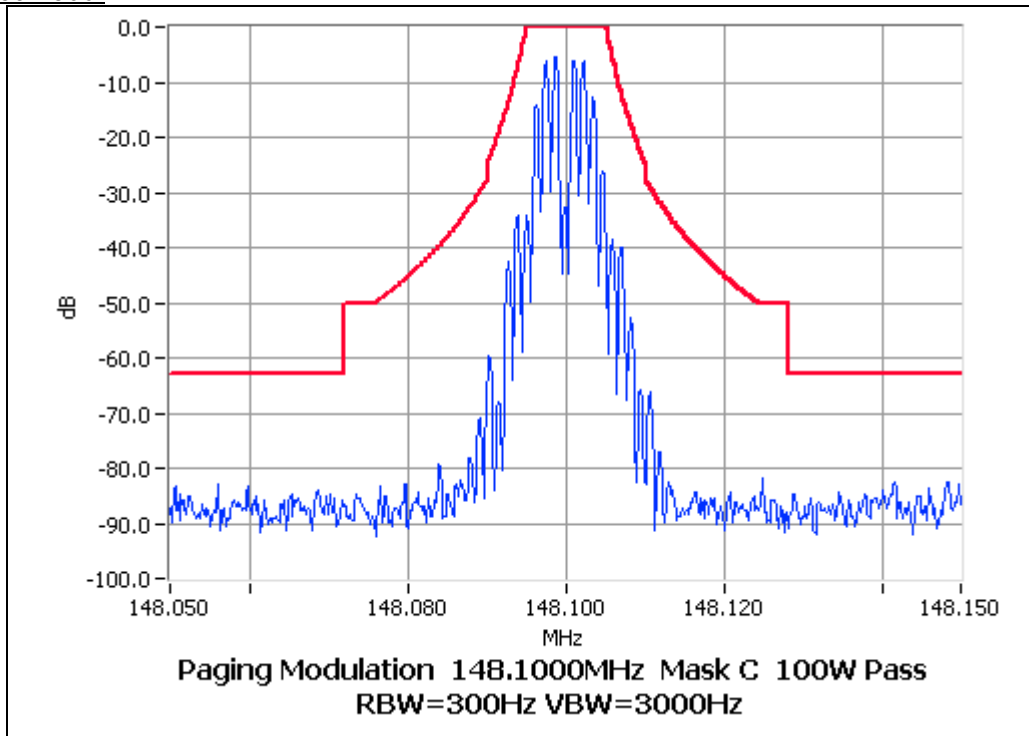
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 100W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



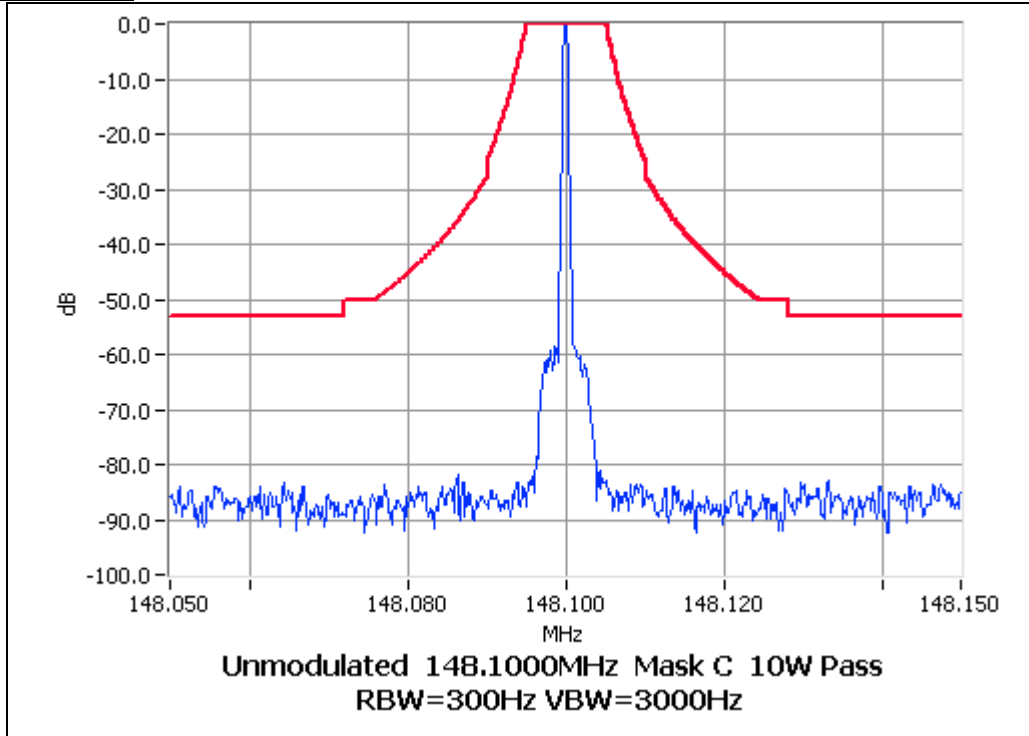
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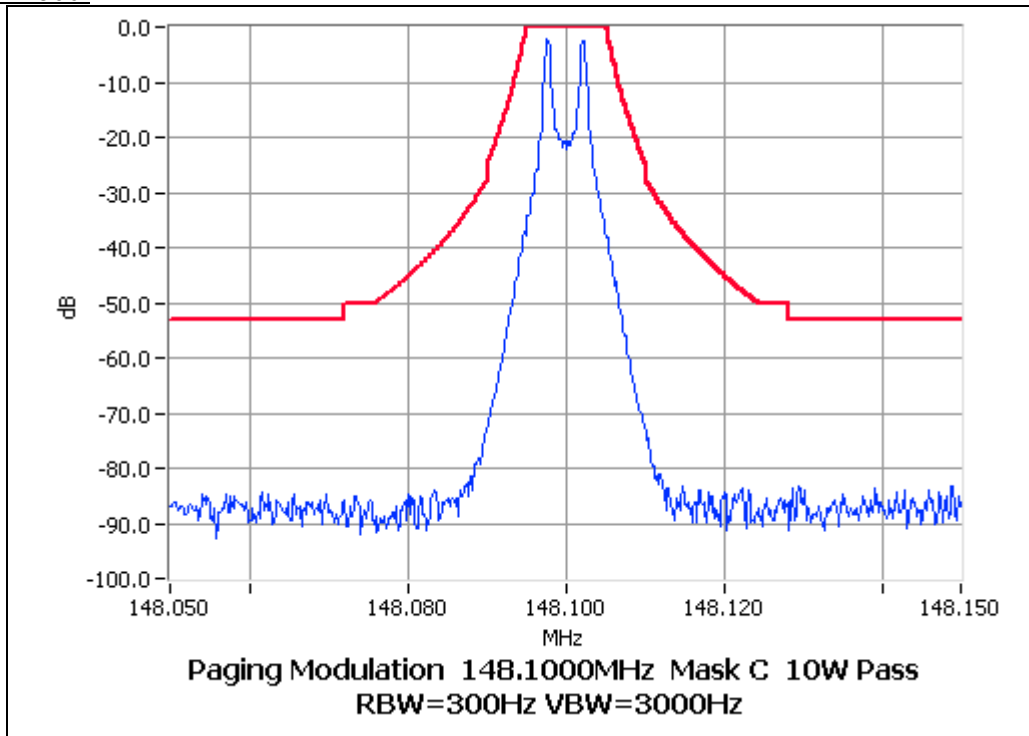
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 10W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



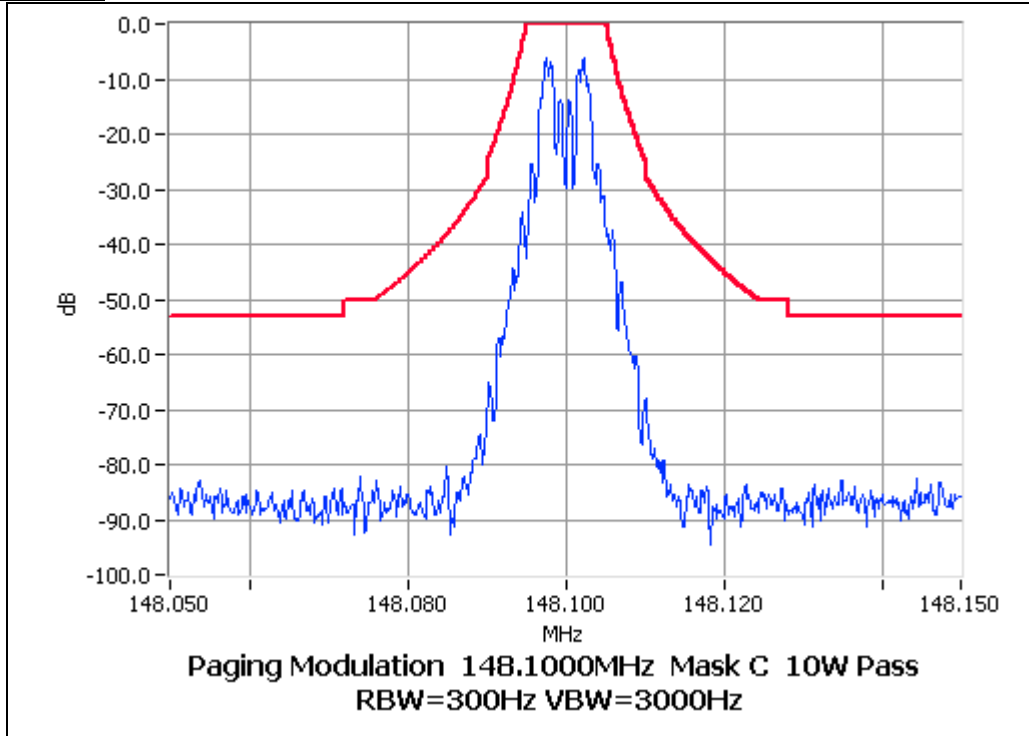
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PAGING (POCSAG)

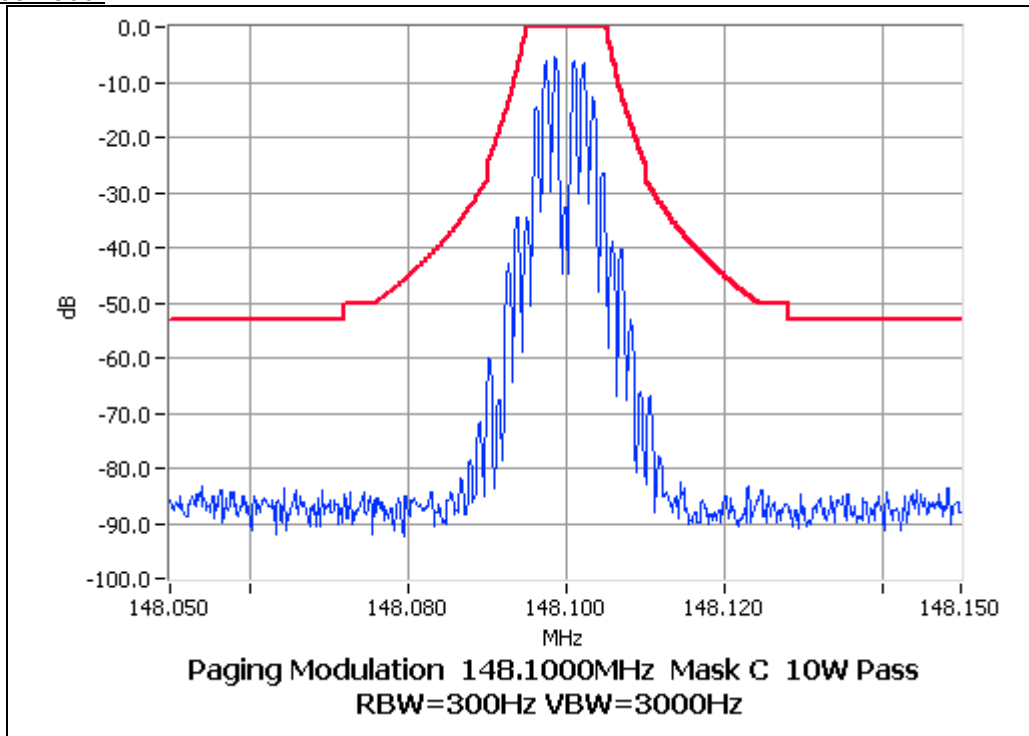
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1MHz 10W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



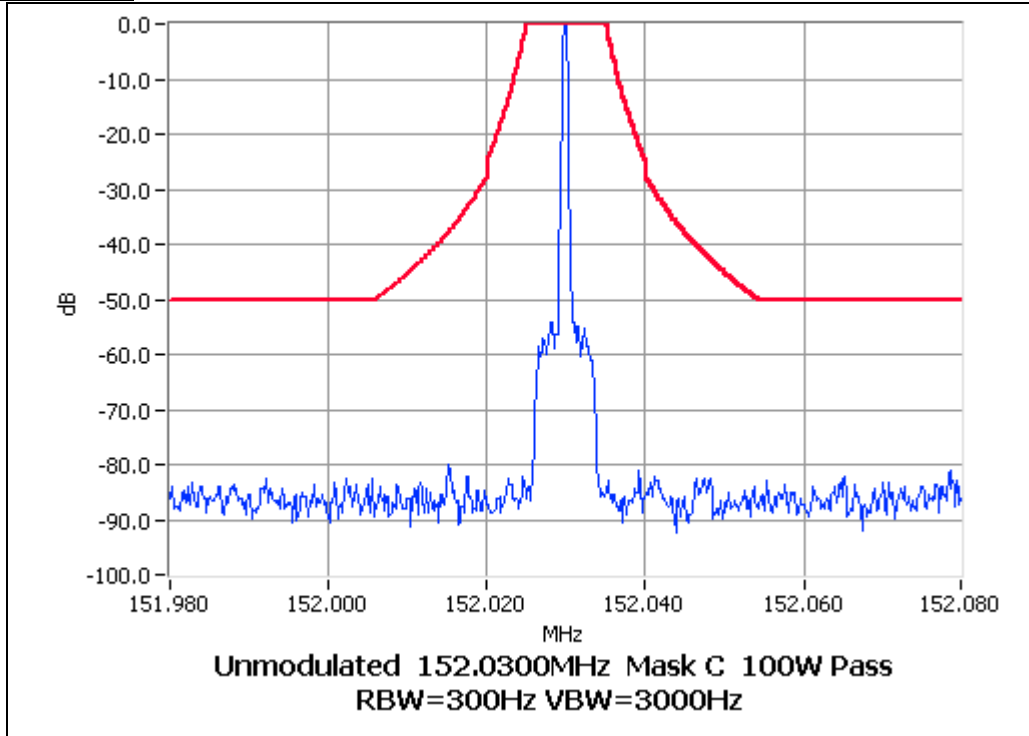
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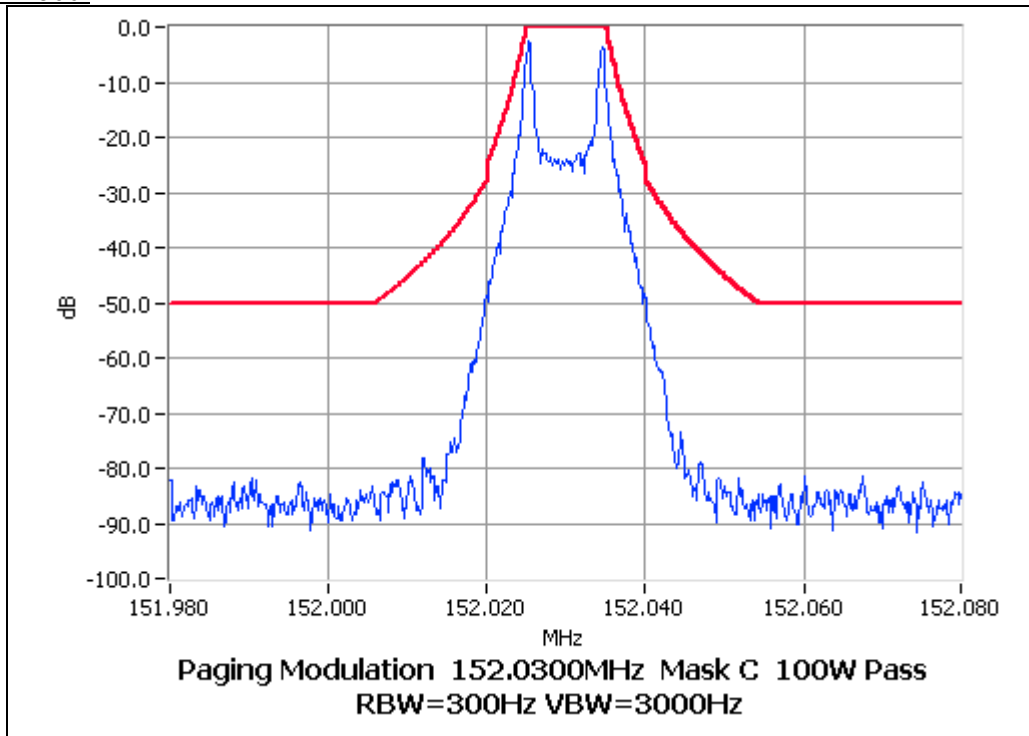
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 100W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



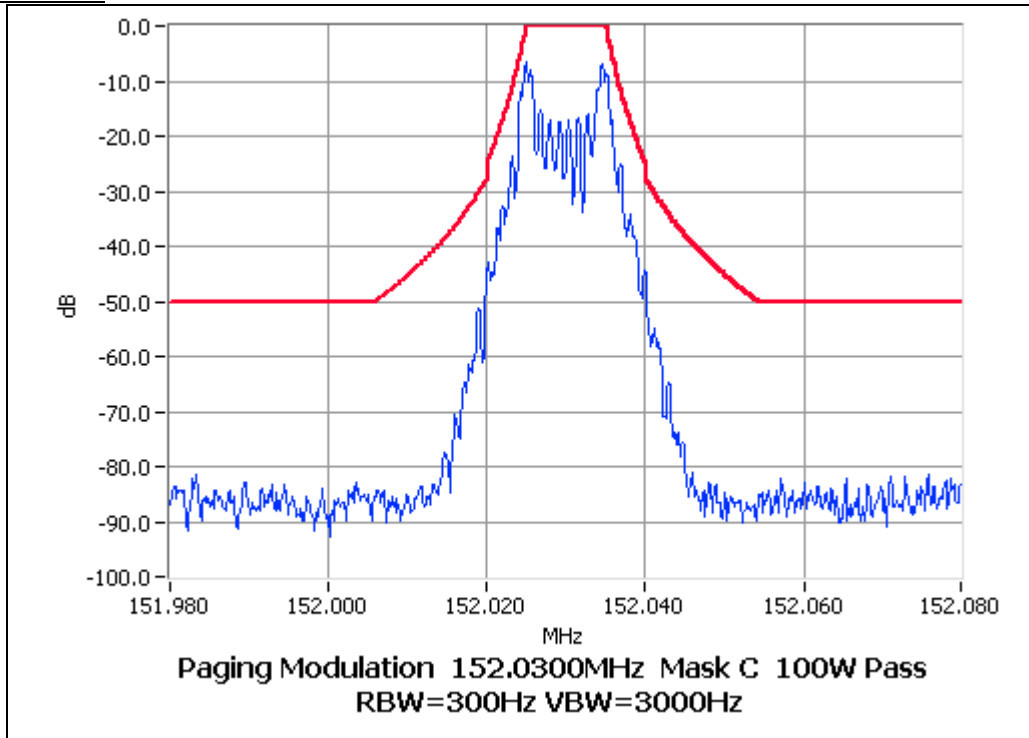
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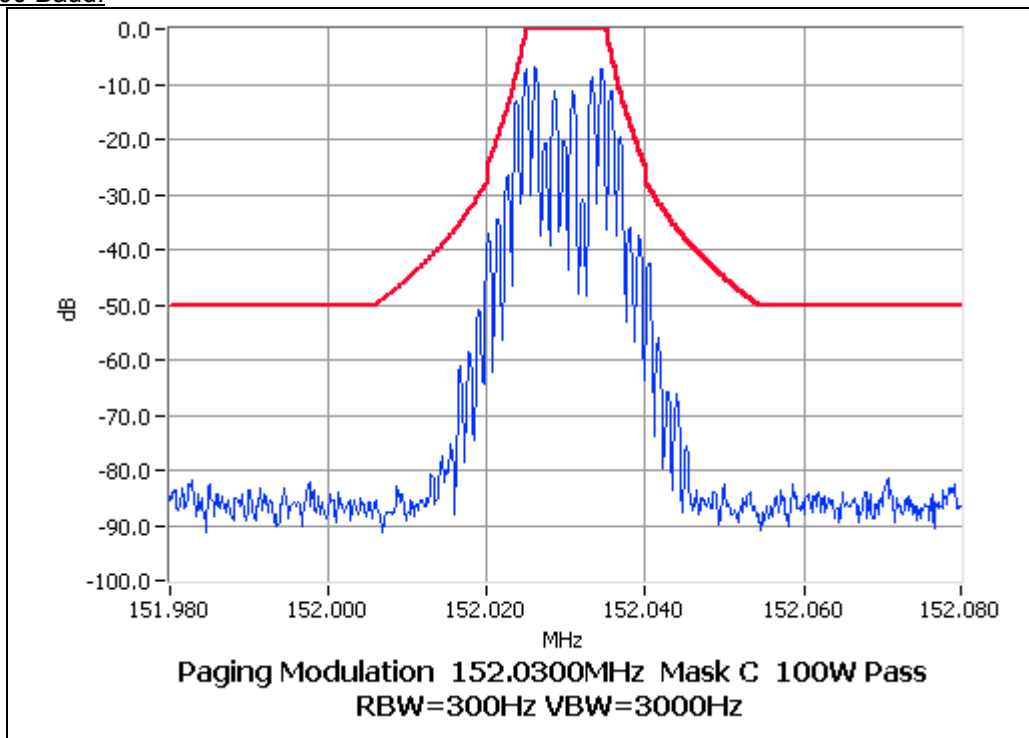
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Tx FREQUENCY: 152.03MHz 100W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:





