

REPORT NUMBER 2113

November 2004

RADIO PERFORMANCE MEASUREMENTS

On the TBAK2 Base Station Transceiver consisting of

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBER (S)
Reciter	TBA40K4-0B00	18005774
Power Amplifier	TBA90K2-0000 TBA80K2-0000 TBA70K2-0000	18005264 18005319 18005305
Power Management Unit	TBA30A1-1100	18004551 18004140
User Interface	TBA2021	18004619

FCC ID: CASTBAK2

In accordance with

FCC 47 CFR Part 22, & 90 sub part S

PREPARED BY: Marcus Ludwig
Test Technician

CHECKED & APPROVED BY: Hamish Newton
Senior Technician



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REPORT ON :

Type Approval Testing of the TBAK2 in accordance with:

FCC 47 CFR Part 22, & 90 sub part S

FCC ID: CASTBAK2

PREPARED FOR :

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

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TELTest Laboratory	Mr S Crompton	Copy No 1
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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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DECLARATION OF CONFORMITY

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

Equipment: Base Station Transceiver

Type: TBAK2

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBER (S)
Reciter	TBA40K4-0B00	18005774
Power Amplifier	TBA90K2-0000 TBA80K2-0000 TBA70K2-0000	18005264 18005319 18005305
Power management Unit	TBA30A1-1100	18004551 18004140
User Interface	TBA2021	18004619

Quantity: 1

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

FCC 47 CFR Part 22, & 90 sub part S

Signature:_____

S. A. Crompton
Compliance Laboratory Manager.

Date:_____

Test Conditions

All testing was performed at the following conditions.

Ambient Temperature	15°C to 30°C
Relative Humidity	20% to 75%

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. Analogue Voice 12.5kHz Bandwidth

Necessary bandwidth	Emission Designator
$M = 3\text{kHz}$	11k0F3E
$D = 2.5\text{kHz}$	F3E represents a FM voice transmission
$B_n = 6 + 5 \times 1$ $= 11\text{kHz}$	

2. Analogue Voice 25kHz Bandwidth

Necessary bandwidth	Emission Designator
$M = 3\text{kHz}$	16k0F3E
$D = 5\text{kHz}$	F3E represents a FM voice transmission
$B_n = 6 + 10 \times 1$ $= 16\text{kHz}$	

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

Necessary bandwidth	Emission Designator
$M = 1.8\text{ kHz}$	6k60F2D
$D = 1.5\text{kHz}$ (60% of peak deviation)	F2D represents a FM data transmission with the use of a modulating sub carrier
$B_n = 3.6 + 3 \times 1$ $= 6.6\text{ kHz}$	

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

Necessary bandwidth

Emission Designator

M = 1.8 kHz

9k60F2D

D = 3kHz (60% of peak deviation)

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

Bn = 3.6 + 6 x 1
=9.6 kHz

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:

100 W Power Amplifier		
858.1125 MHz	100 W nominal	10 W nominal
POWER (W)	104.9	11.7
Variation from Nominal (%)	4.9	17.0
867.1 MHz		
POWER (W)	102.8	11.5
Variation from Nominal (%)	2.8	15.0
50 W Power Amplifier		
858.1125 MHz	50 W nominal	5 W nominal
POWER (W)	54.2	5.5
Variation from Nominal (%)	8.4	10.0
867.1 MHz		
POWER (W)	55.6	5.3
Variation from Nominal (%)	11.2	6.2
5 W Power Amplifier		
858.1125 MHz	5 W nominal	1 W nominal
POWER (W)	5.5	1.0
Variation from Nominal (%)	10.0	0.0
867.1 MHz		
POWER (W)	5.4	1.0
Variation from Nominal (%)	8.0	0.0
Measurement Uncertainty (dB)	+0.63 -0.68	

LIMIT CLAUSE: FCC 47 CFR 90.635

Radio Type: Base Station Transceiver

Frequency Band: 851 MHz ~ 869 MHz

90.205 (r) 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.

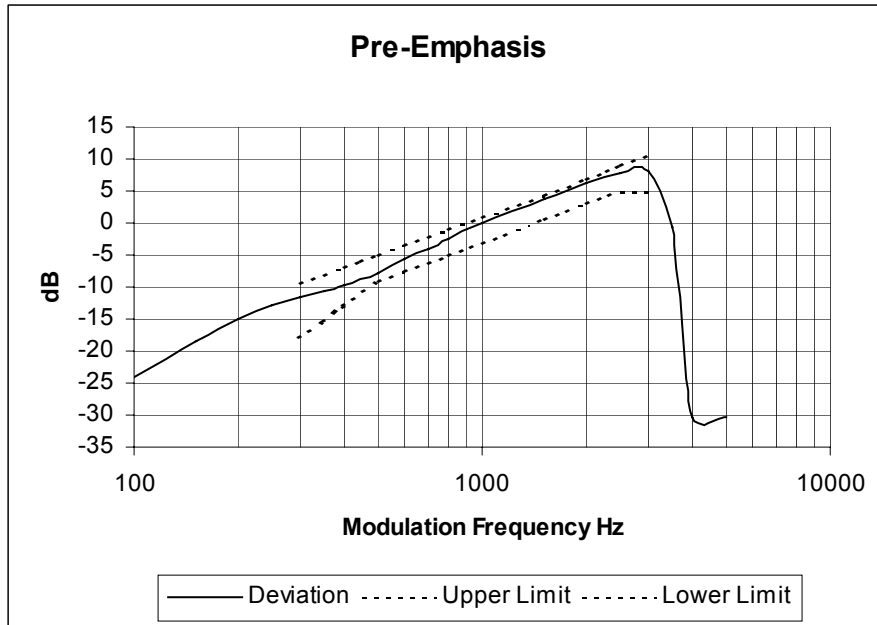
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LIMIT CLAUSE: TIA/EIA-603B 3.2.6

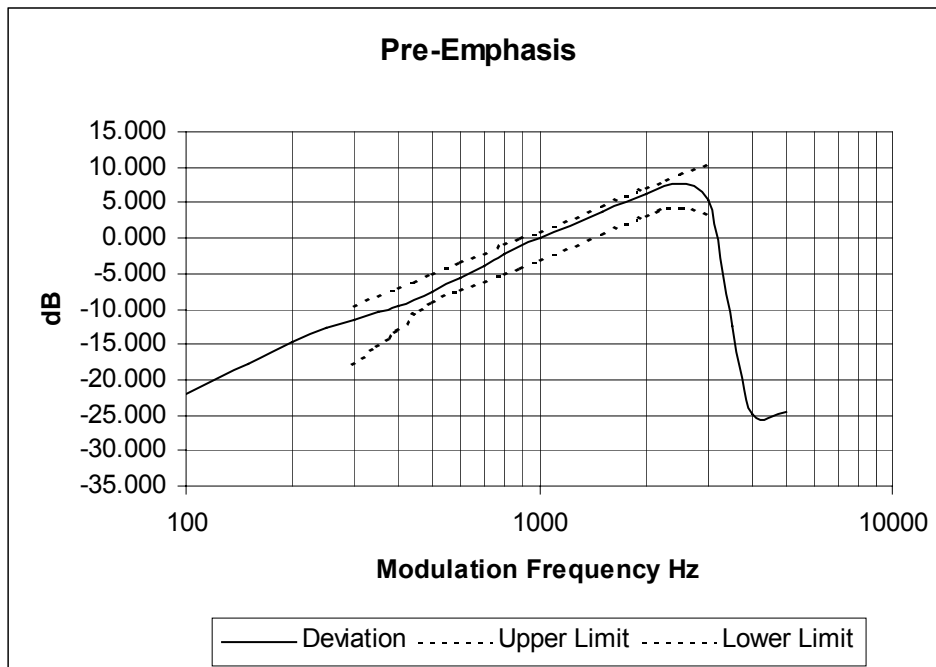
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 858.1125 MHz 25 kHz Channel Spacing



Tx FREQUENCY: 867.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

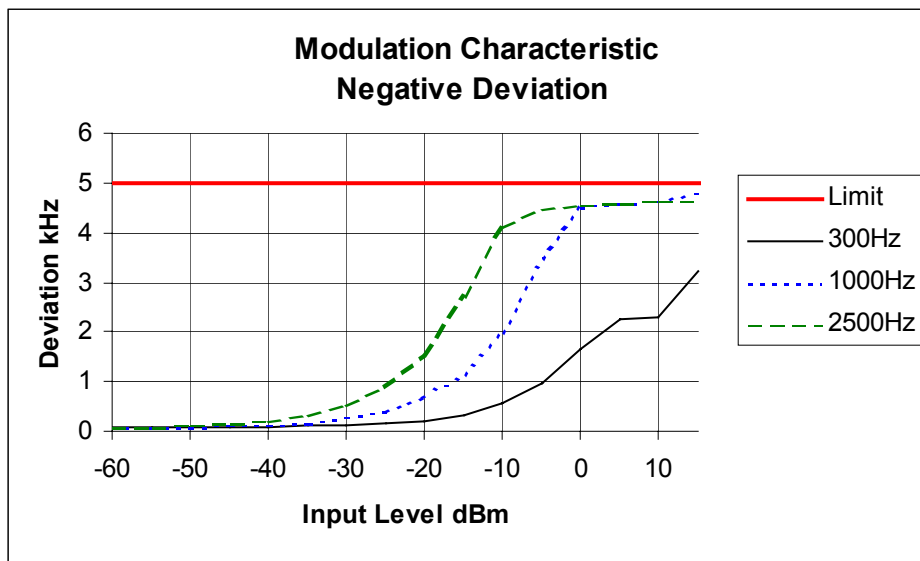
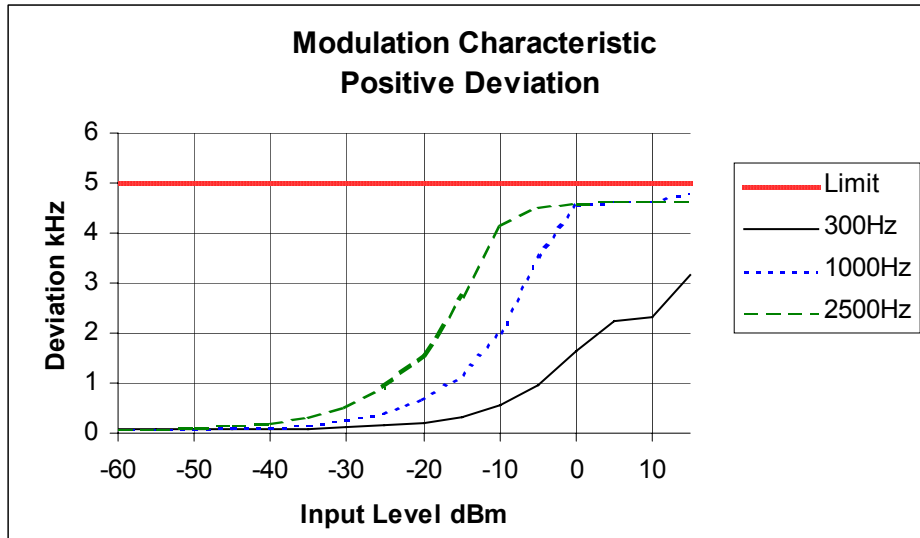
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