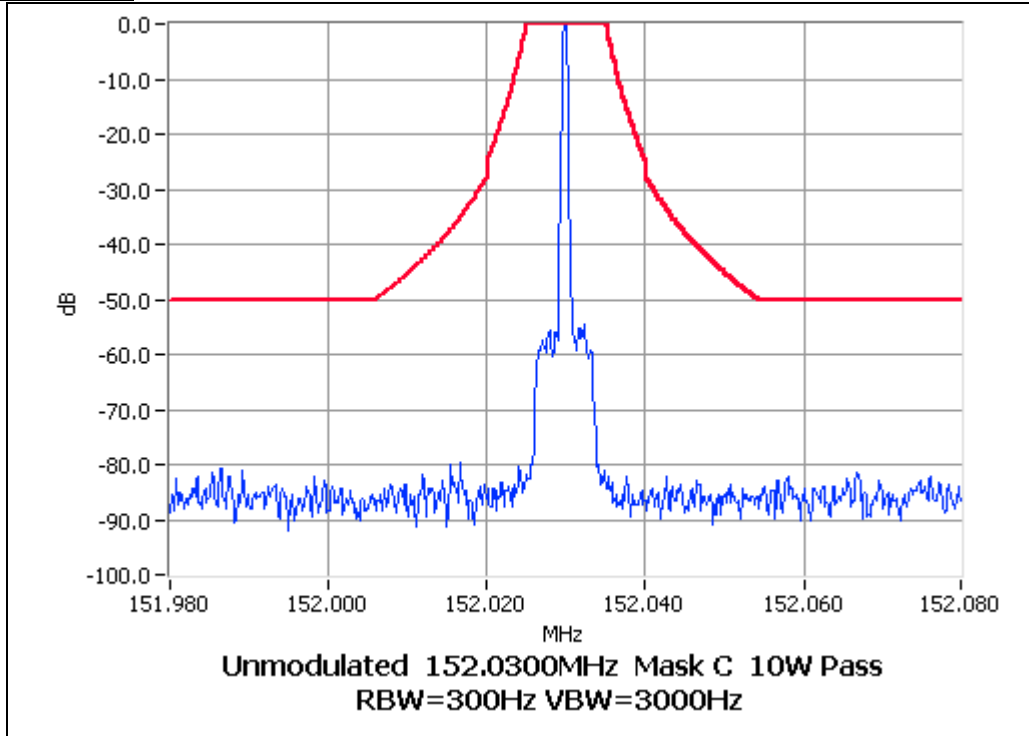
OCCUPIED BANDWIDTH

PAGING (POCSAG)

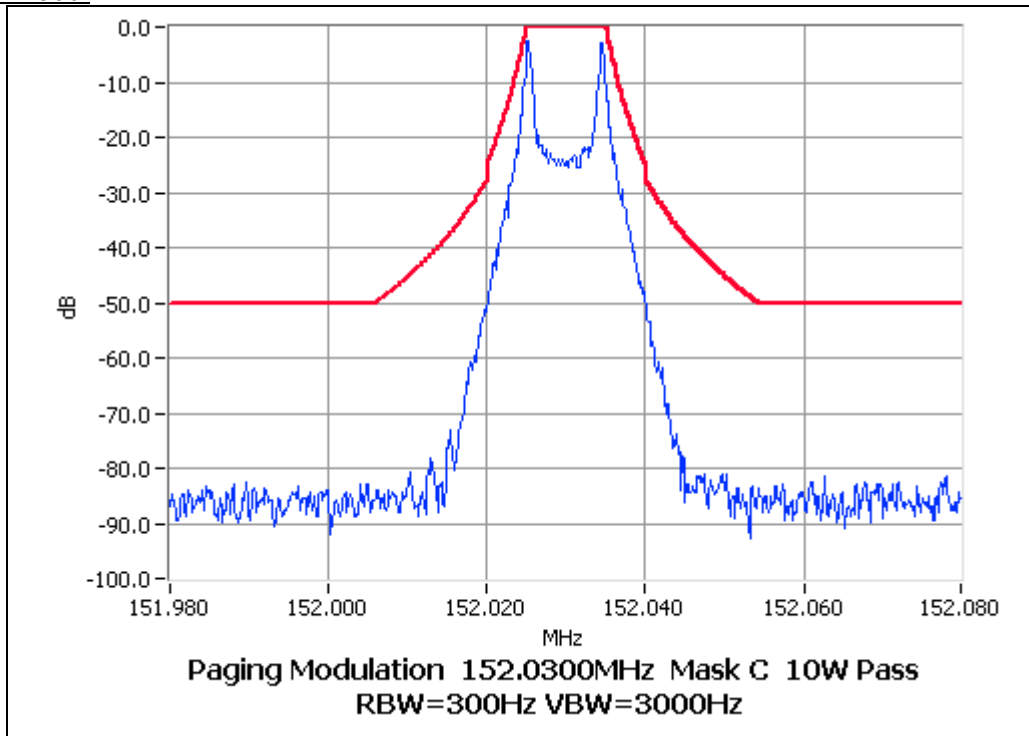
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 10W 25 kHz Channel Spacing

Unmodulated:



512 Baud:



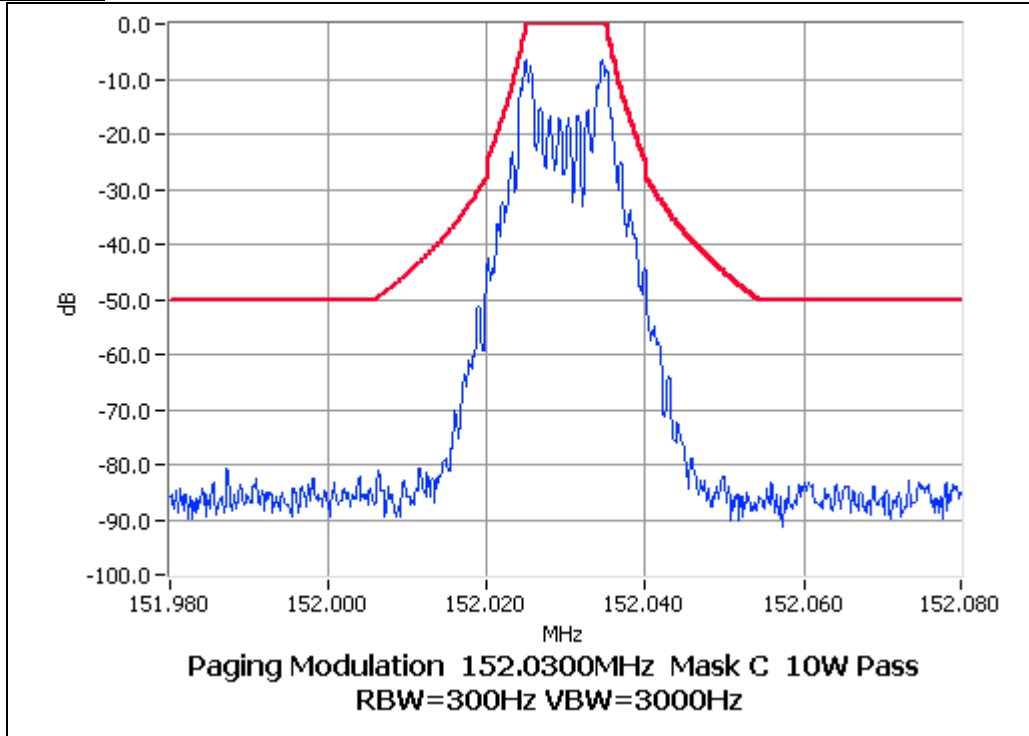
OCCUPIED BANDWIDTH

PAGING (POCSAG)

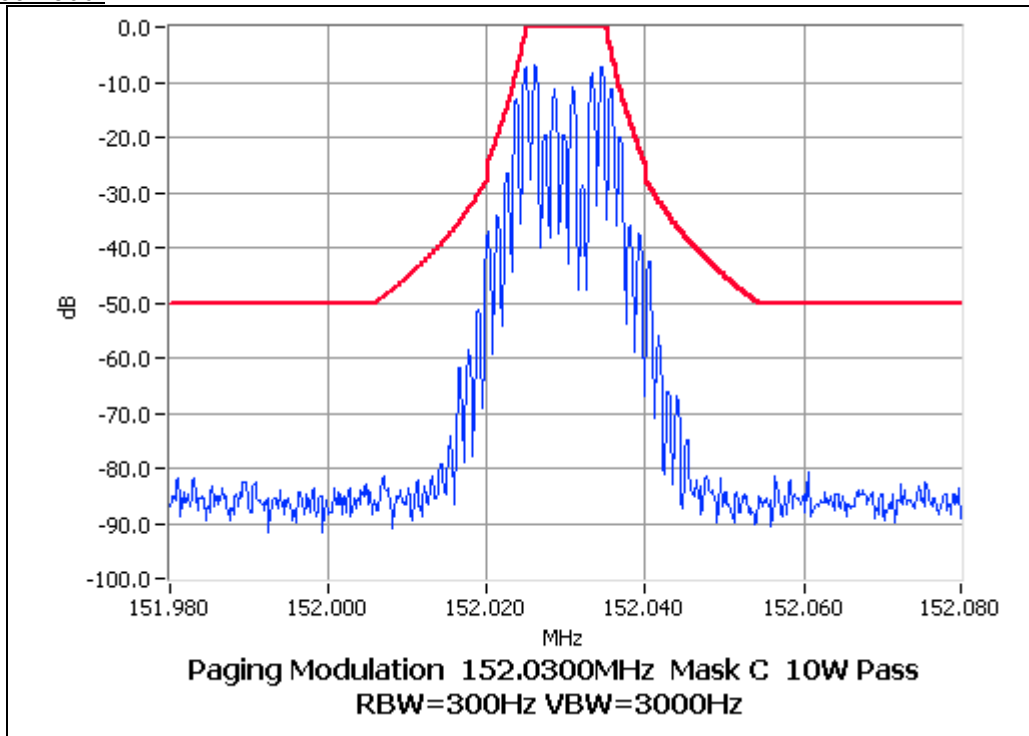
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 10W 25 kHz Channel Spacing

1200 Baud:



2400 Baud:



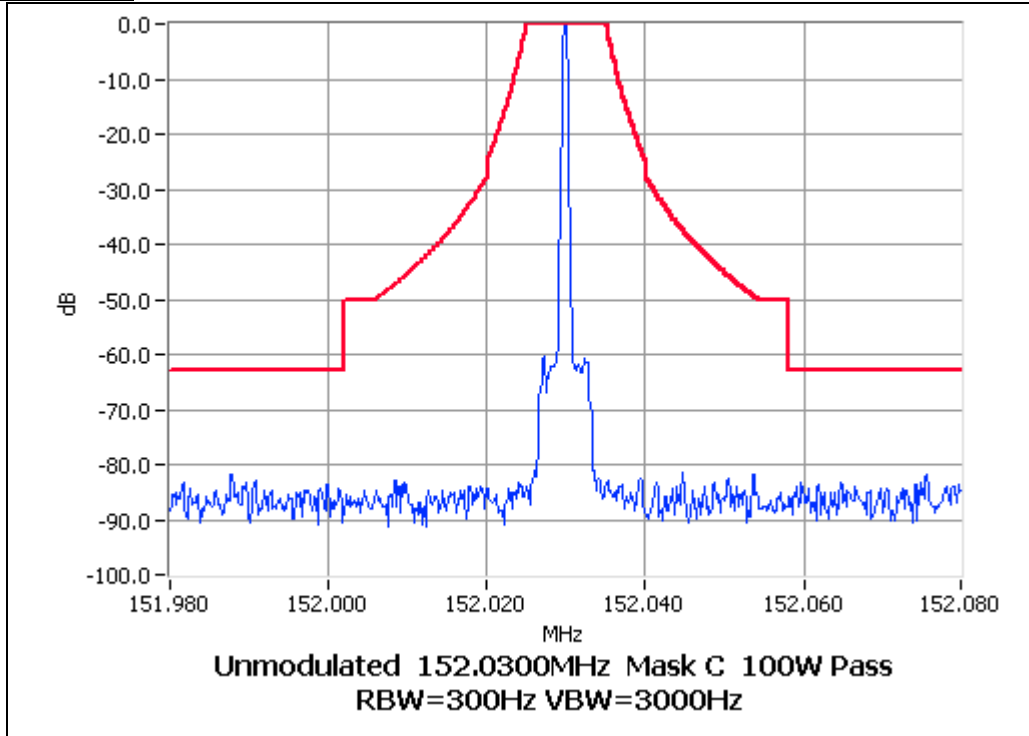
OCCUPIED BANDWIDTH

PAGING (POCSAG)

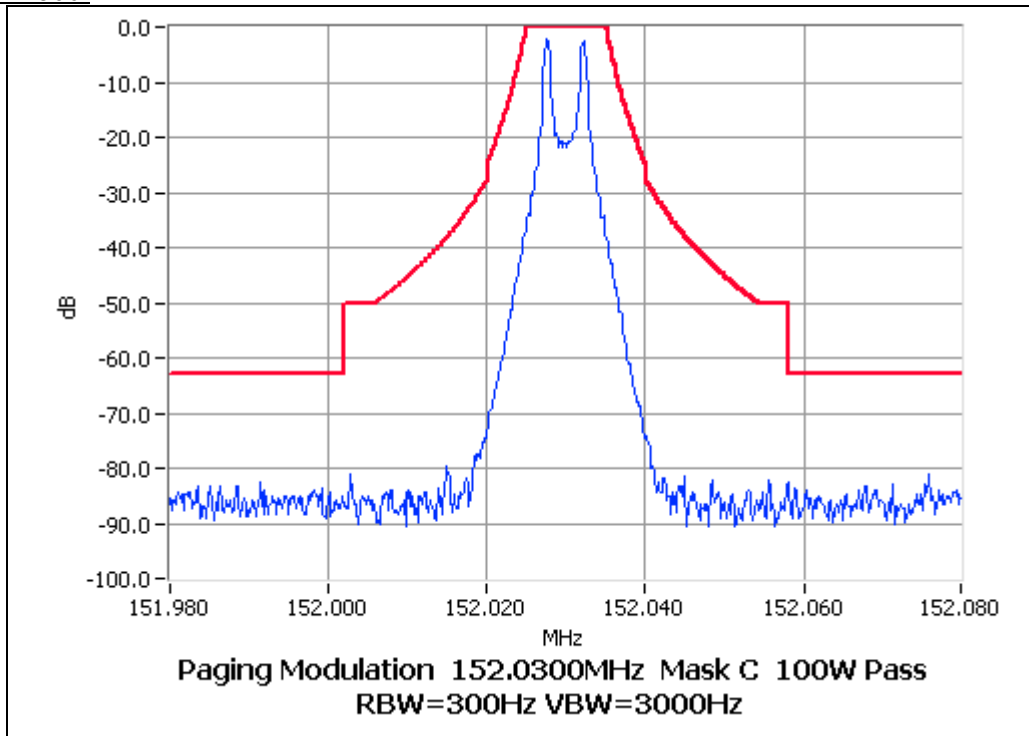
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 100W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



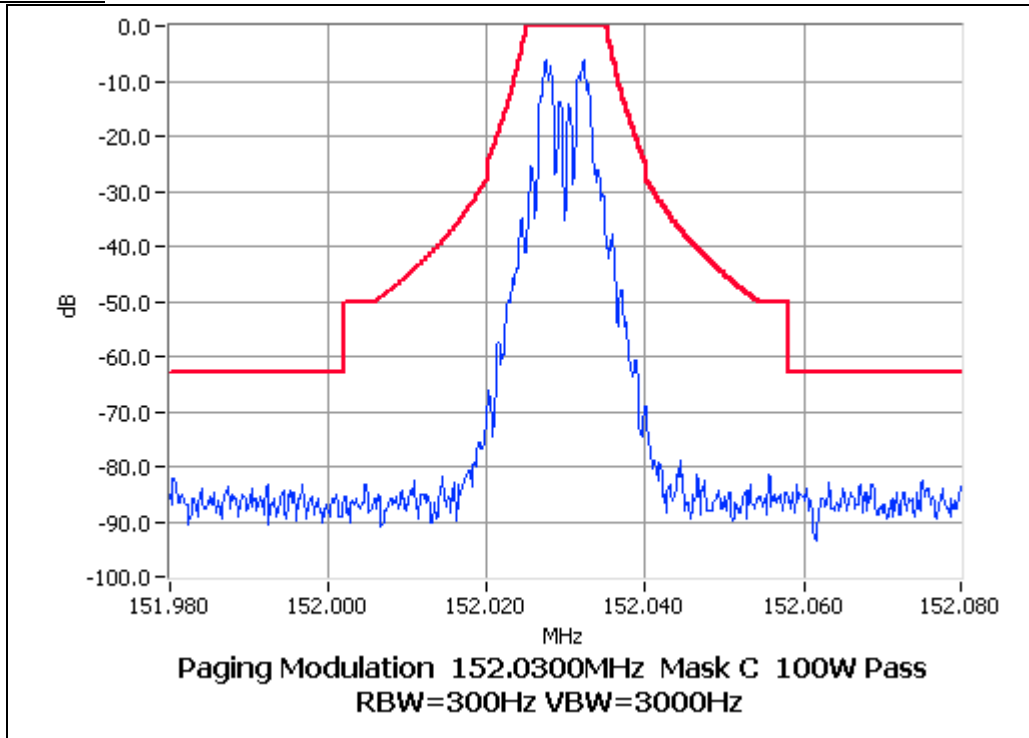
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PAGING (POCSAG)

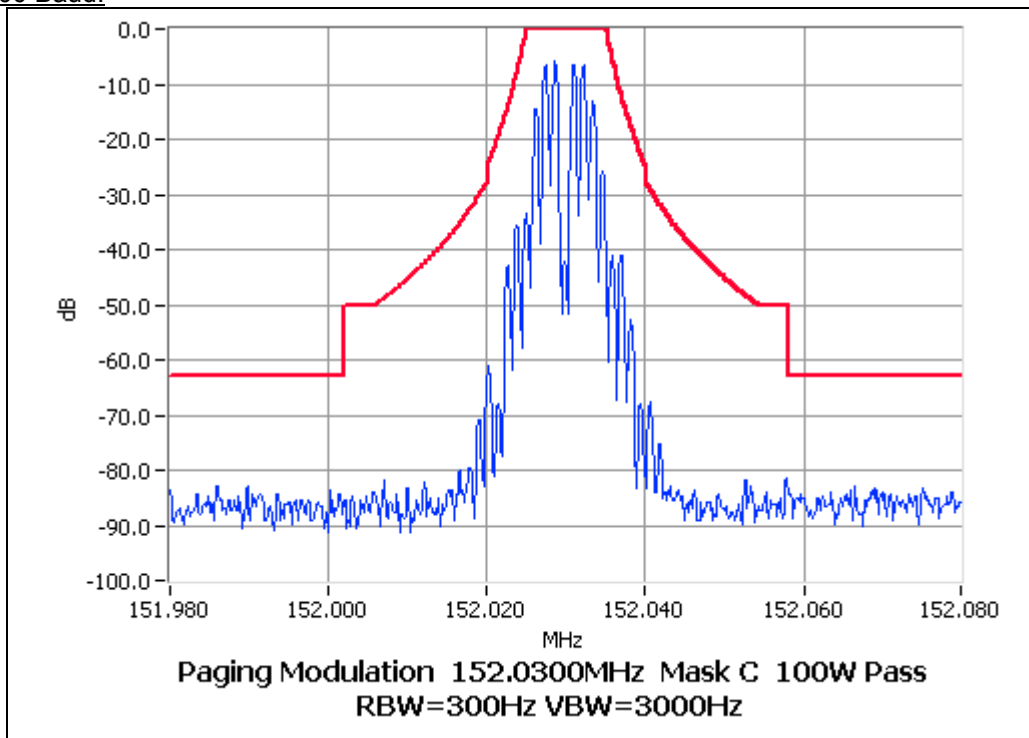
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Tx FREQUENCY: 152.03MHz 100W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