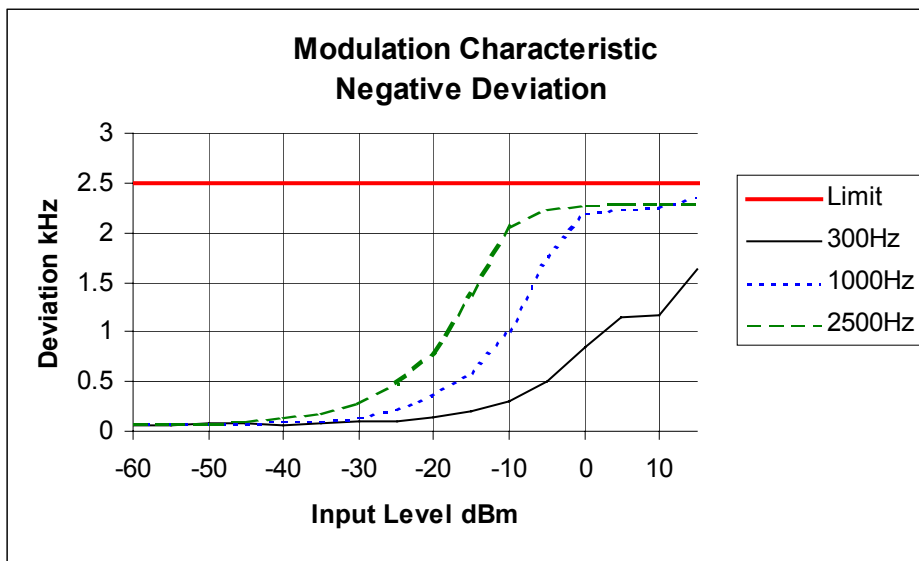
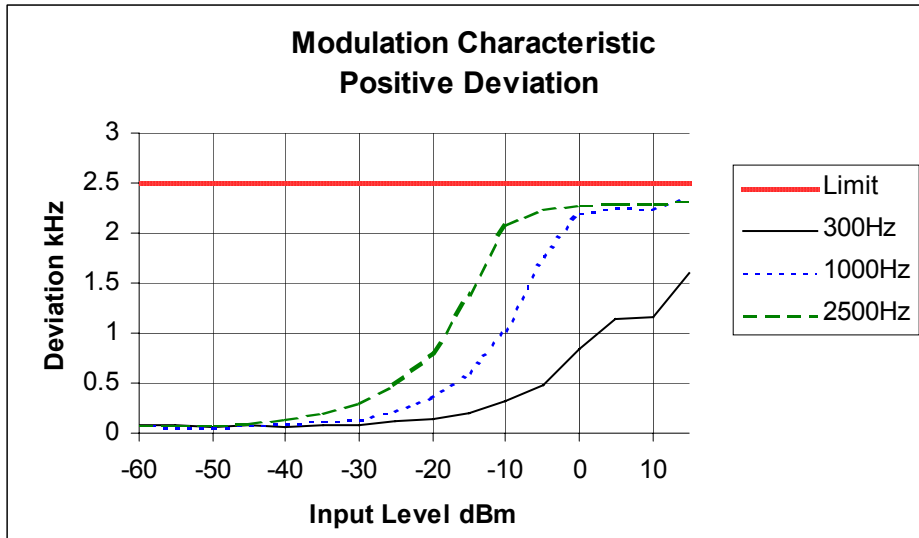
Tx FREQUENCY: 858.1125 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 867.1 MHz 12.5 kHz Channel Spacing



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. 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 G – 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	Analogue Voice; FFSK;
Emission Mask B	25.0 kHz Channel Spacing	Analogue Voice
Emission Mask G	25.0 kHz Channel Spacing	FFSK