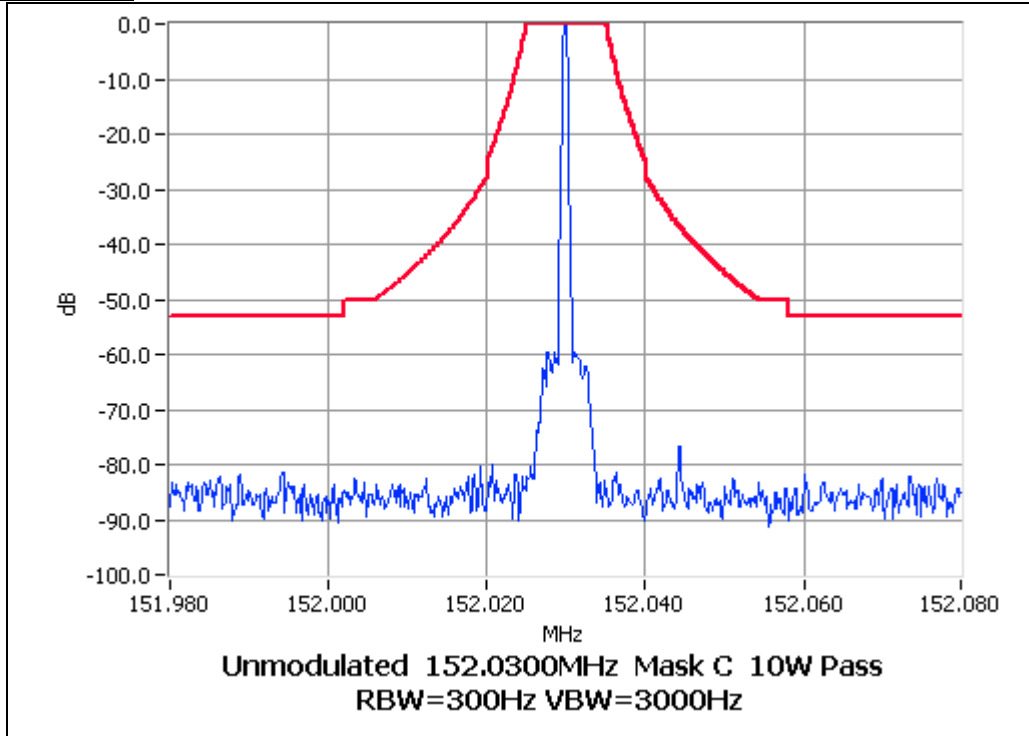
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PAGING (POCSAG)

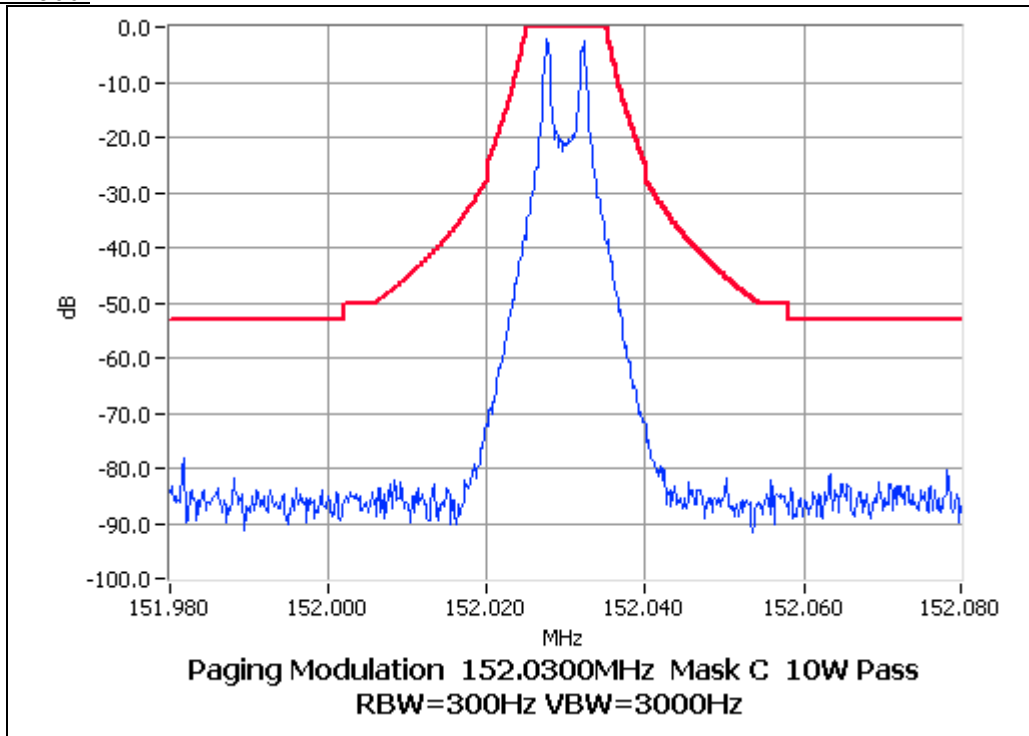
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 10W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



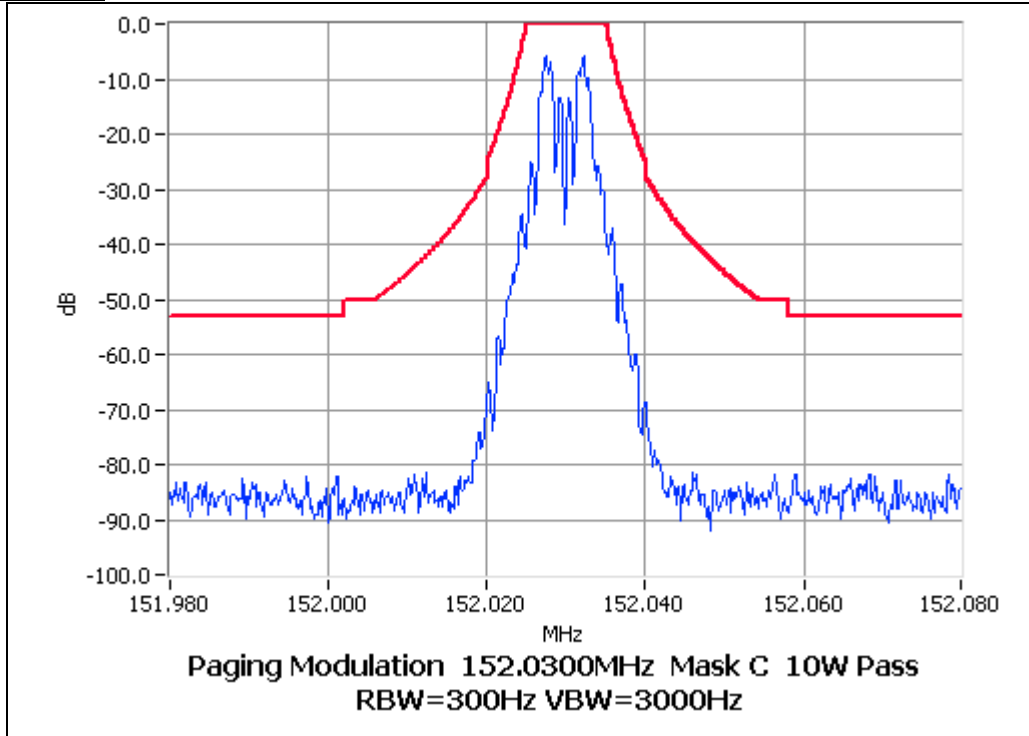
OCCUPIED BANDWIDTH

PAGING (POCSAG)

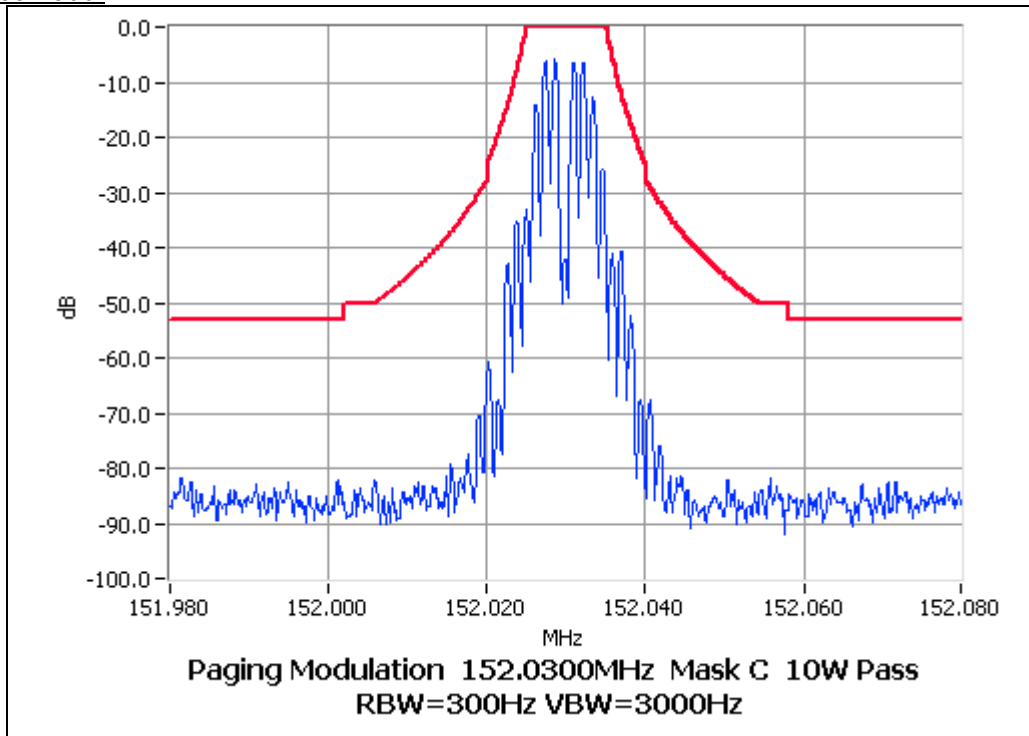
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03MHz 10W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



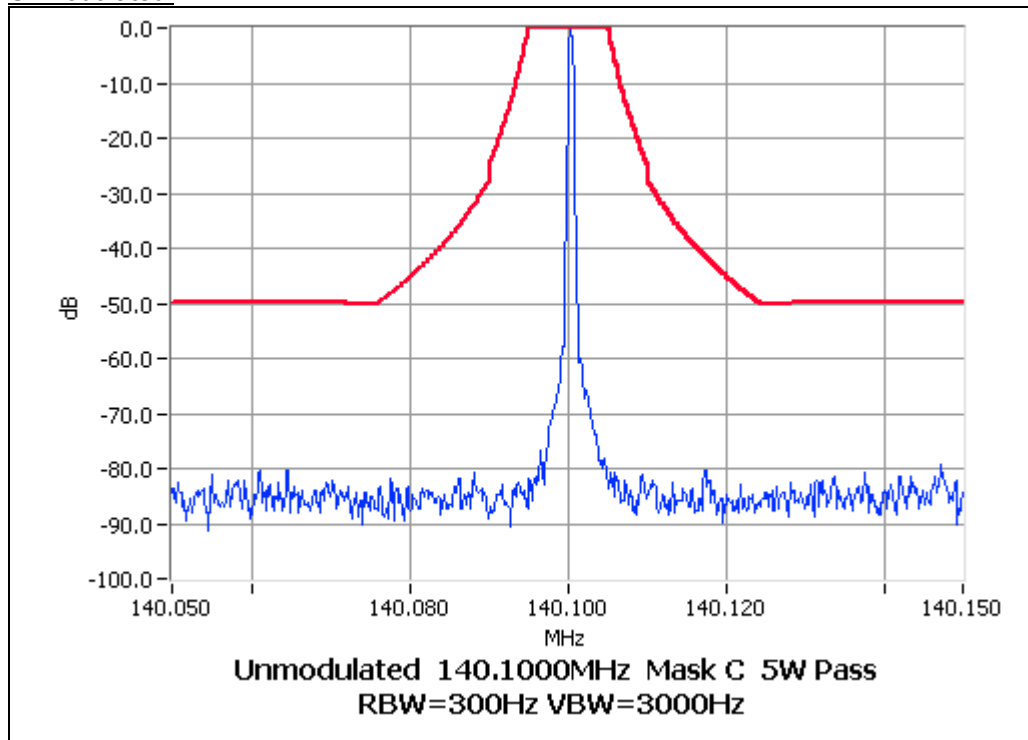
OCCUPIED BANDWIDTH

PAGING (POCSAG)

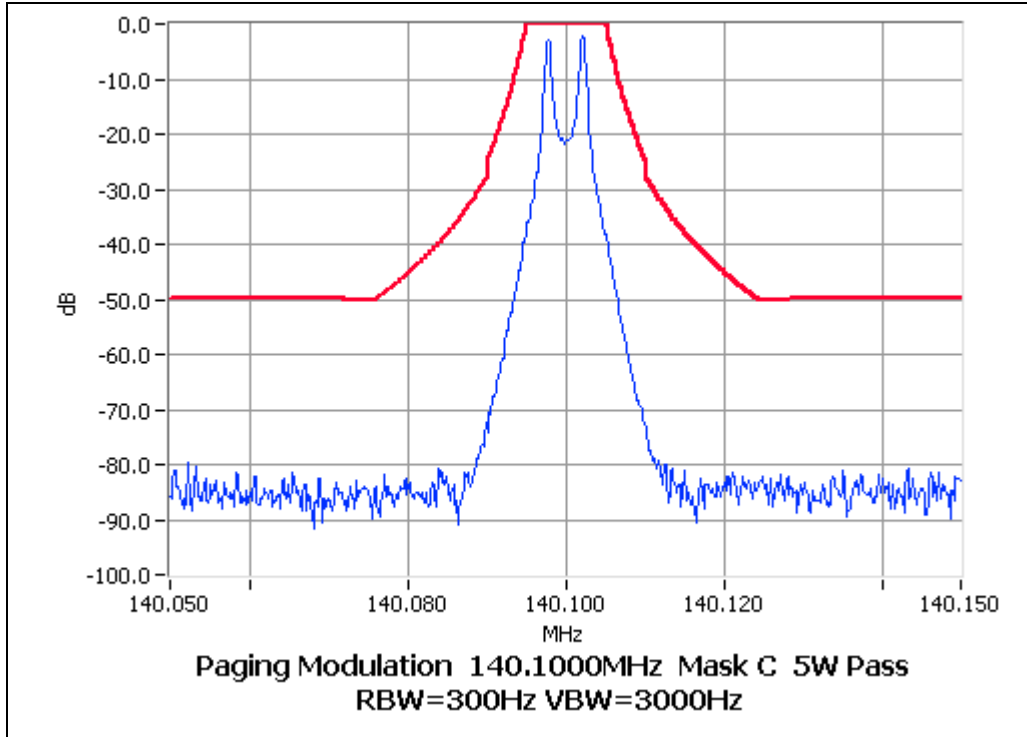
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 5W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



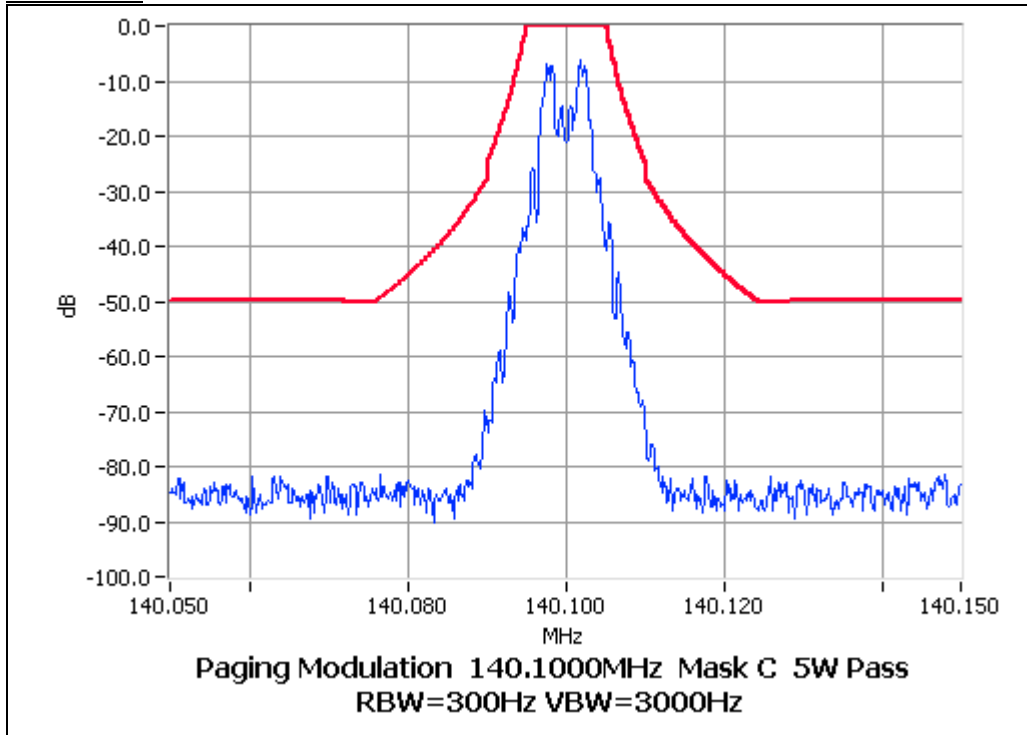
OCCUPIED BANDWIDTH

PAGING (POCSAG)

SPECIFICATION: FCC CFR 2.1049 (c)

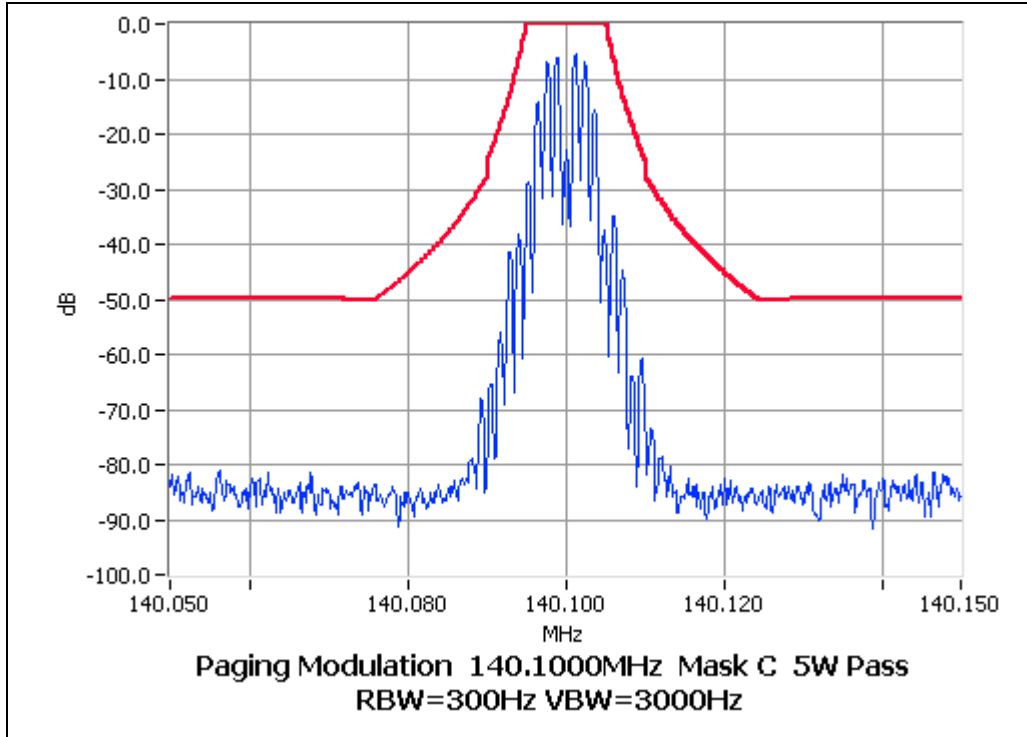
Tx FREQUENCY: 140.1 MHz 5W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:





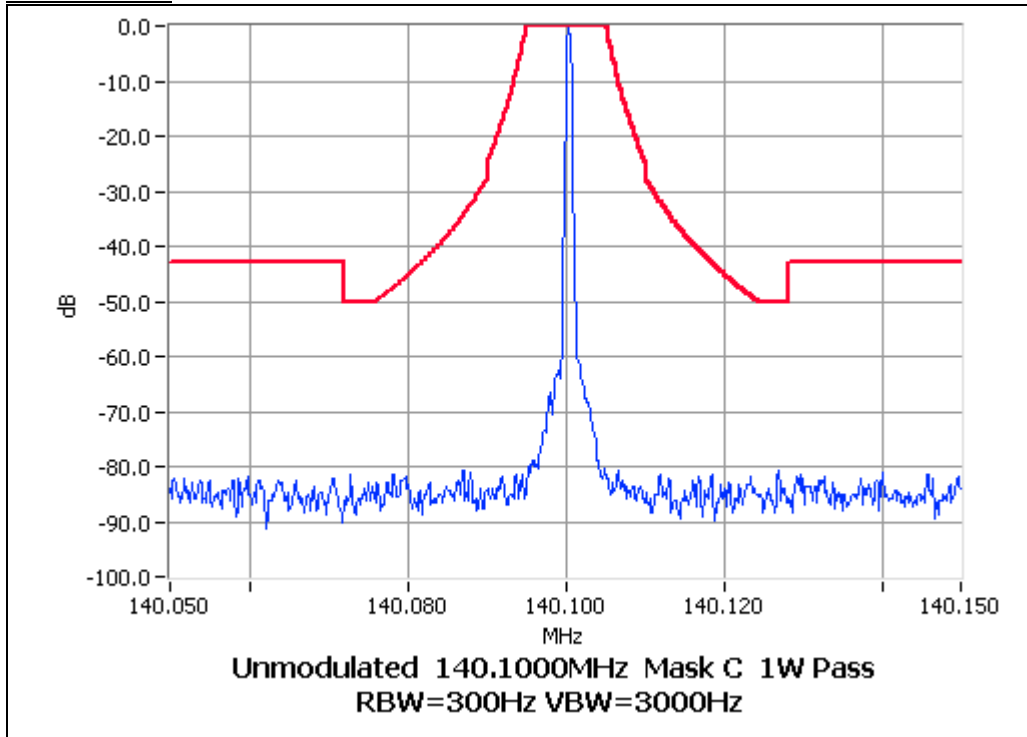
OCCUPIED BANDWIDTH

PAGING (POCSAG)

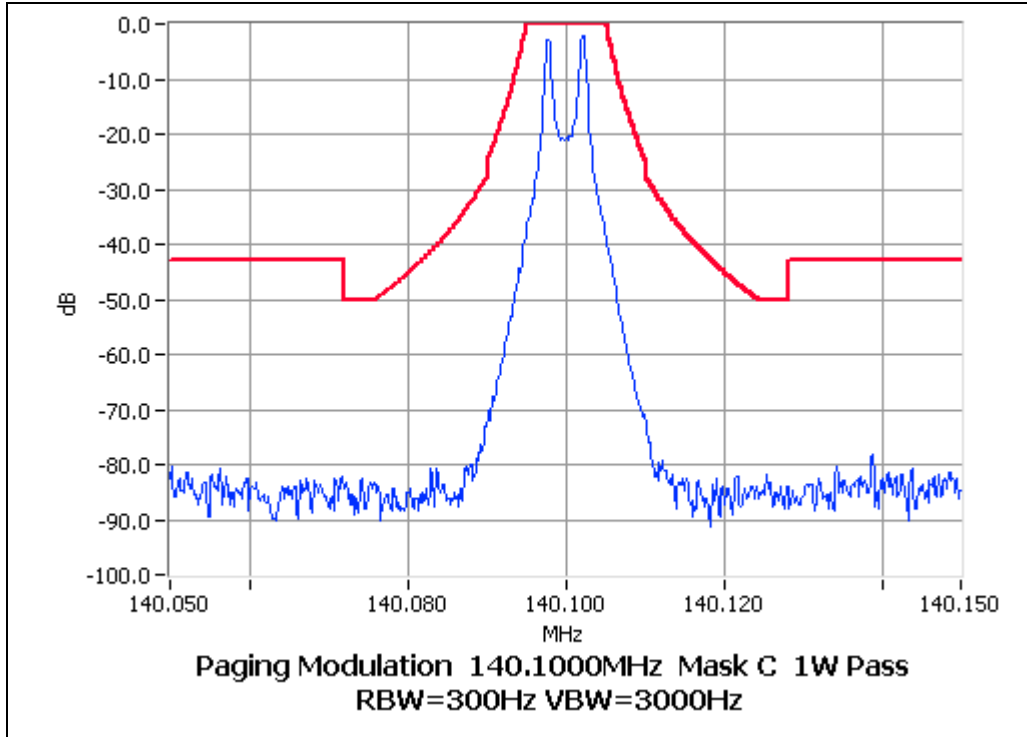
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 1W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



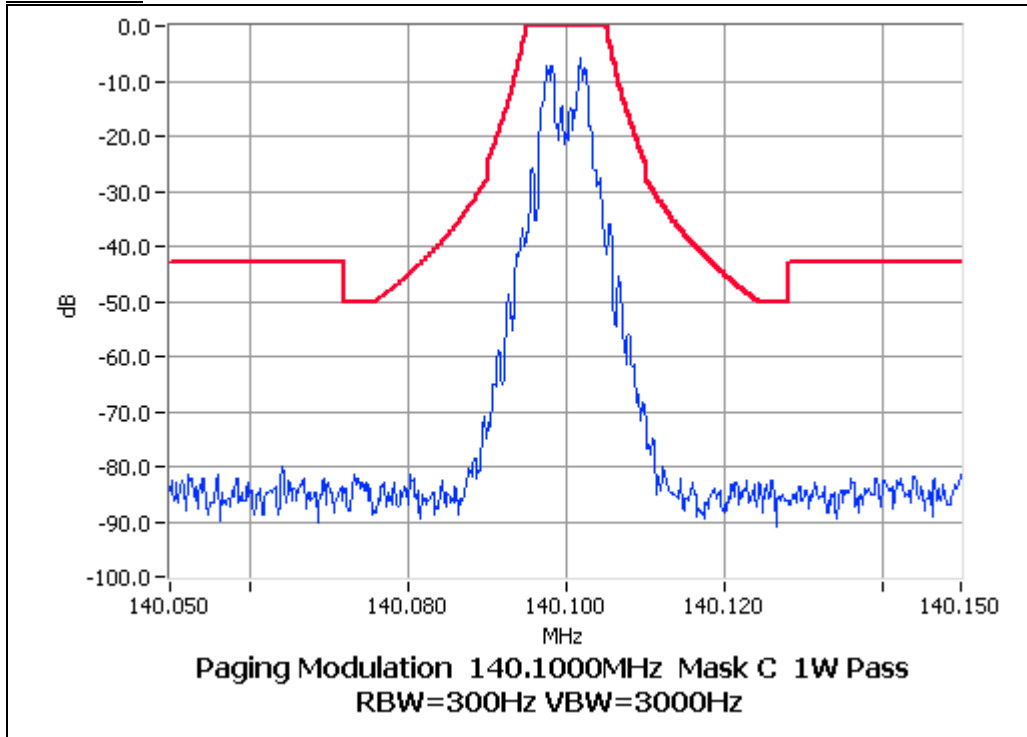
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PAGING (POCSAG)

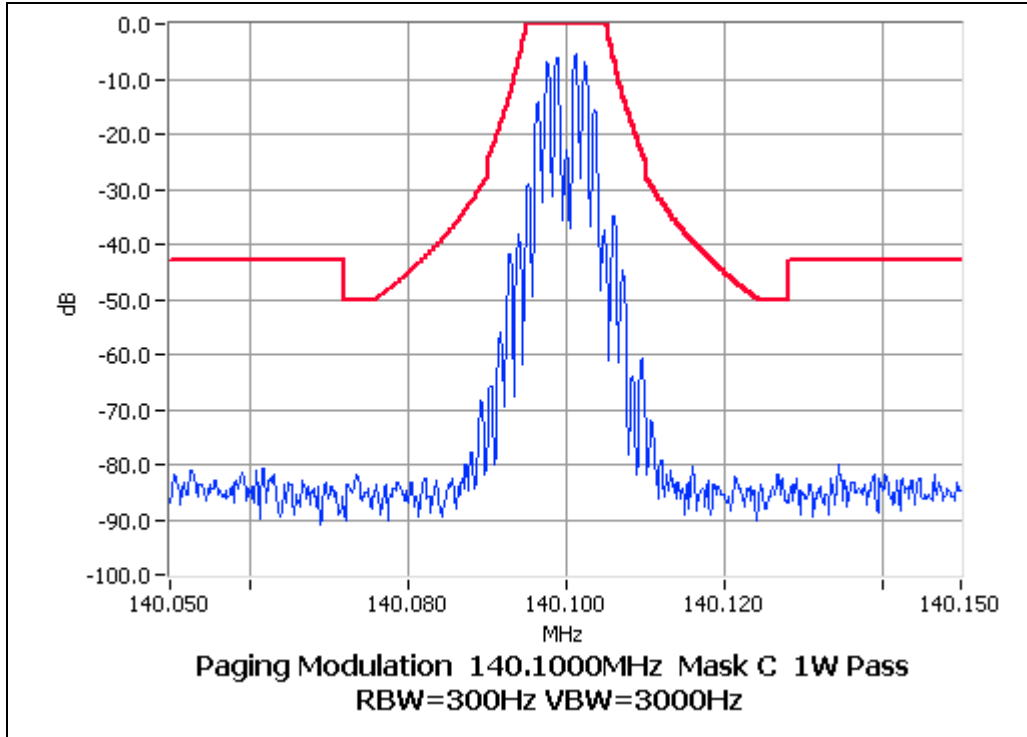
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 1W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



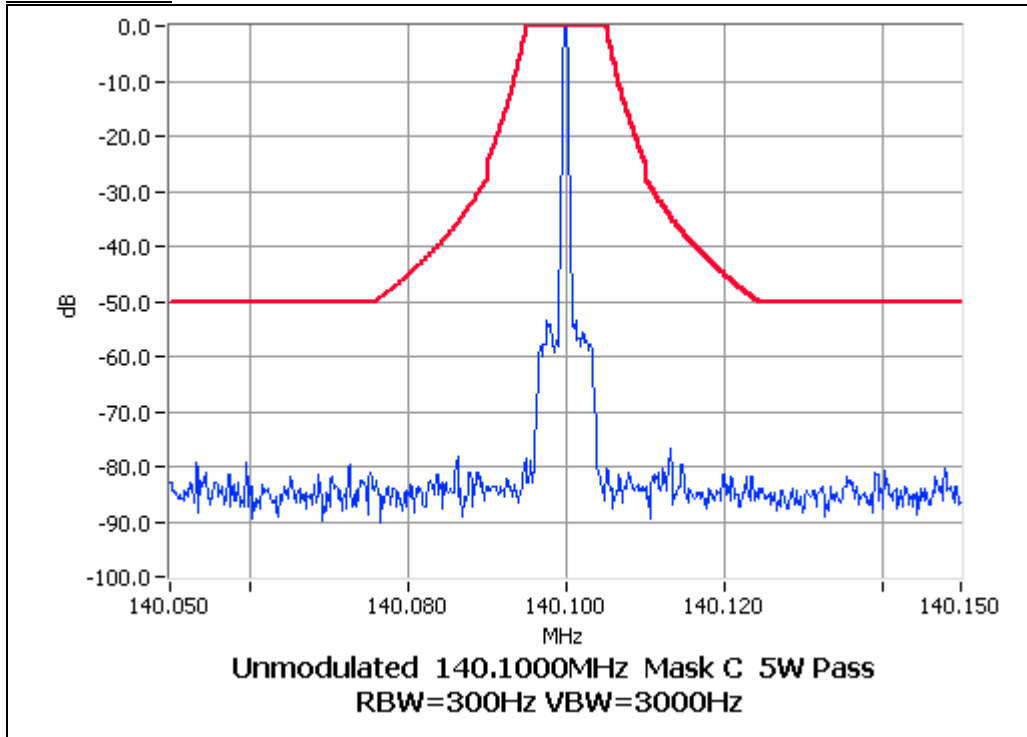
OCCUPIED BANDWIDTH

PAGING (POCSAG)

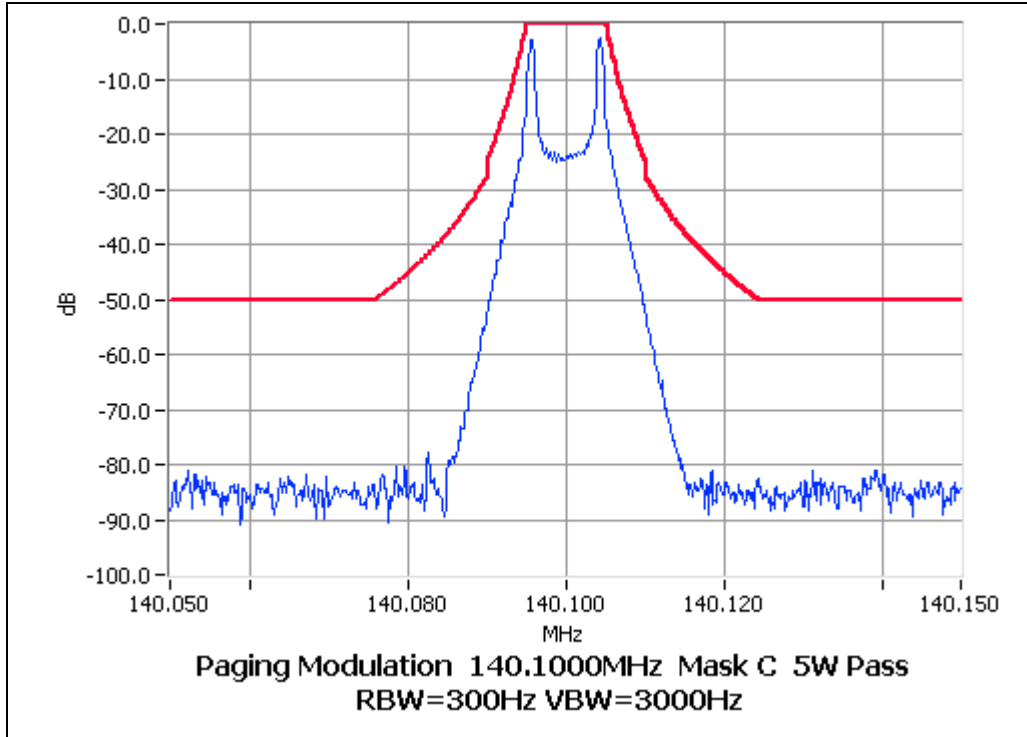
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 5W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



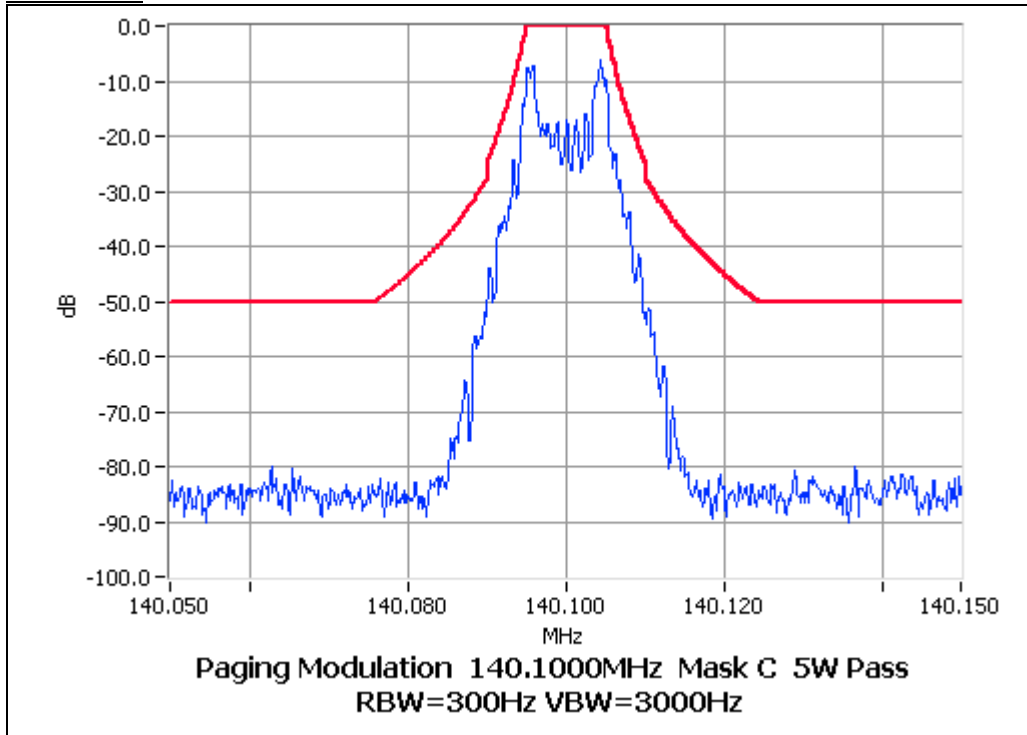
OCCUPIED BANDWIDTH

PAGING (POCSAG)

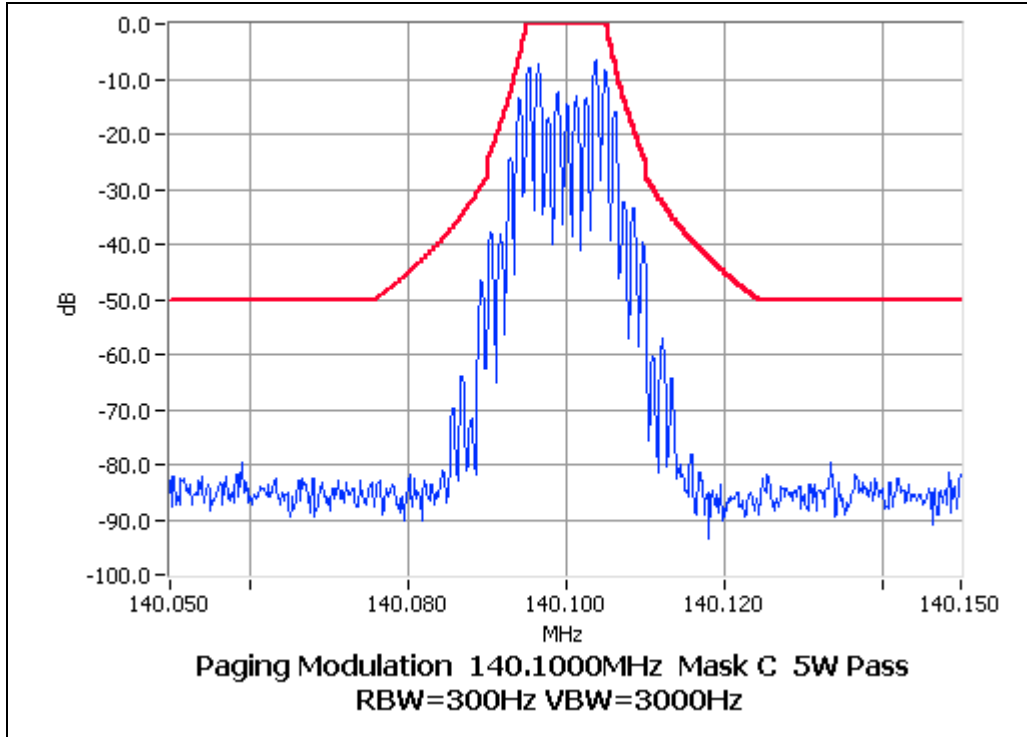
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 5W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



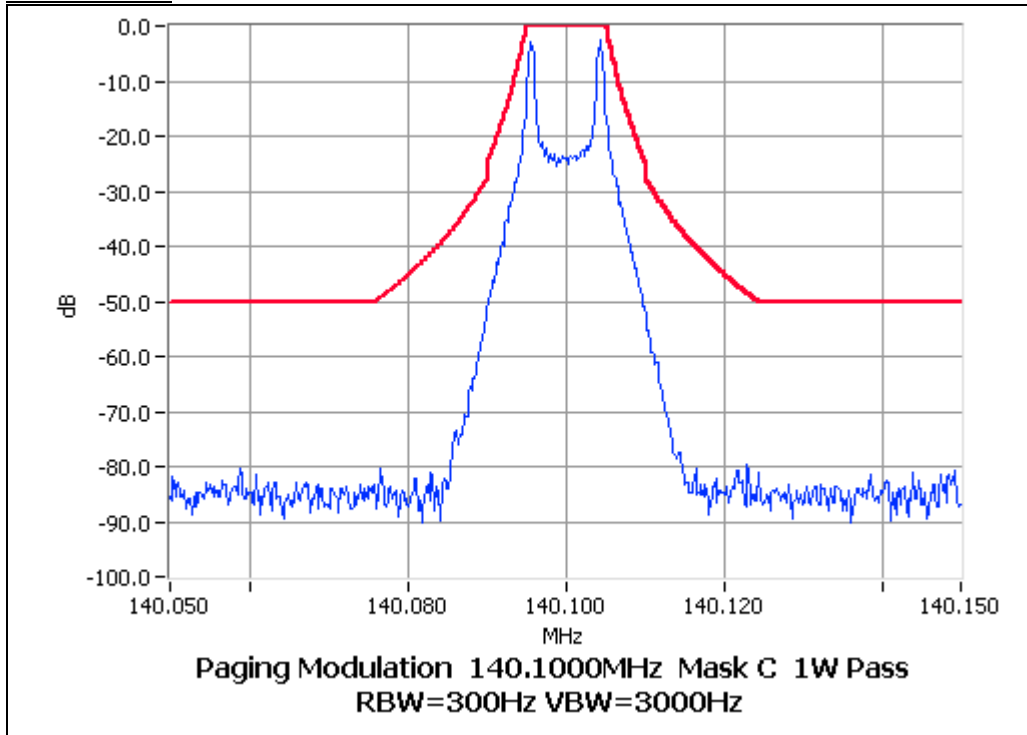
OCCUPIED BANDWIDTH

PAGING (POCSAG)

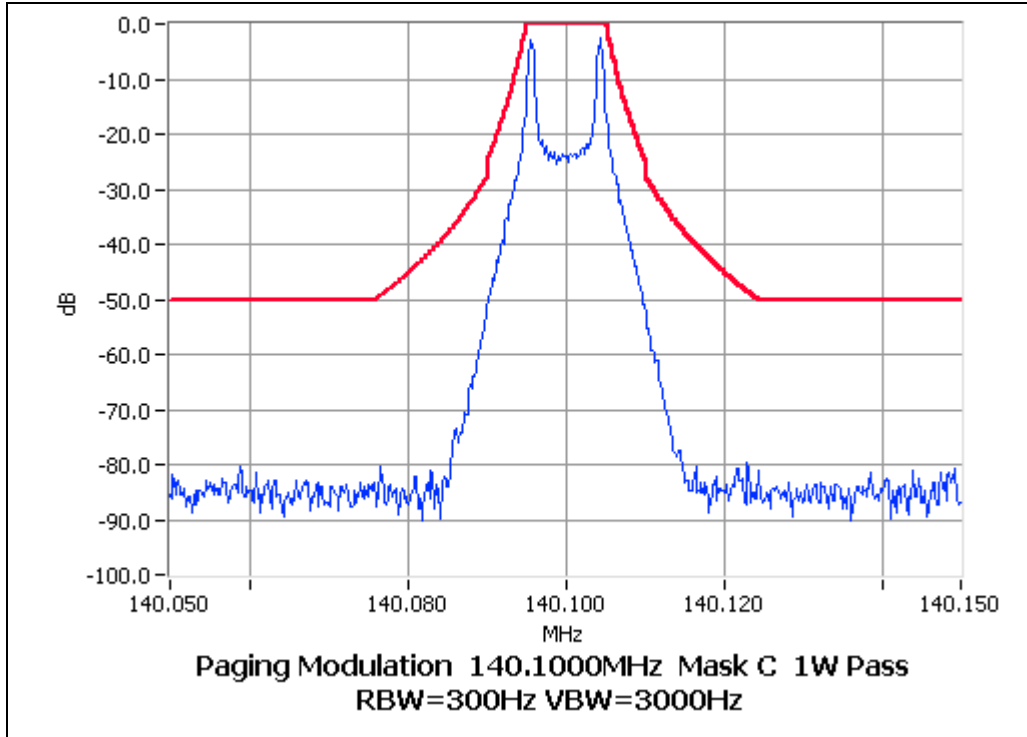
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 1W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