DATA SPEED

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

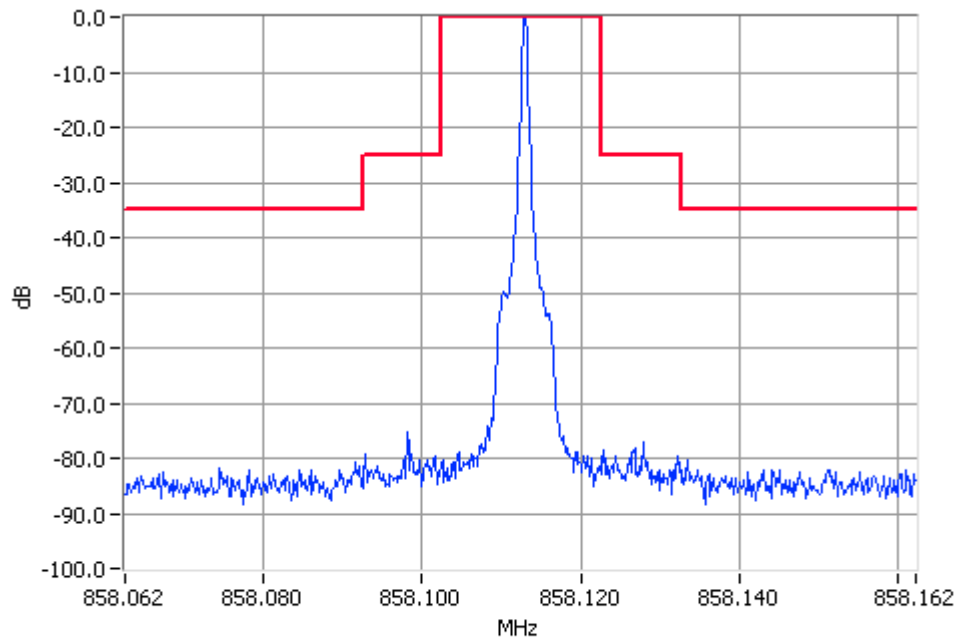
OCCUPIED BANDWIDTH

ANALOGUE VOICE

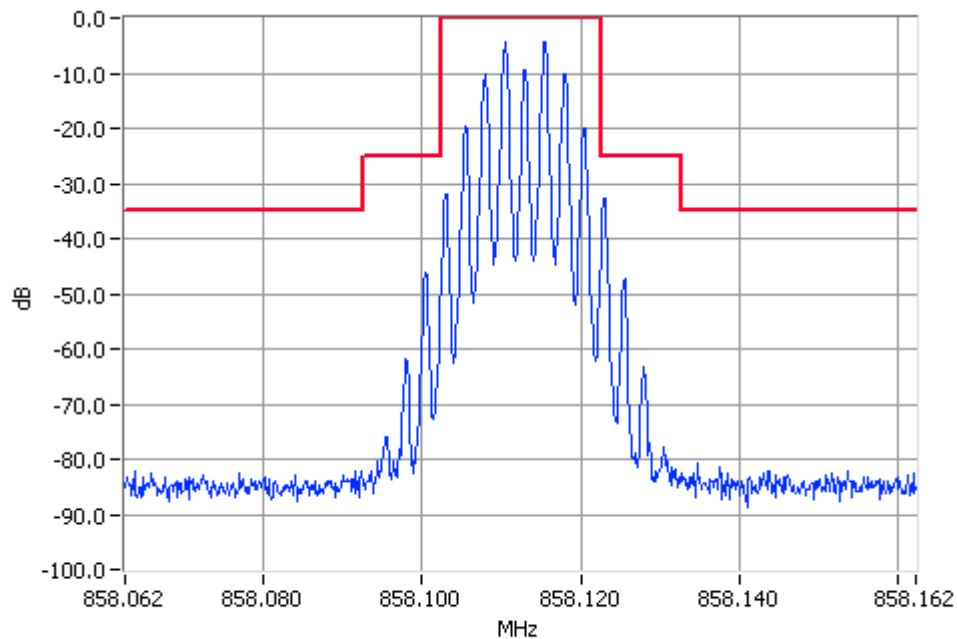
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 858.1125 MHz 100W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz

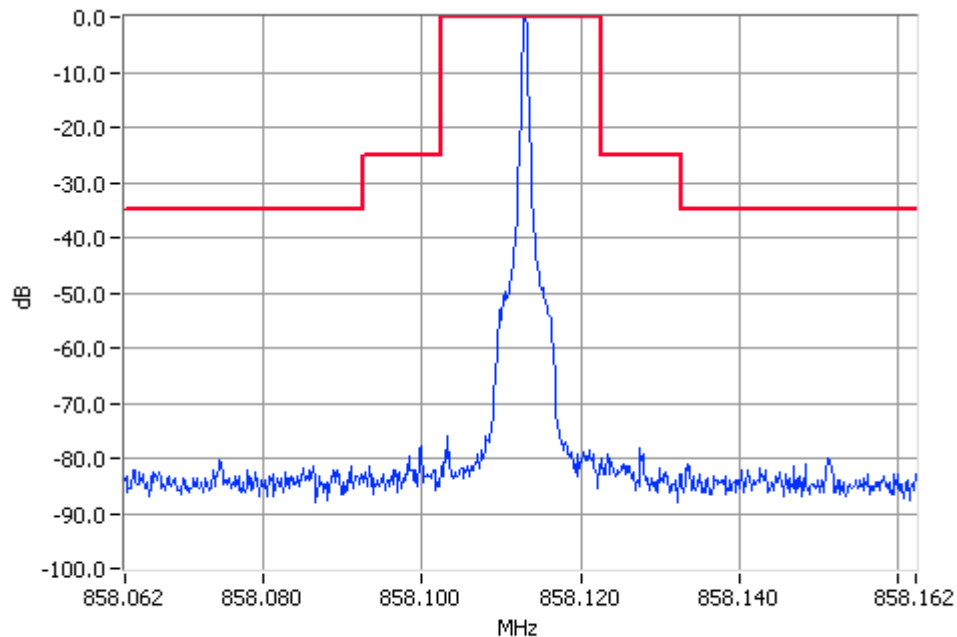
OCCUPIED BANDWIDTH

ANALOGUE VOICE

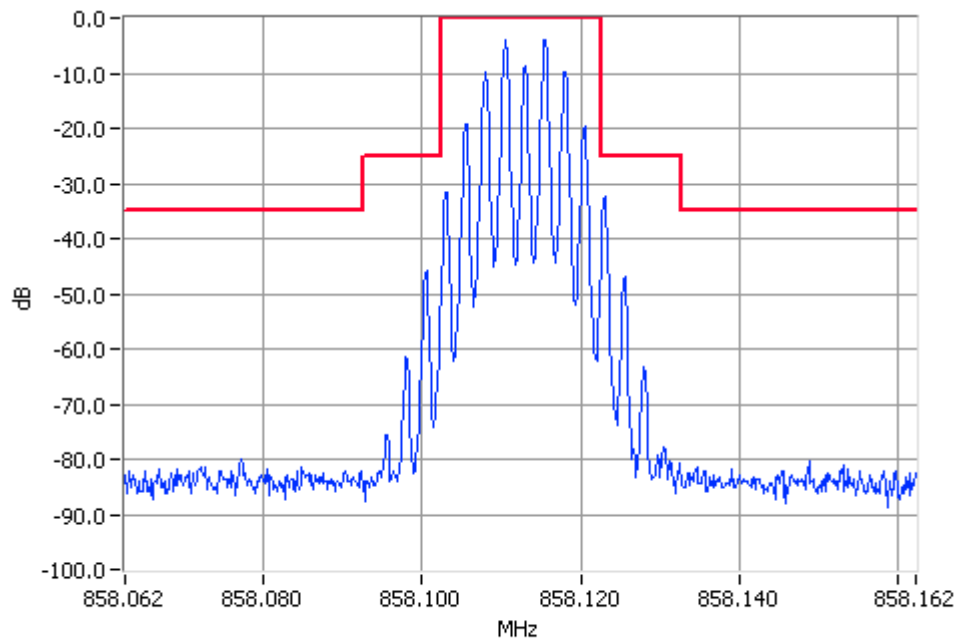
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 858.1125 MHz 10W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 10W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 10W Pass
RBW=300Hz VBW=3000Hz

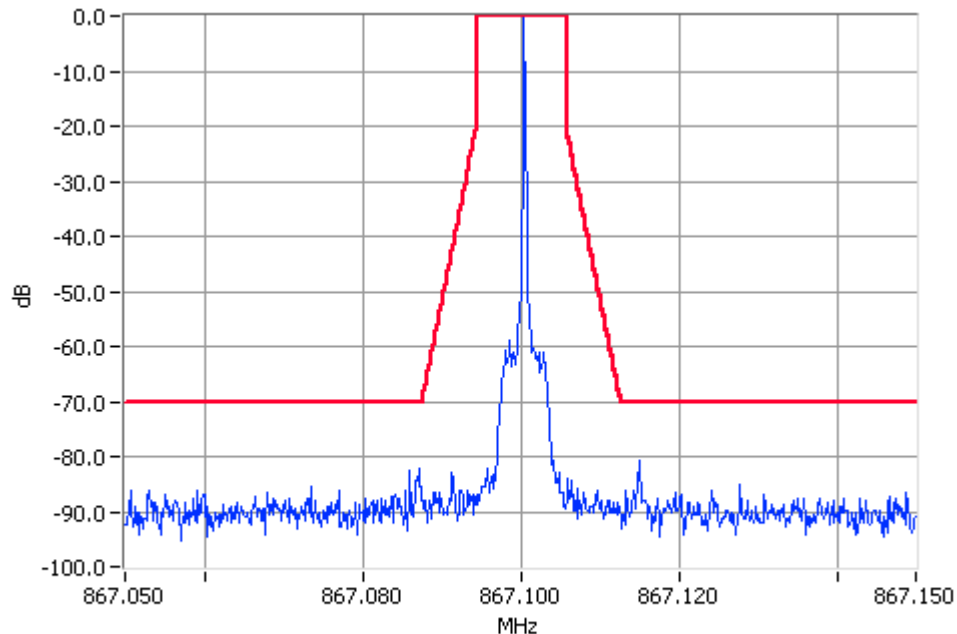
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ANALOGUE VOICE

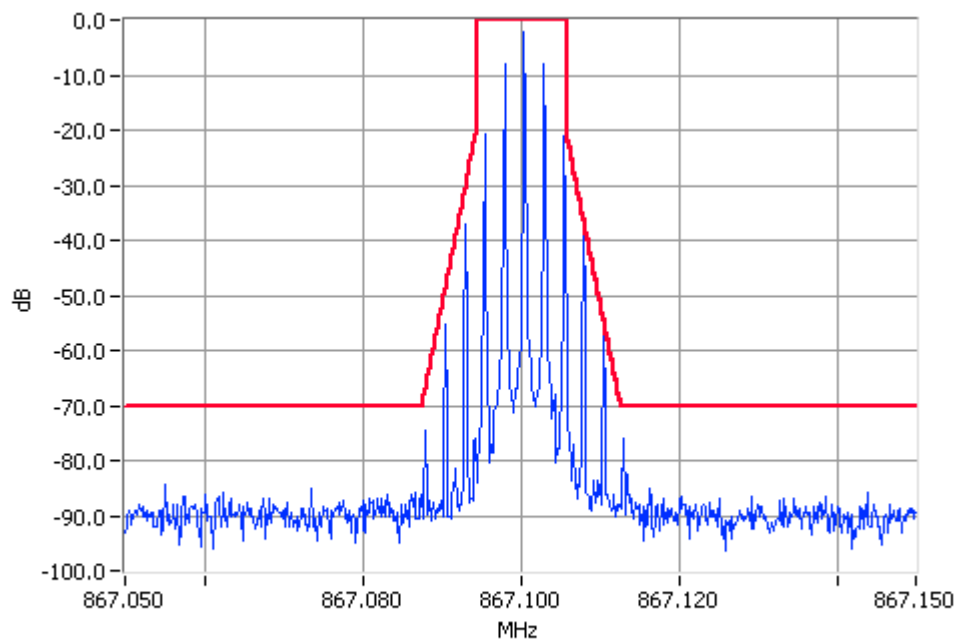
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 867.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