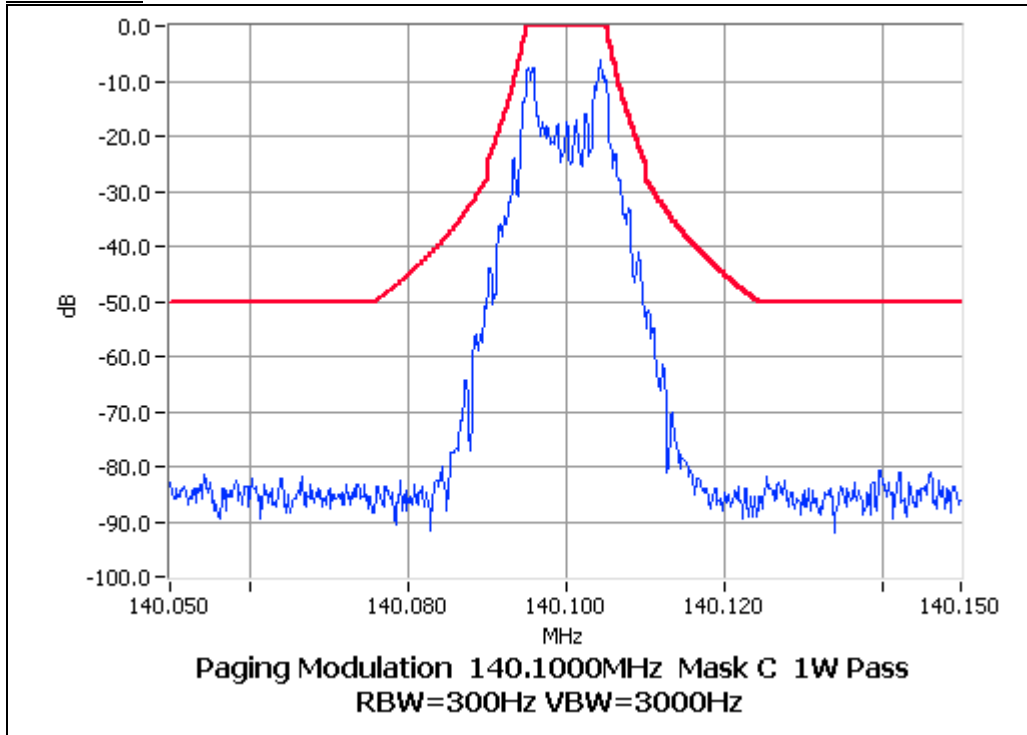
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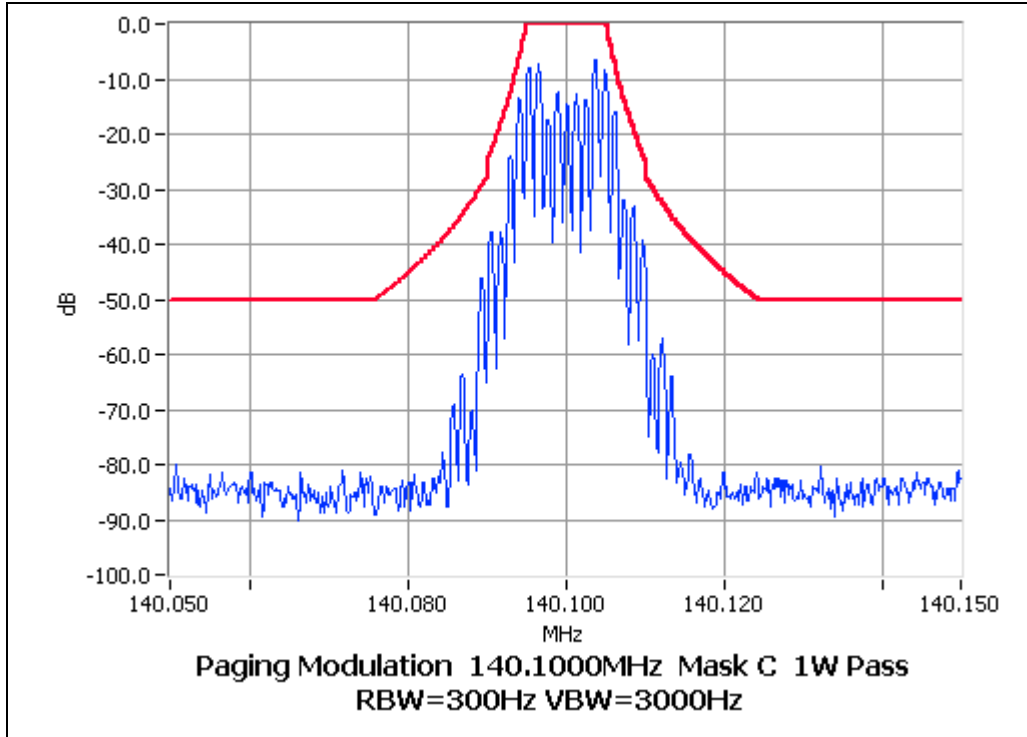
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 140.1 MHz 1W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



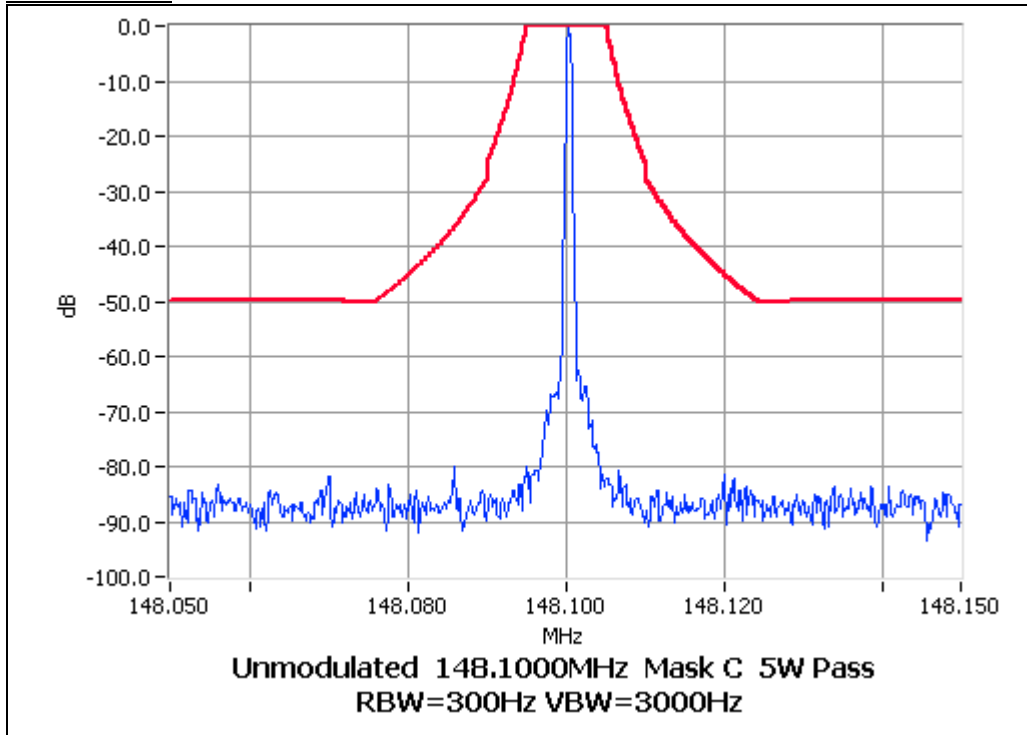
OCCUPIED BANDWIDTH

PAGING (POCSAG)

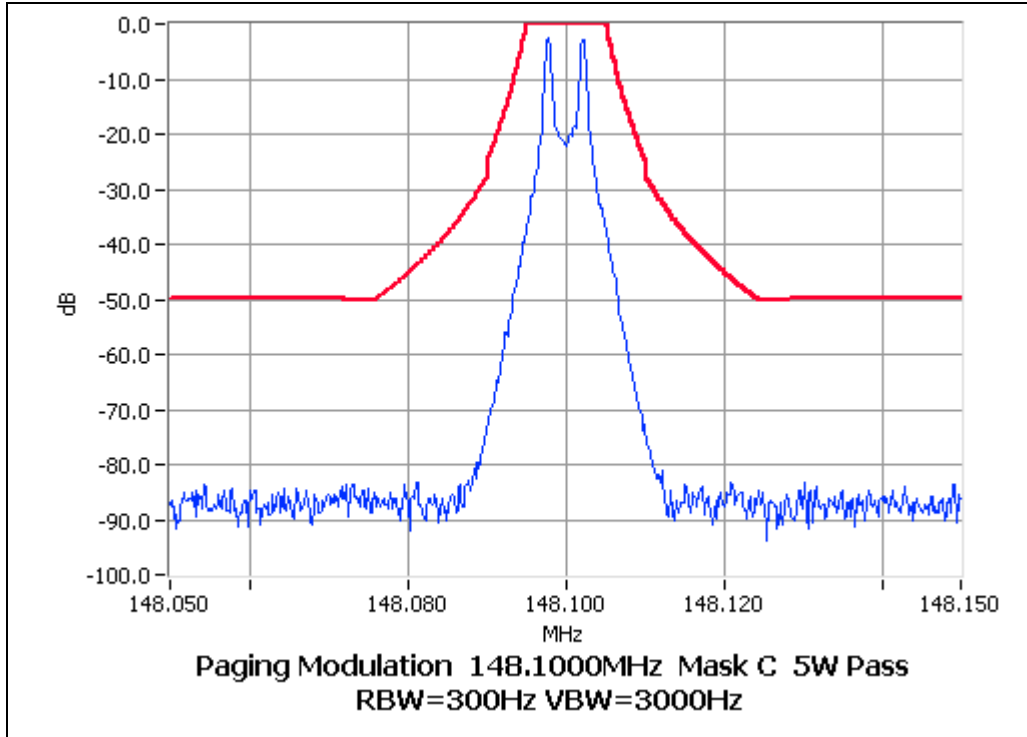
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 5W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



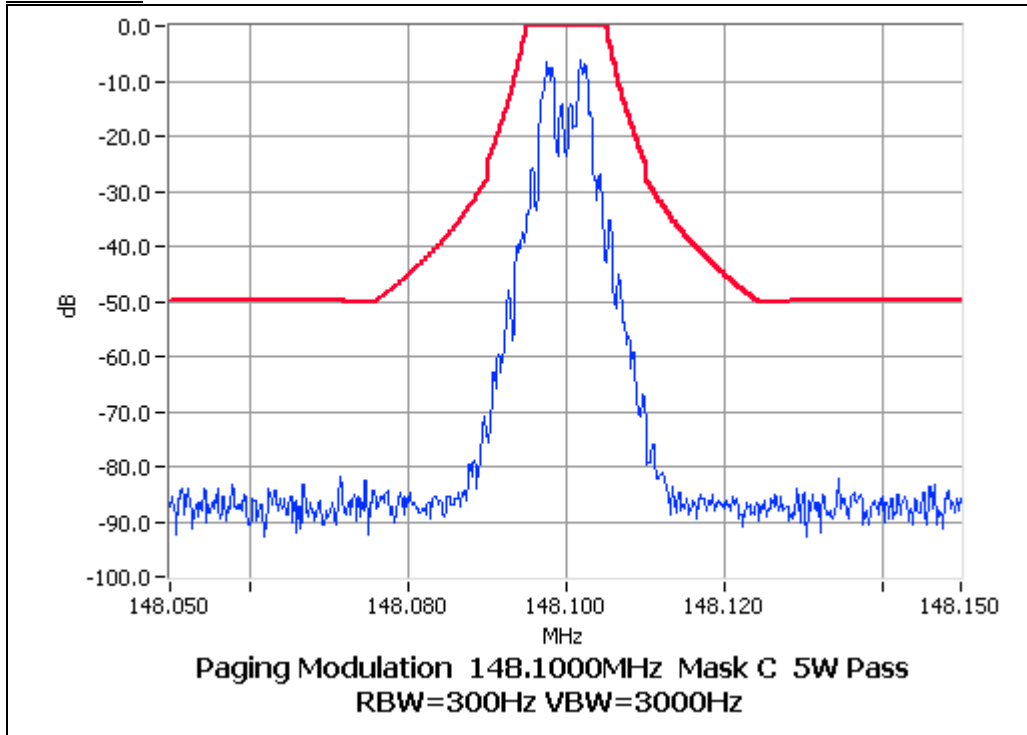
OCCUPIED BANDWIDTH

PAGING (POCSAG)

SPECIFICATION: FCC CFR 2.1049 (c)

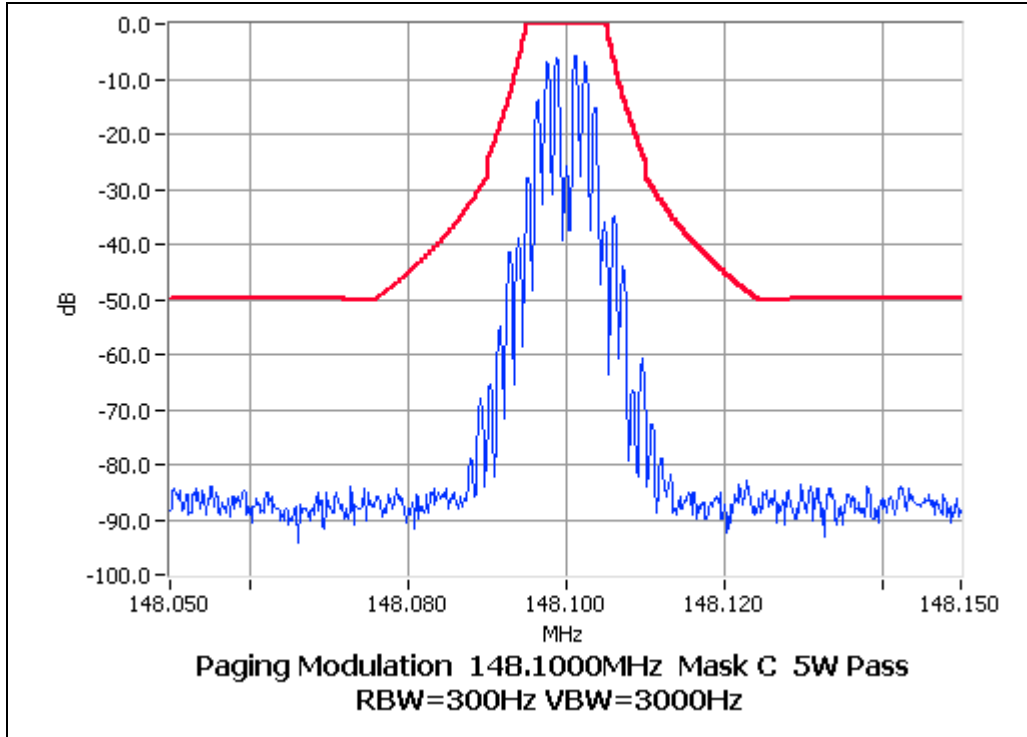
Tx FREQUENCY: 148.1 MHz 5W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:





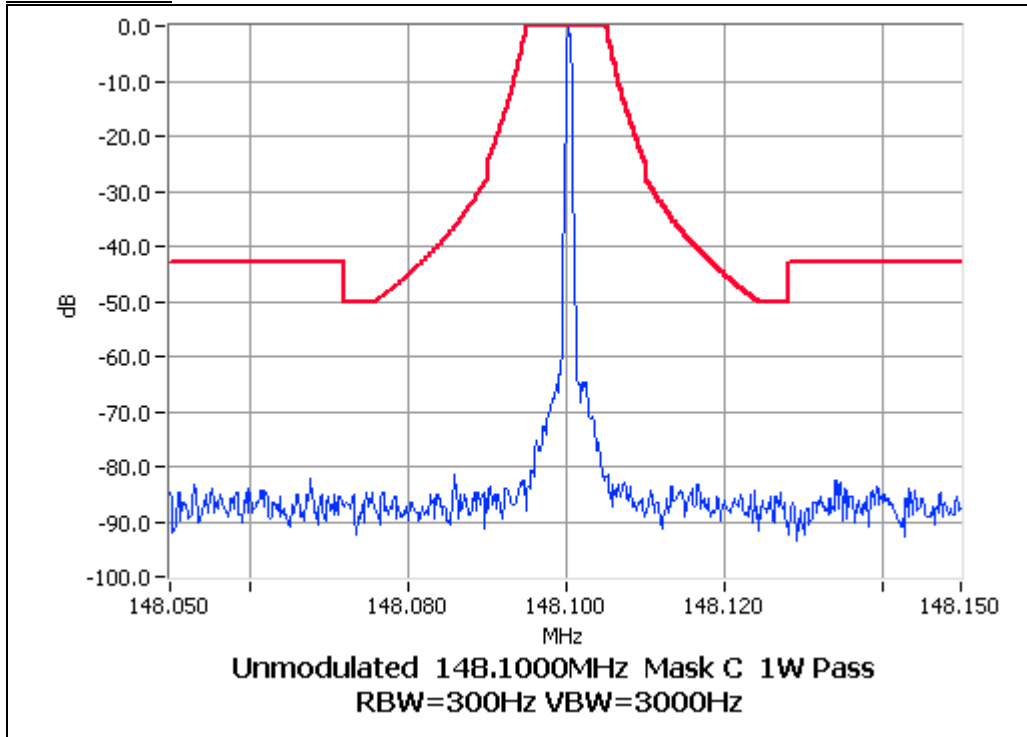
OCCUPIED BANDWIDTH

PAGING (POCSAG)

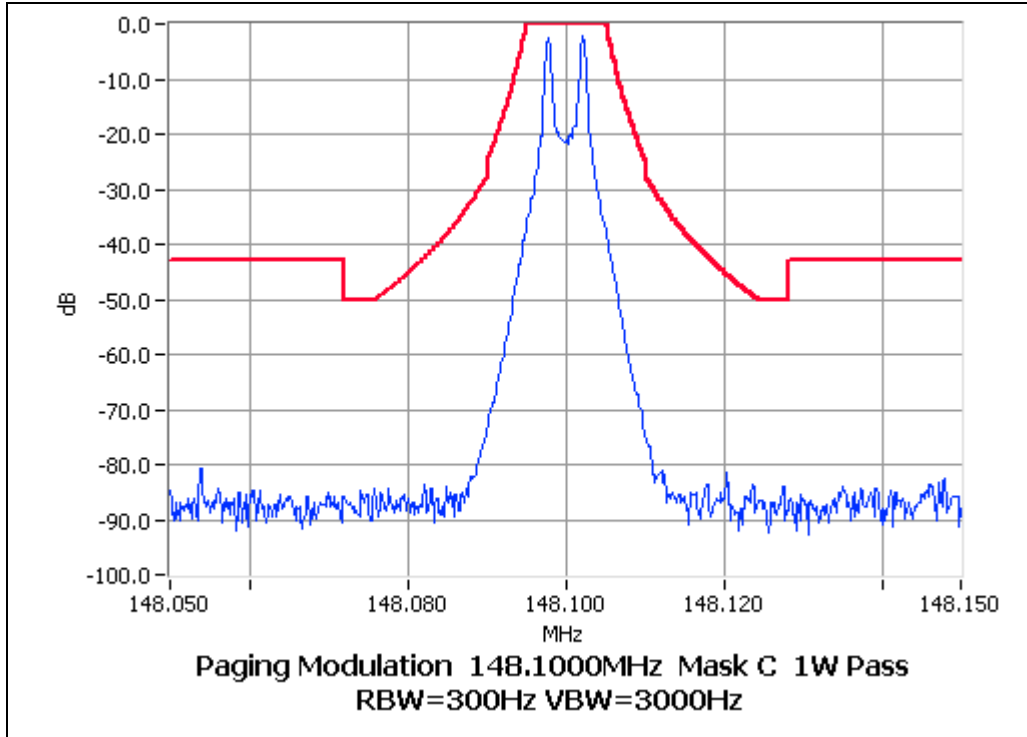
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 1W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