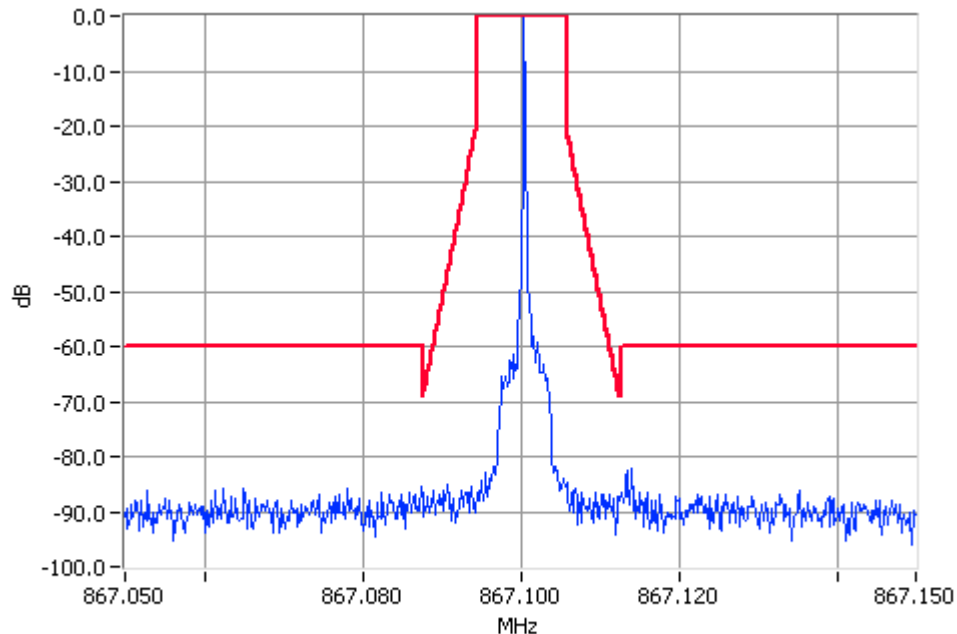
OCCUPIED BANDWIDTH

ANALGUE VOICE

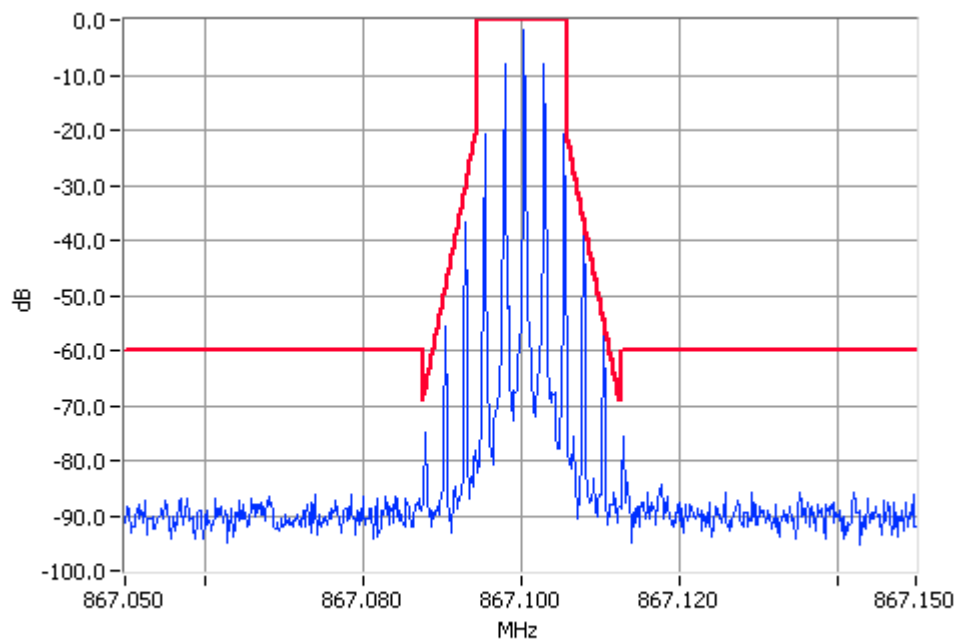
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 867.1 MHz 10W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 10W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 10W Pass
RBW=100Hz VBW=1000Hz

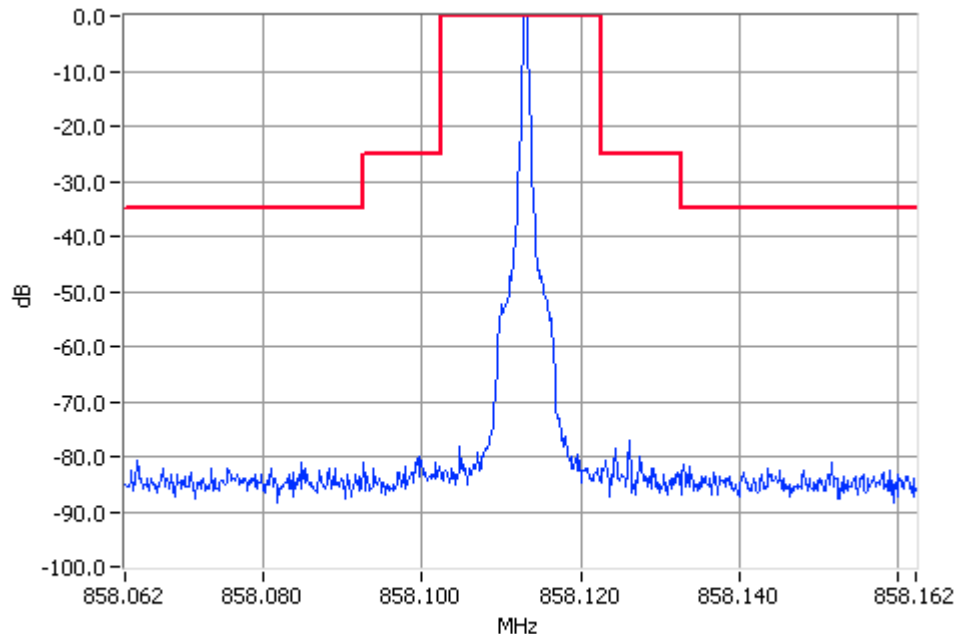
OCCUPIED BANDWIDTH

ANALOGUE VOICE

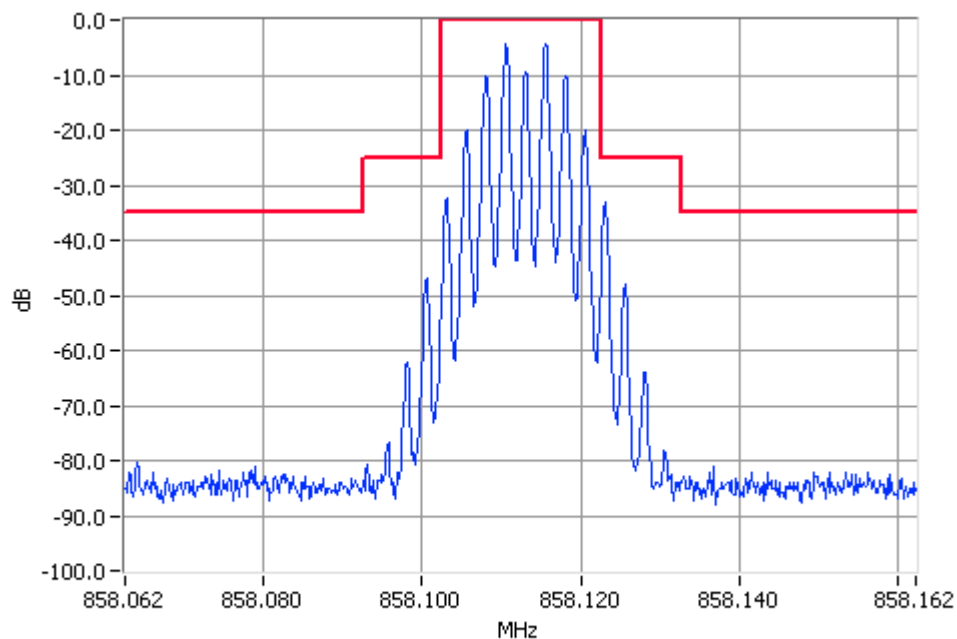
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 858.1125 MHz 50W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 50W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 50W Pass
RBW=300Hz VBW=3000Hz

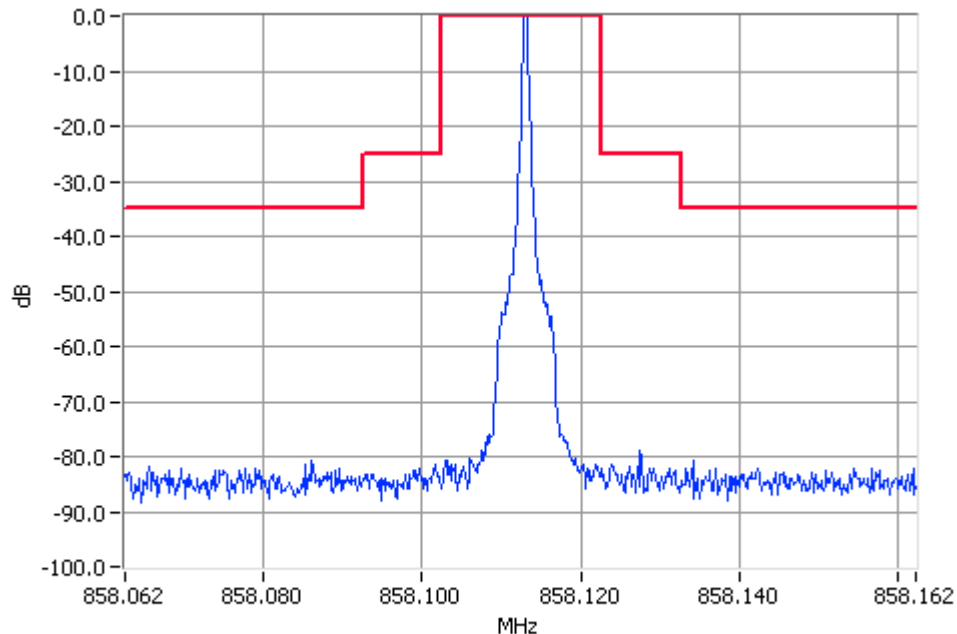
OCCUPIED BANDWIDTH

ANALOGUE VOICE

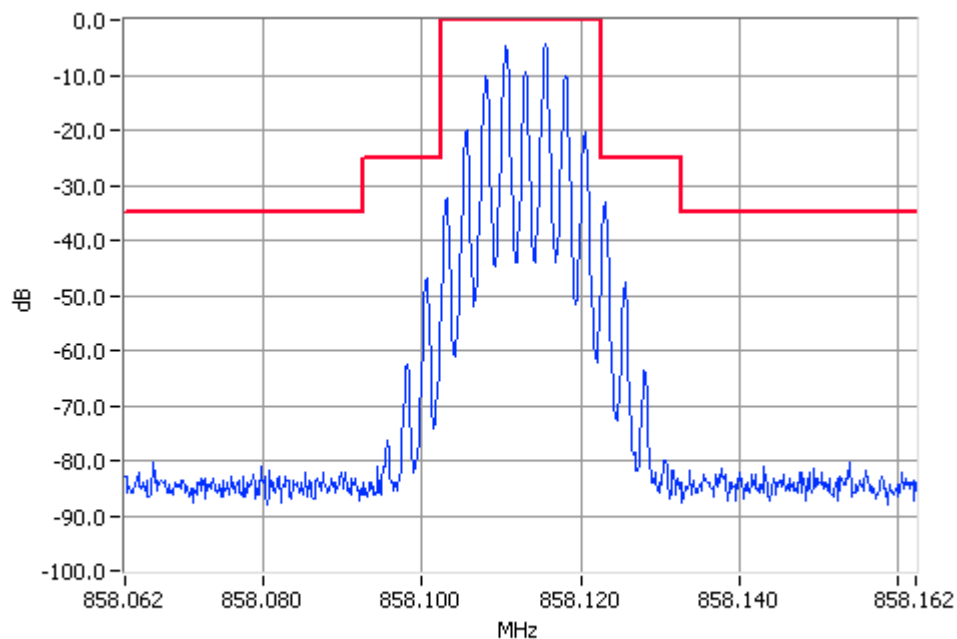
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 858.1125 MHz 5W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz