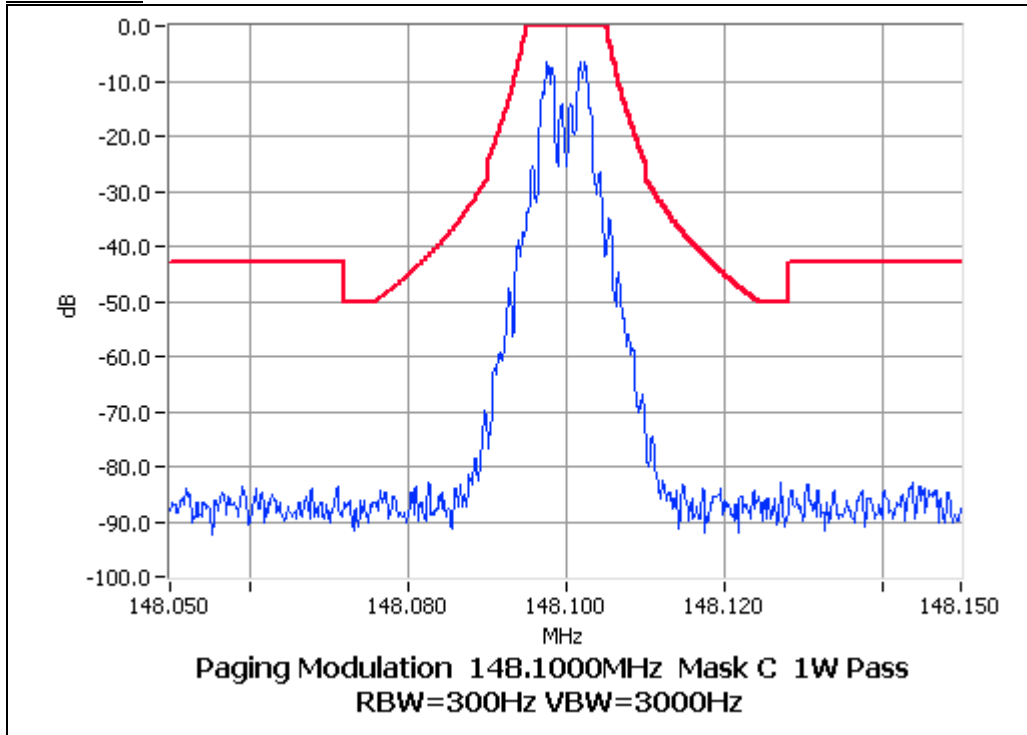
OCCUPIED BANDWIDTH

PAGING (POCSAG)

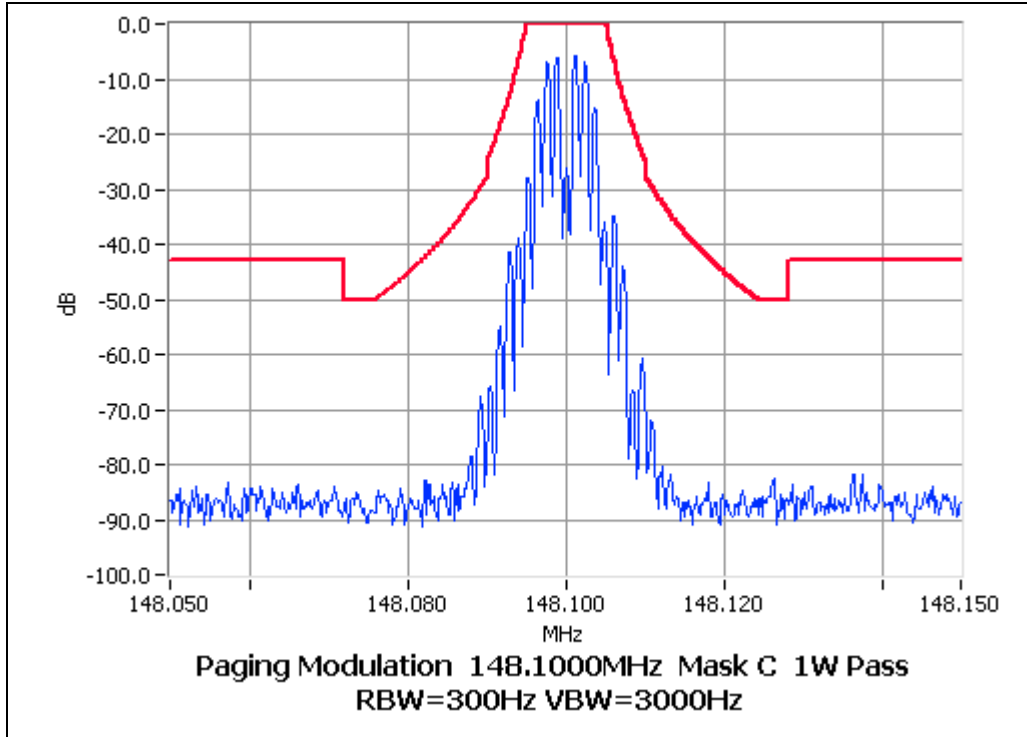
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 1W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



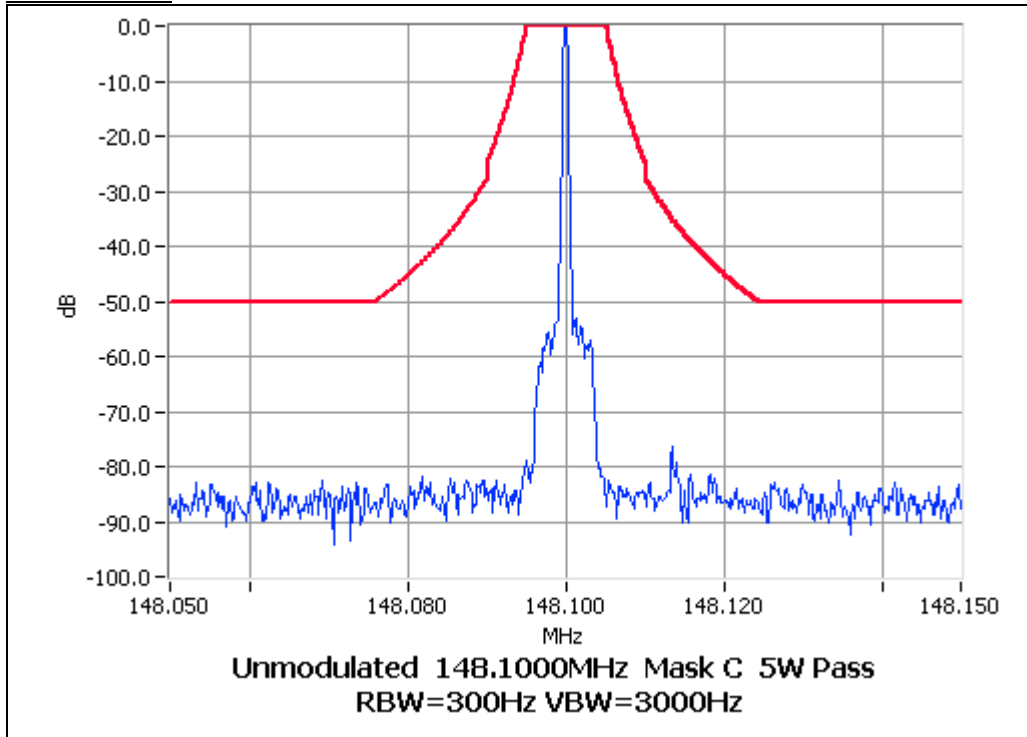
OCCUPIED BANDWIDTH

PAGING (POCSAG)

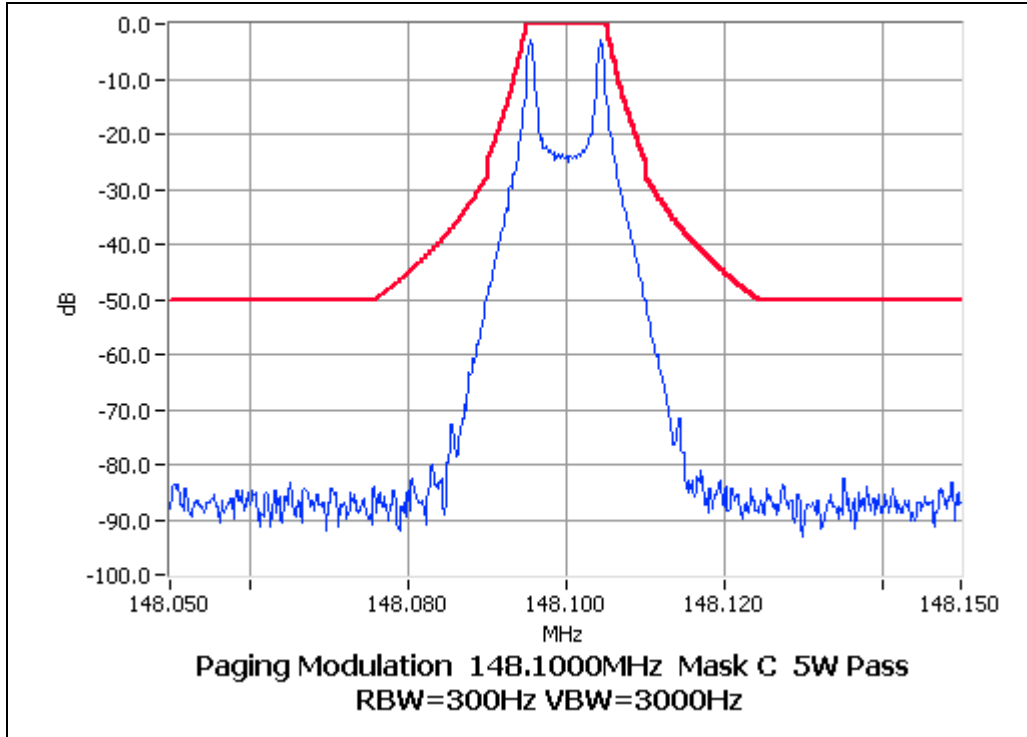
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 5W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



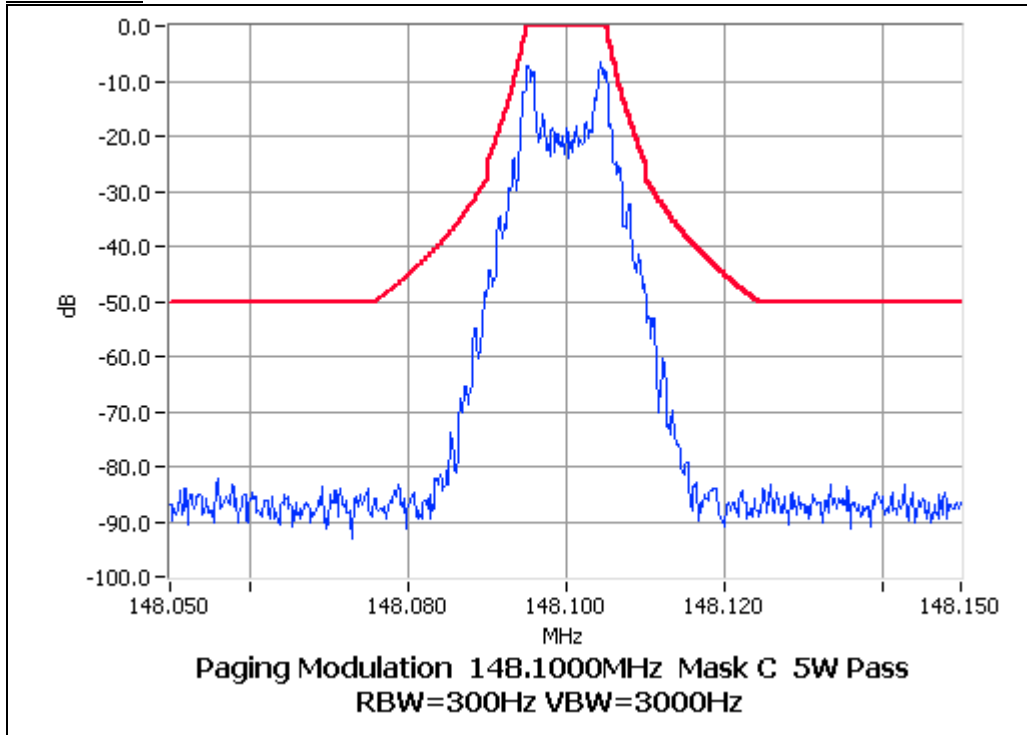
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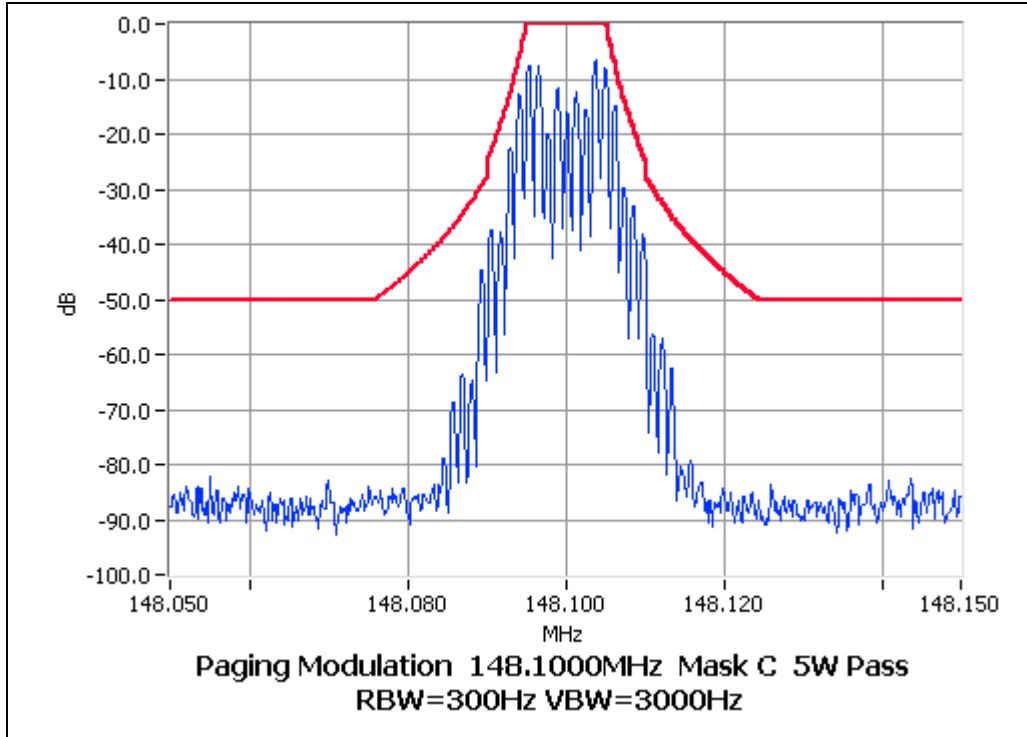
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 5W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



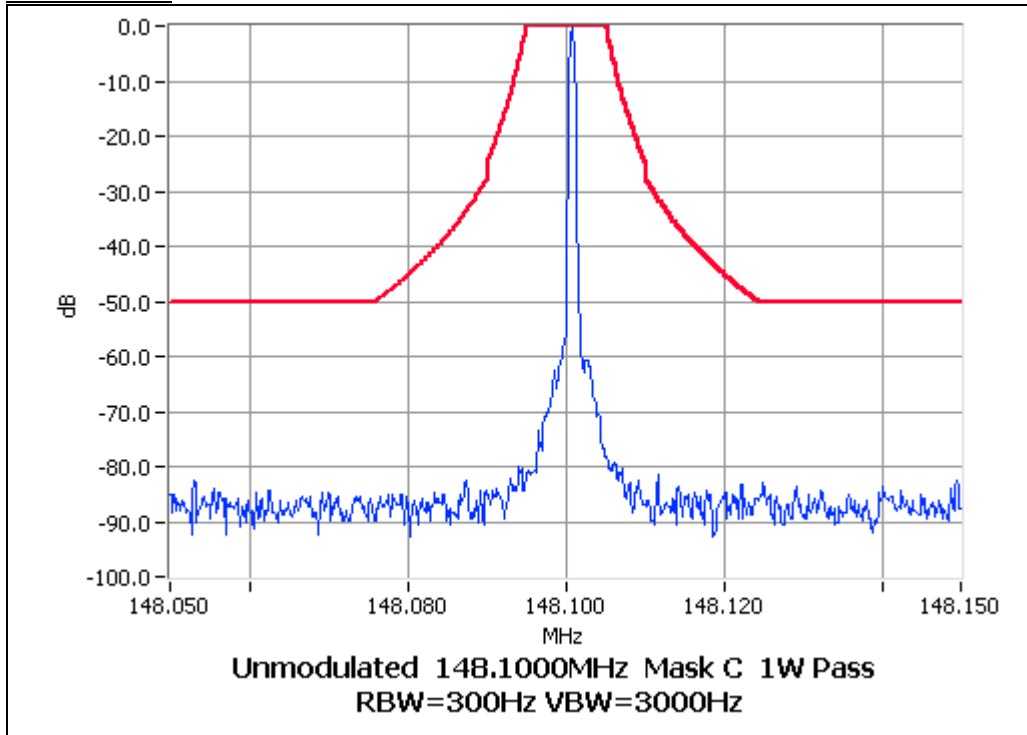
OCCUPIED BANDWIDTH

PAGING (POCSAG)

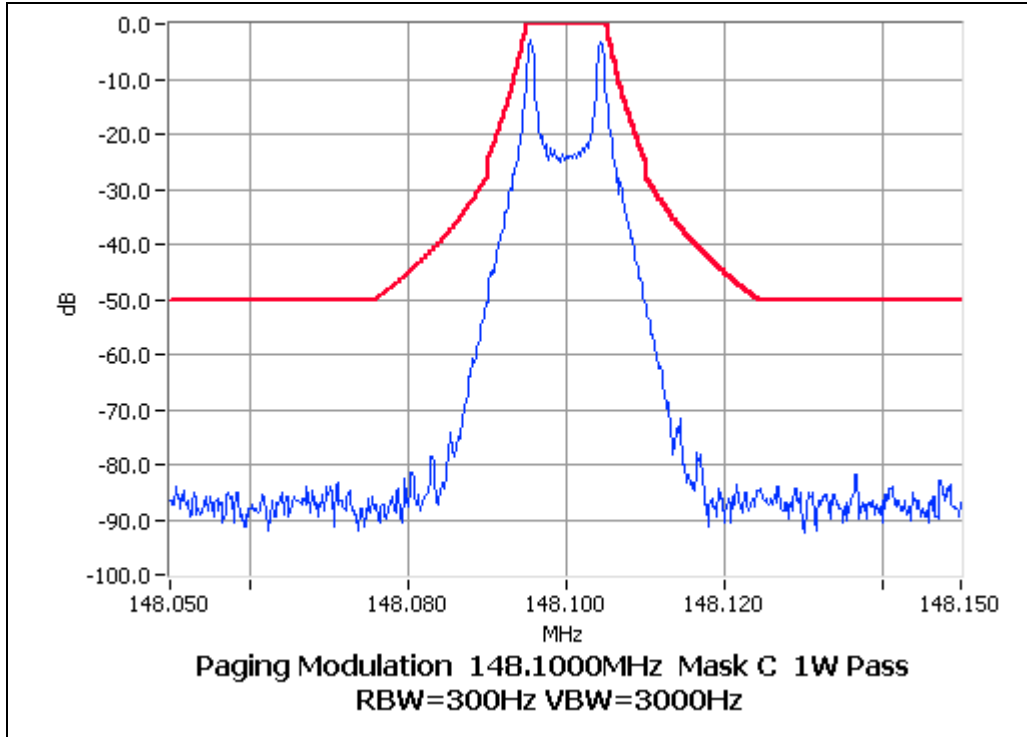
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 1W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



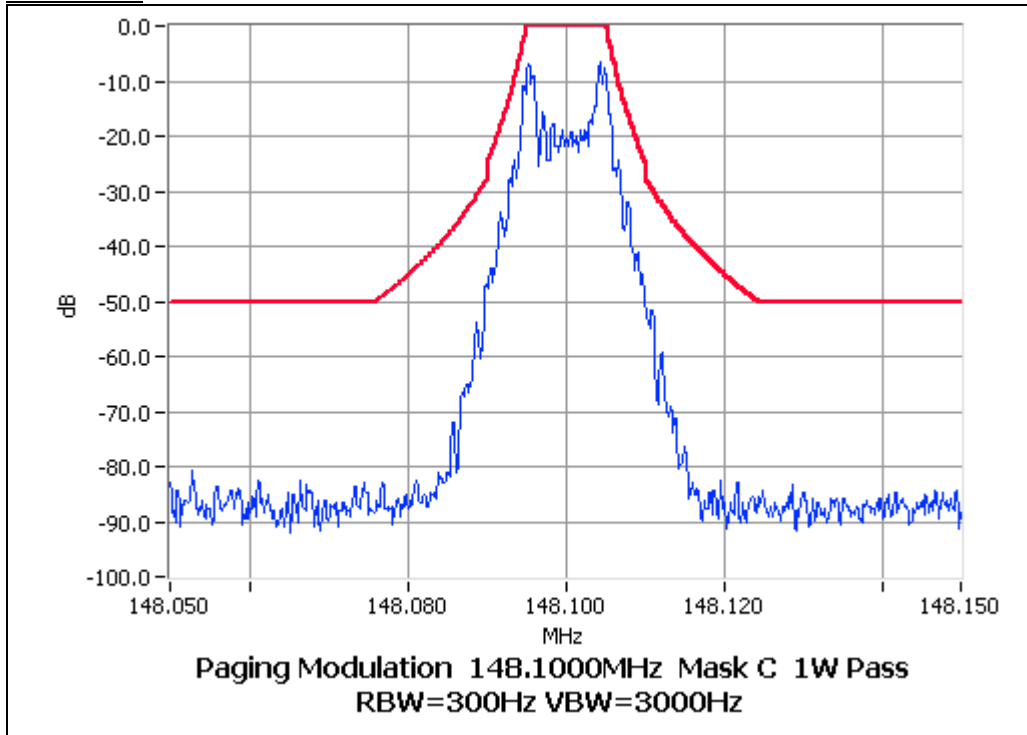
OCCUPIED BANDWIDTH

PAGING (POCSAG)

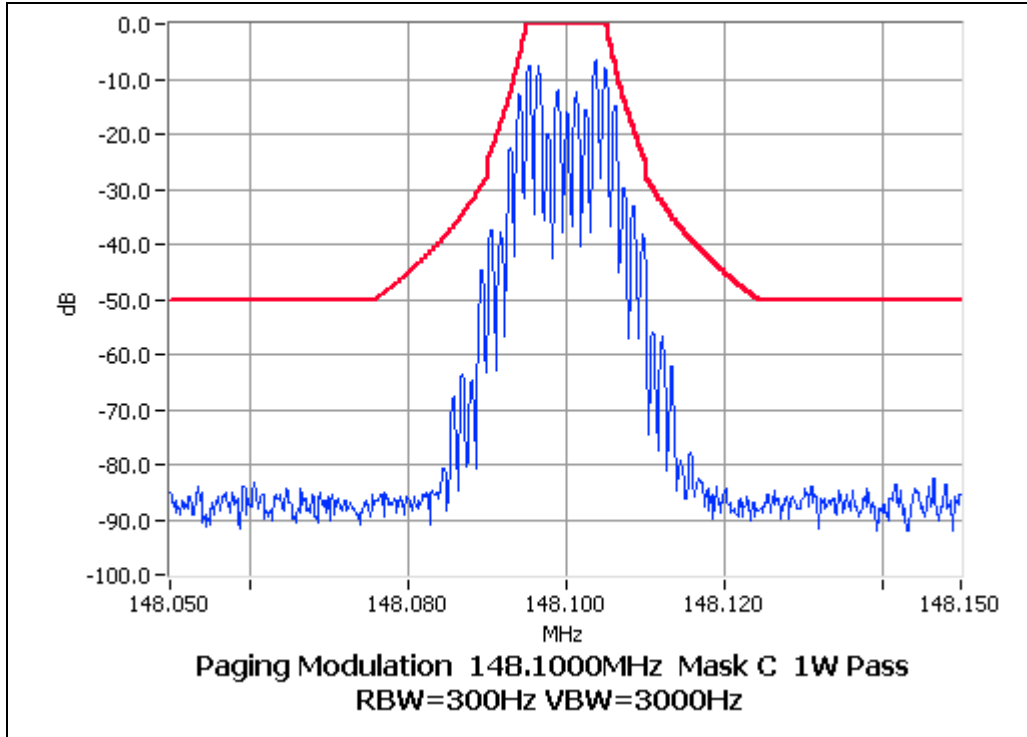
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 148.1 MHz 1W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



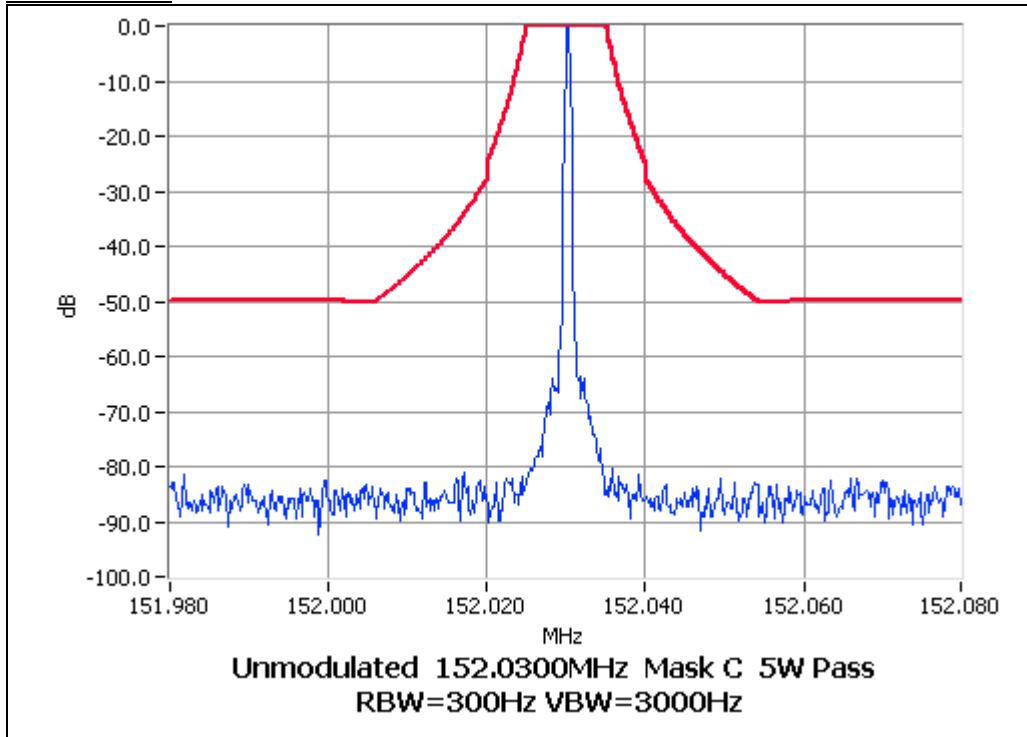
OCCUPIED BANDWIDTH

PAGING (POCSAG)

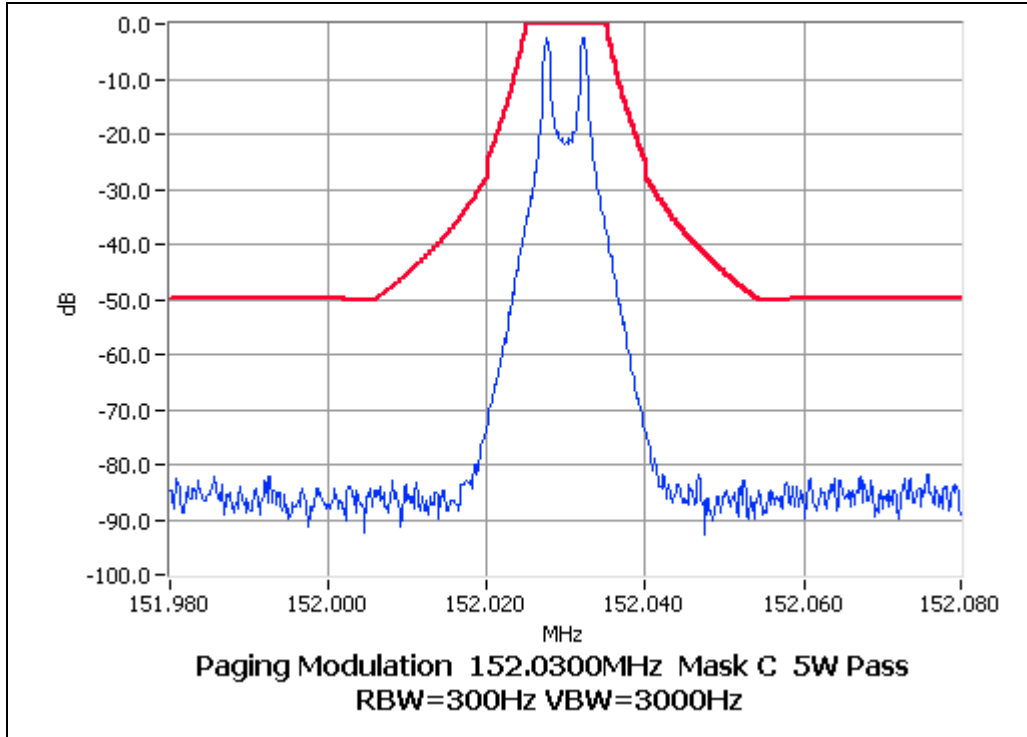
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 5W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



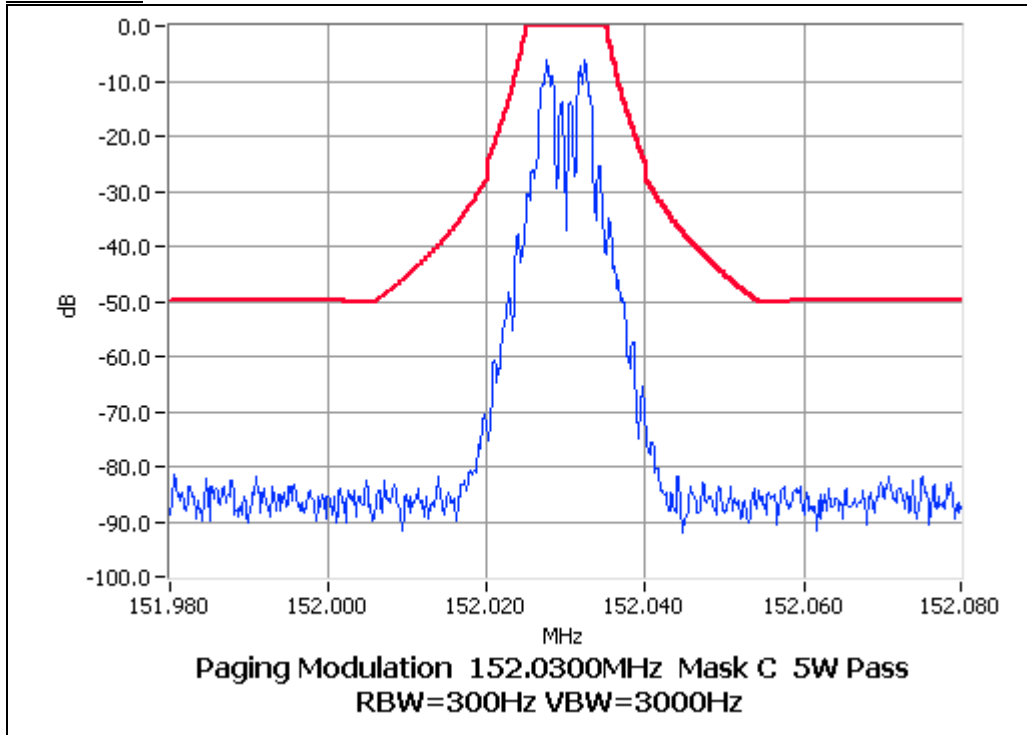
OCCUPIED BANDWIDTH

PAGING (POCSAG)

SPECIFICATION: FCC CFR 2.1049 (c)

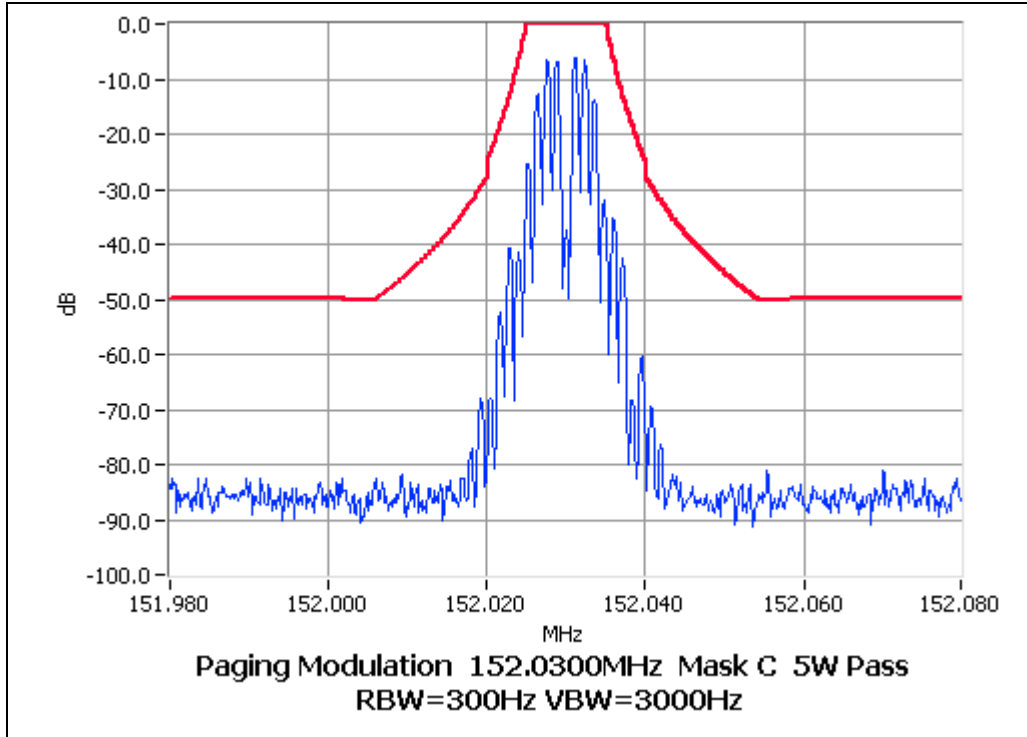
Tx FREQUENCY: 152.03 MHz 5W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:





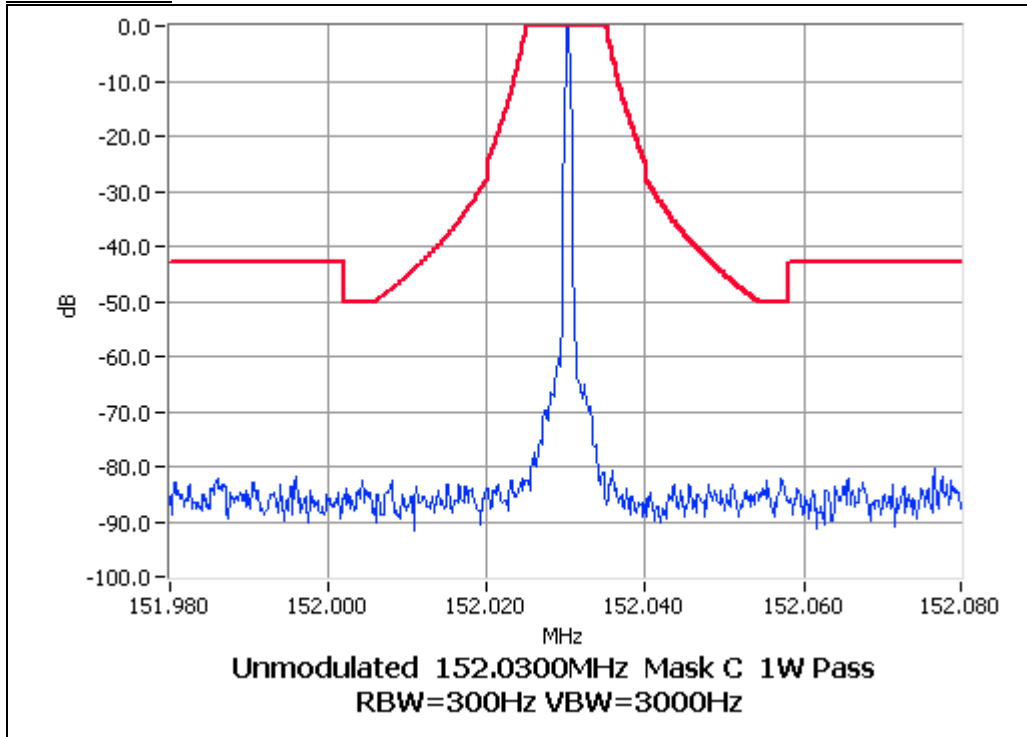
OCCUPIED BANDWIDTH

PAGING (POCSAG)

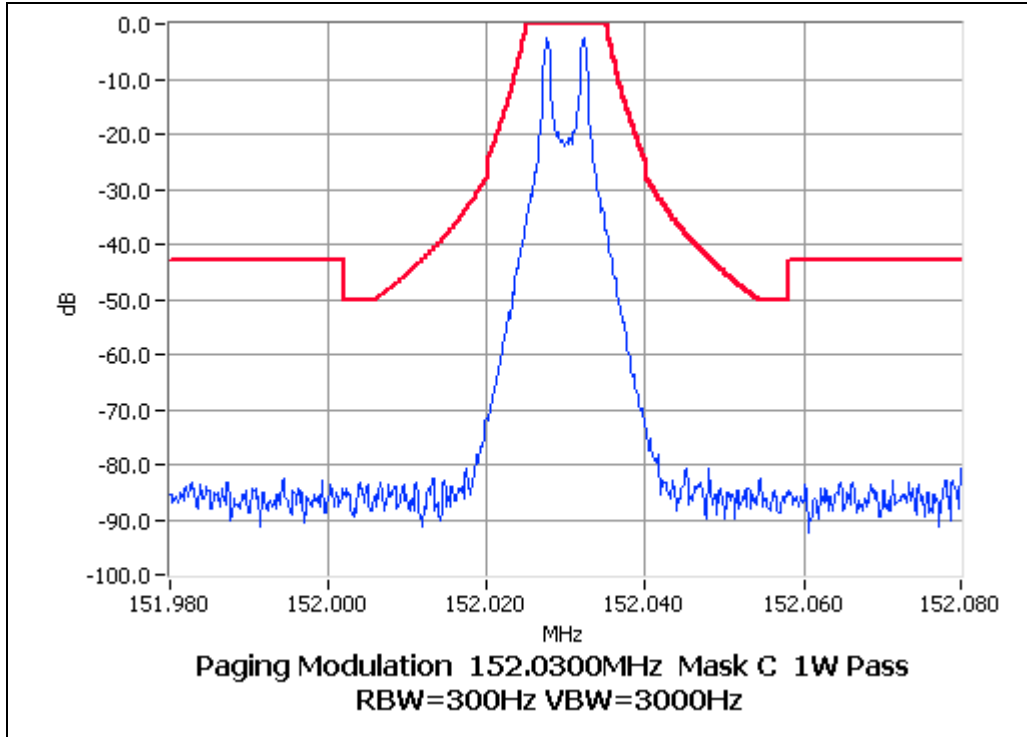
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 1W 12.5 kHz Channel Spacing

Unmodulated:



512 Baud:



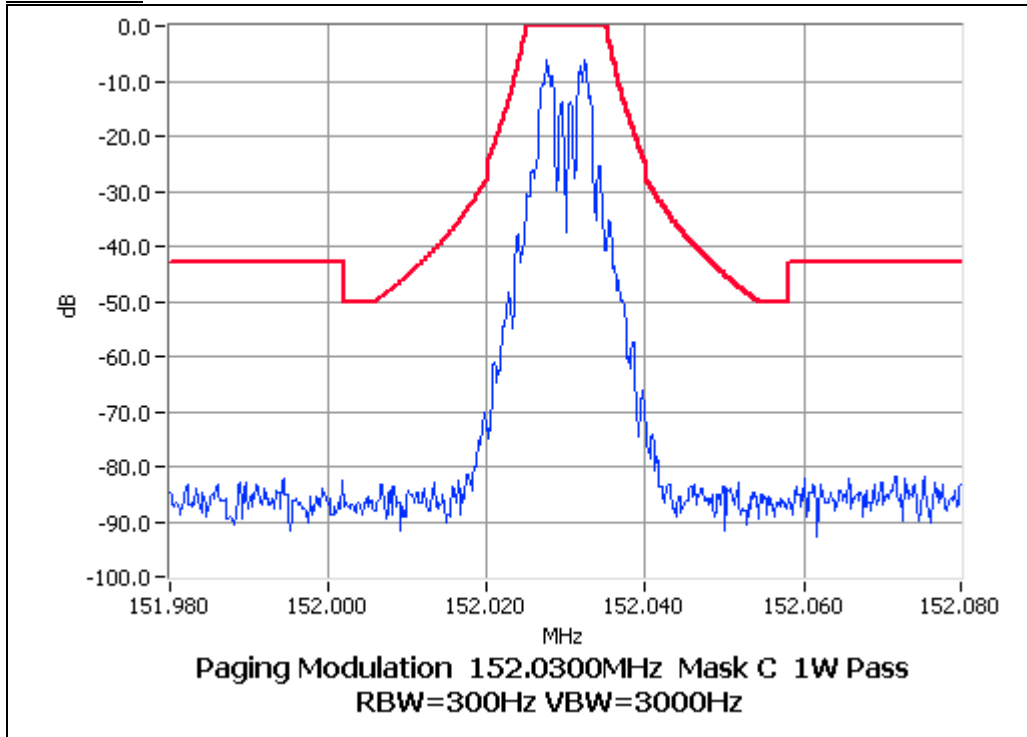
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PAGING (POCSAG)

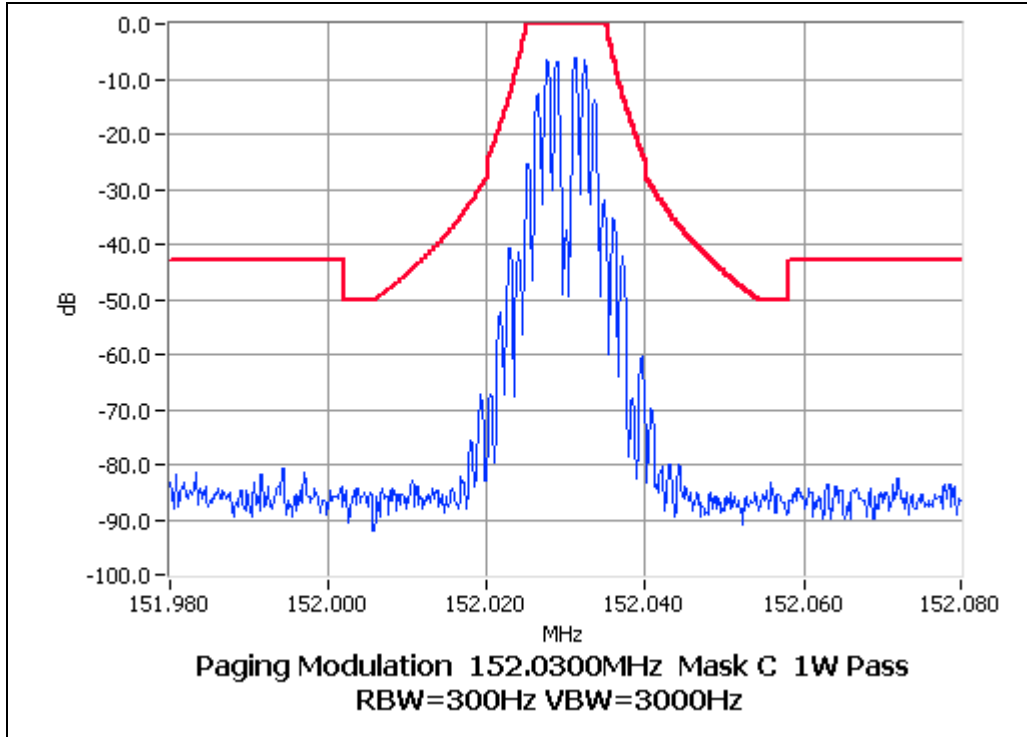
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 1W 12.5 kHz Channel Spacing

1200 Baud:



2400 Baud:



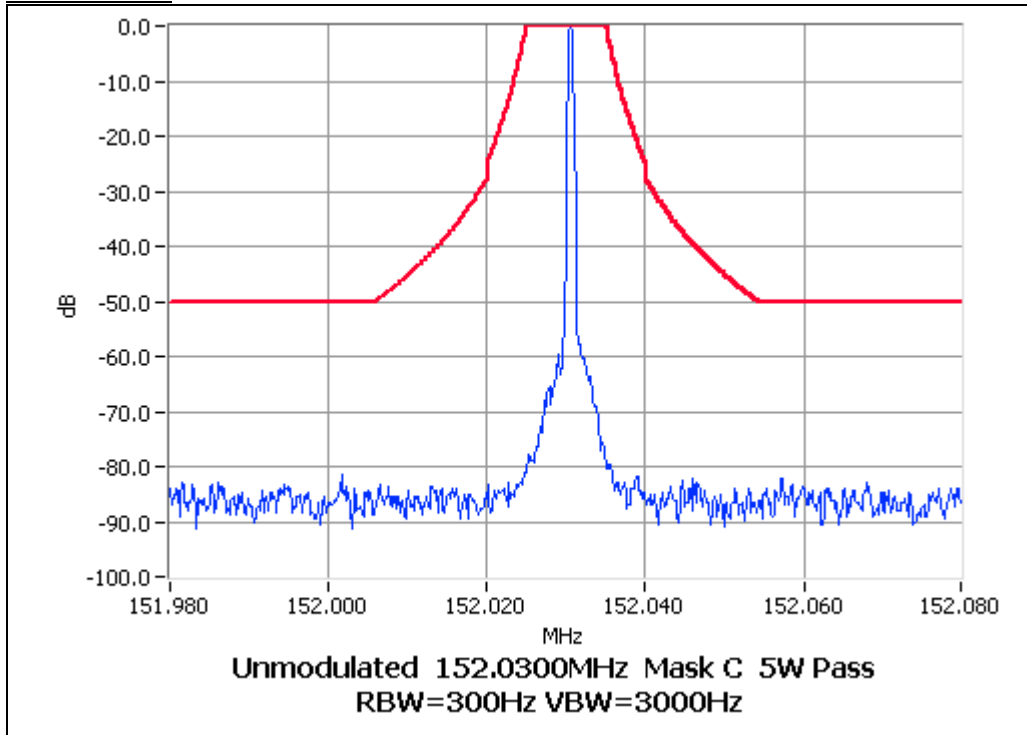
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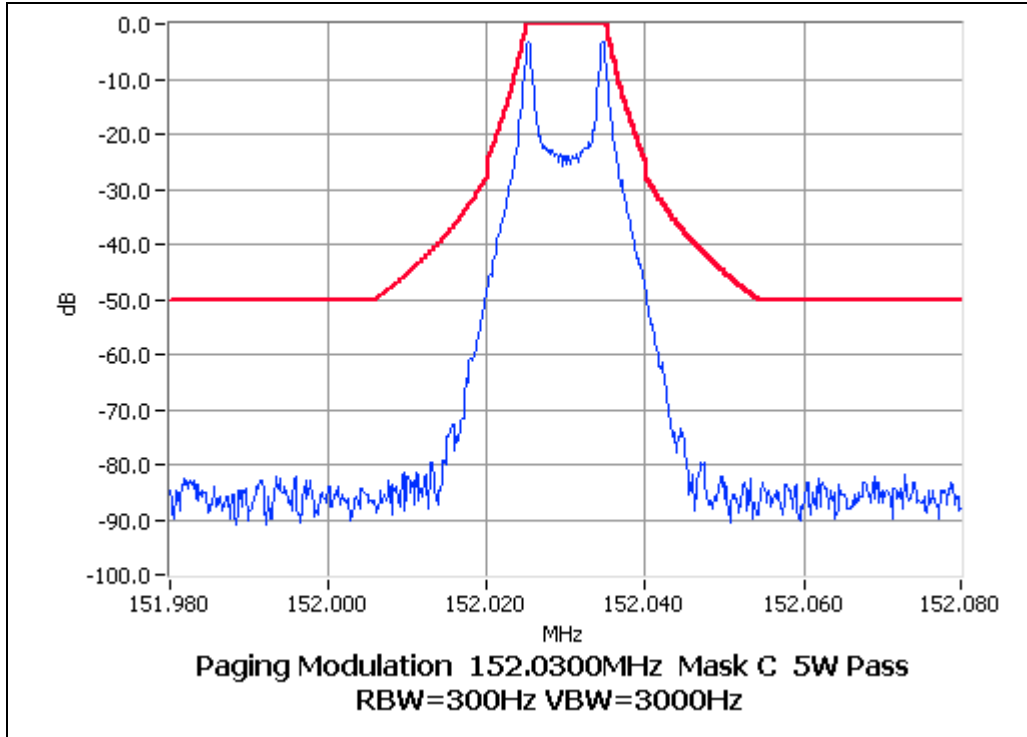
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 5W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



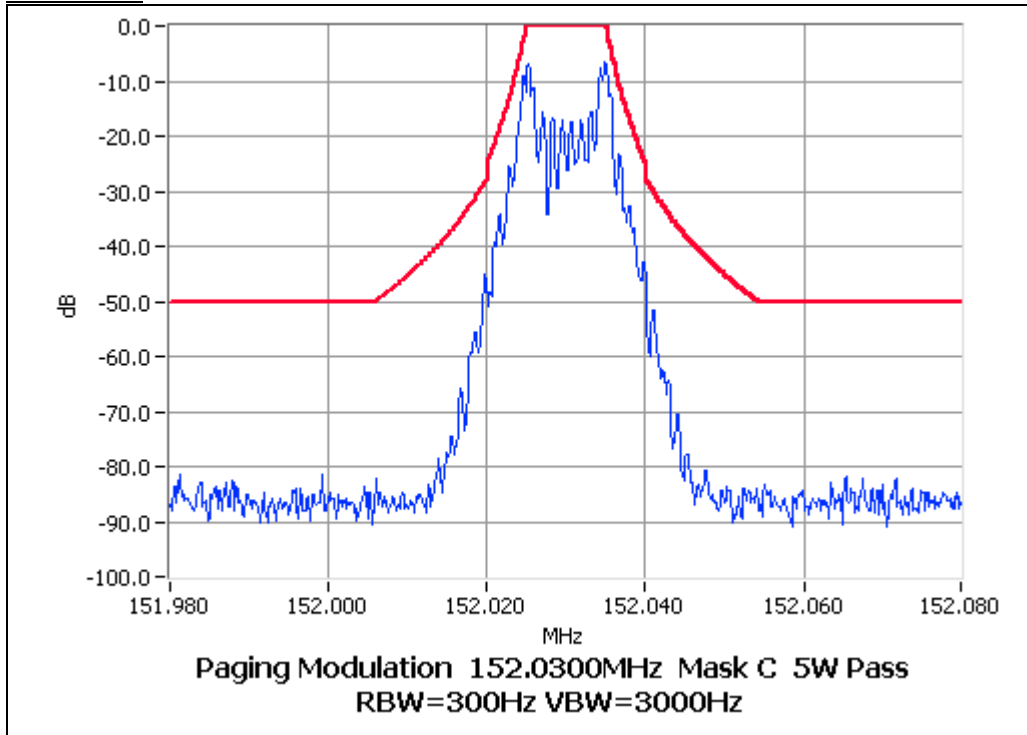
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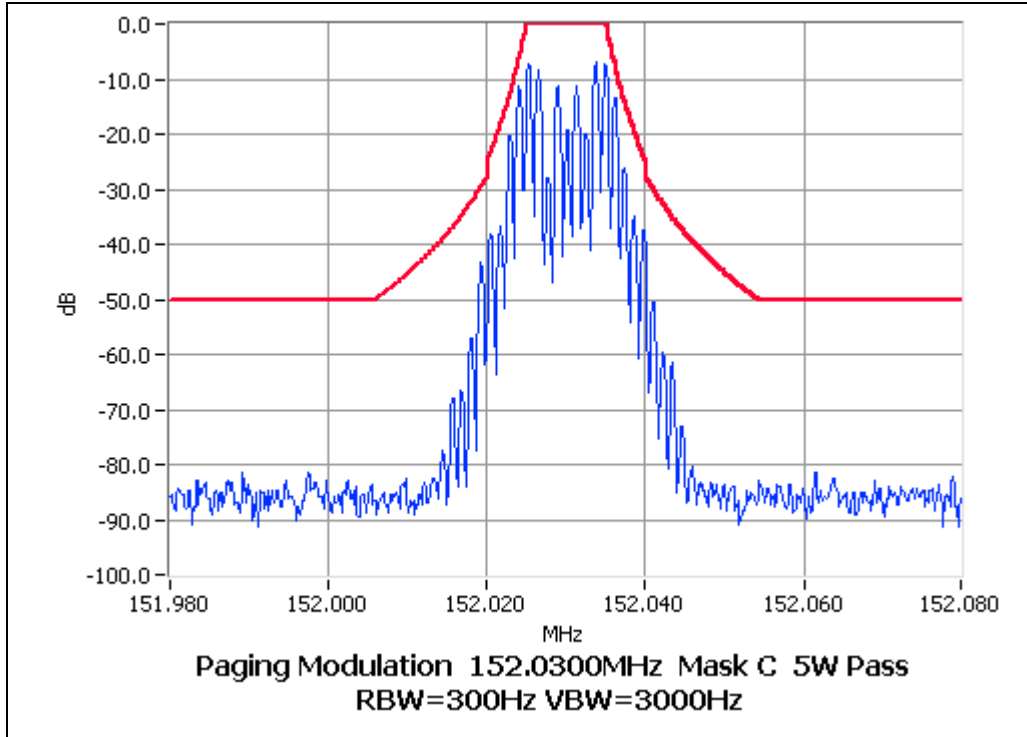
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 5W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



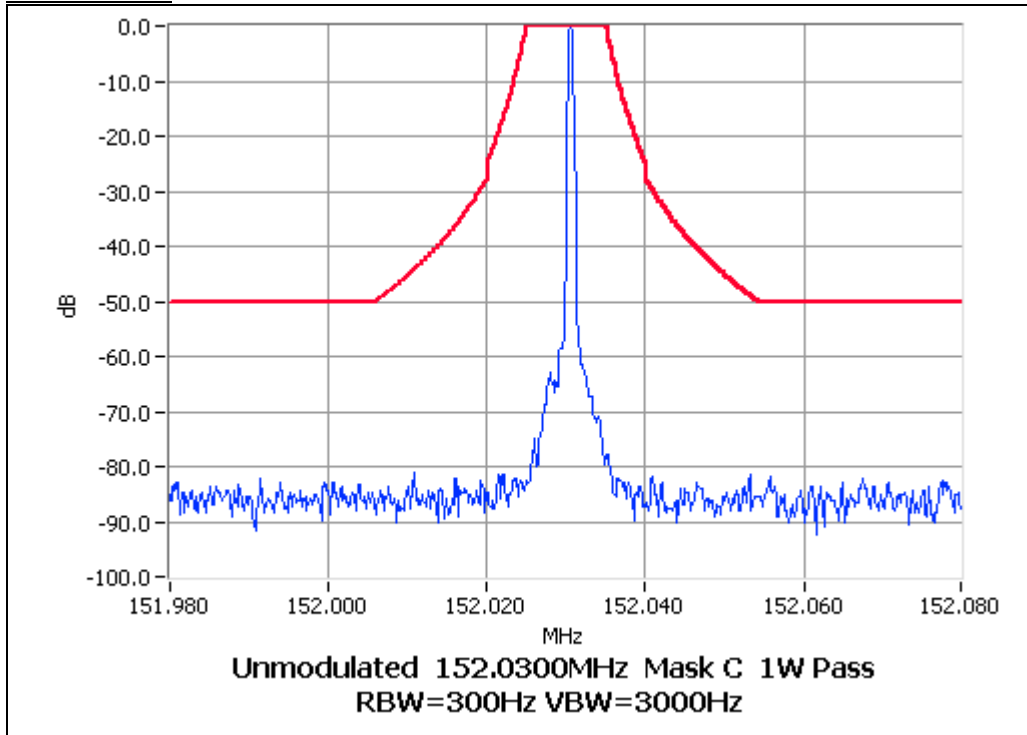
OCCUPIED BANDWIDTH

PAGING (POCSAG)

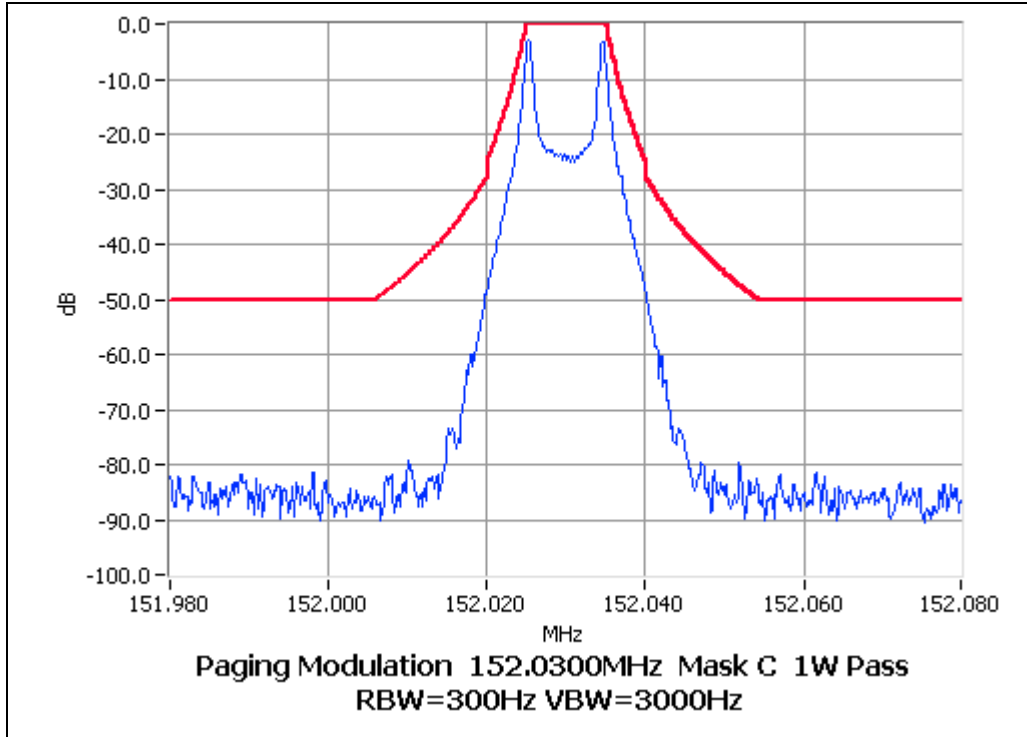
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 1W 25.0 kHz Channel Spacing

Unmodulated:



512 Baud:



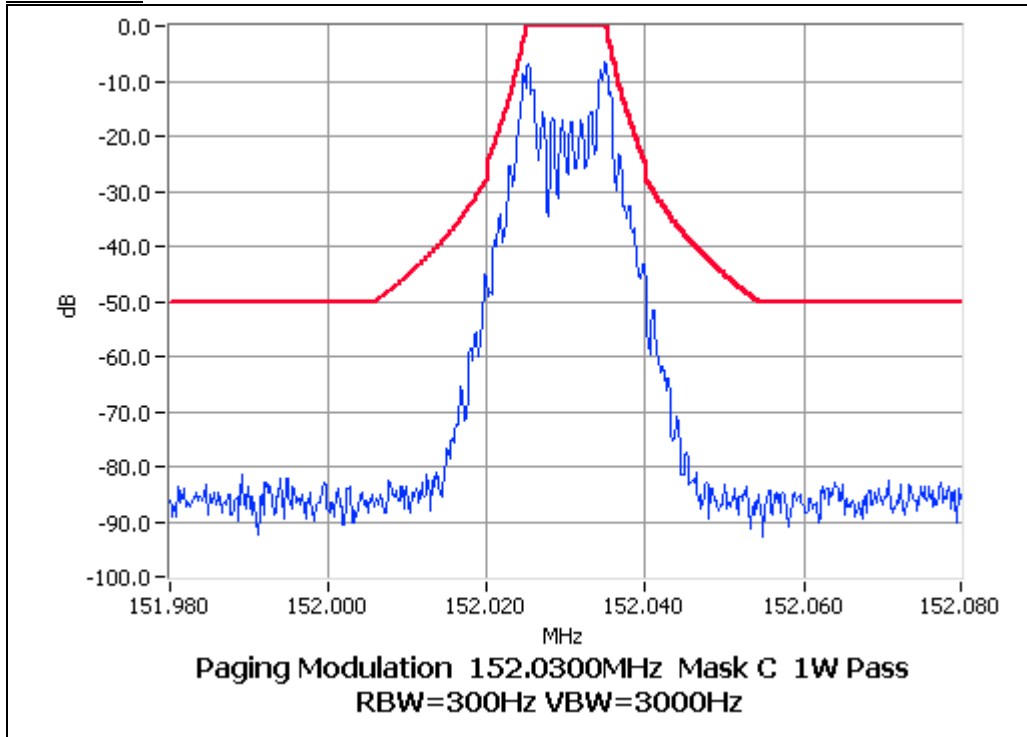
OCCUPIED BANDWIDTH

PAGING (POCSAG)

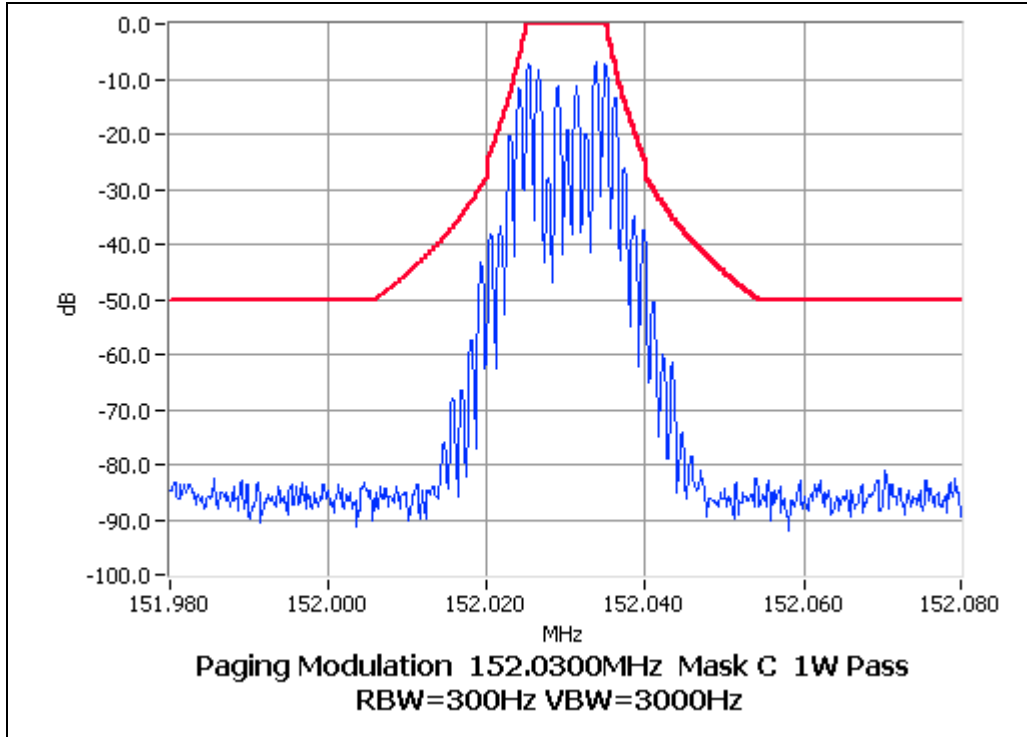
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 152.03 MHz 1W 25.0 kHz Channel Spacing

1200 Baud:



2400 Baud:



**TEST EQUIPMENT USED**

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
60	RF Attenuator 250W	Weinschel	45-30-34	JW663	E3386	15-Nov-05
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	14-Nov-05
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	14-Oct-05
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	30-May-06
136	Multimeter	Fluke	77	35069359	E3237	09-Nov-05

## APPENDIX A

### TEST SETUP DETAILS

All 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.