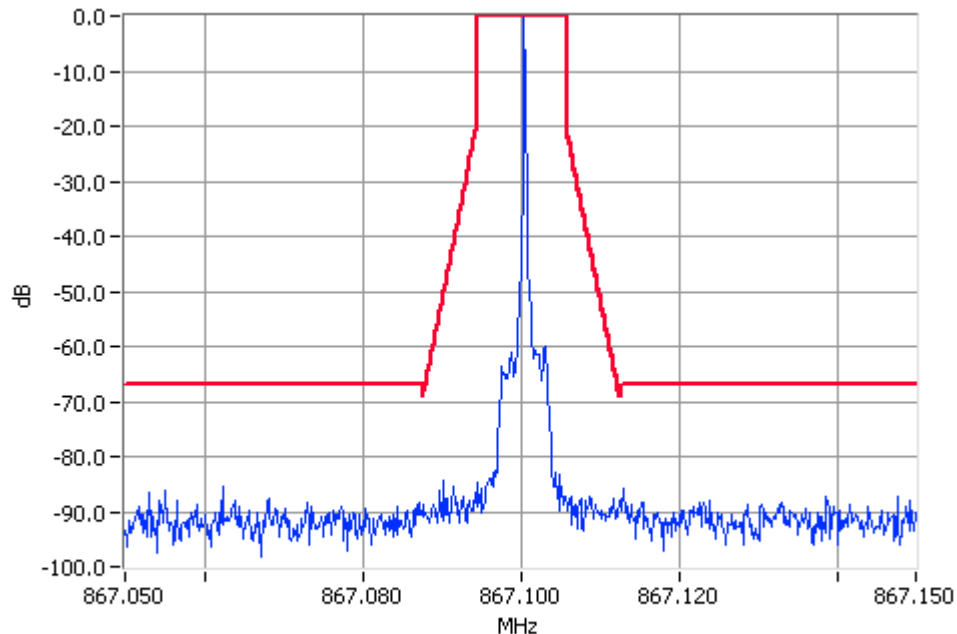
OCCUPIED BANDWIDTH

ANALOGUE VOICE

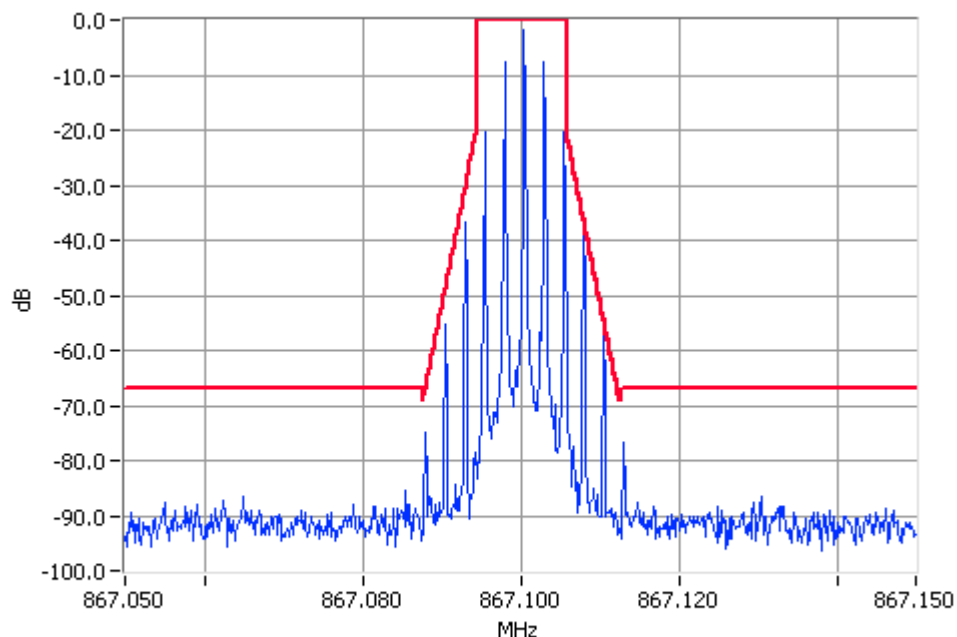
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 867.1 MHz 50W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz

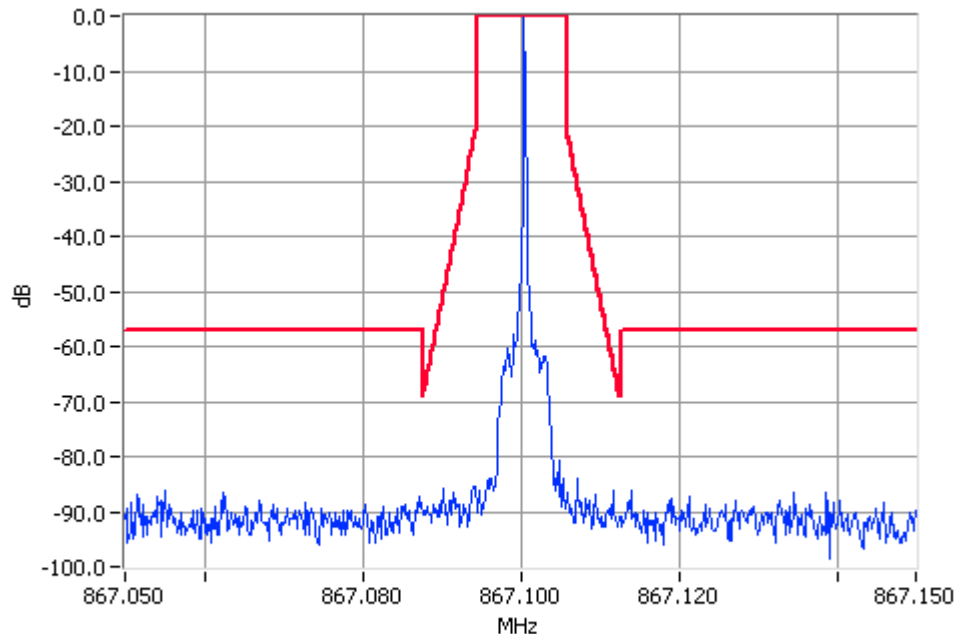
OCCUPIED BANDWIDTH

ANALGUE VOICE

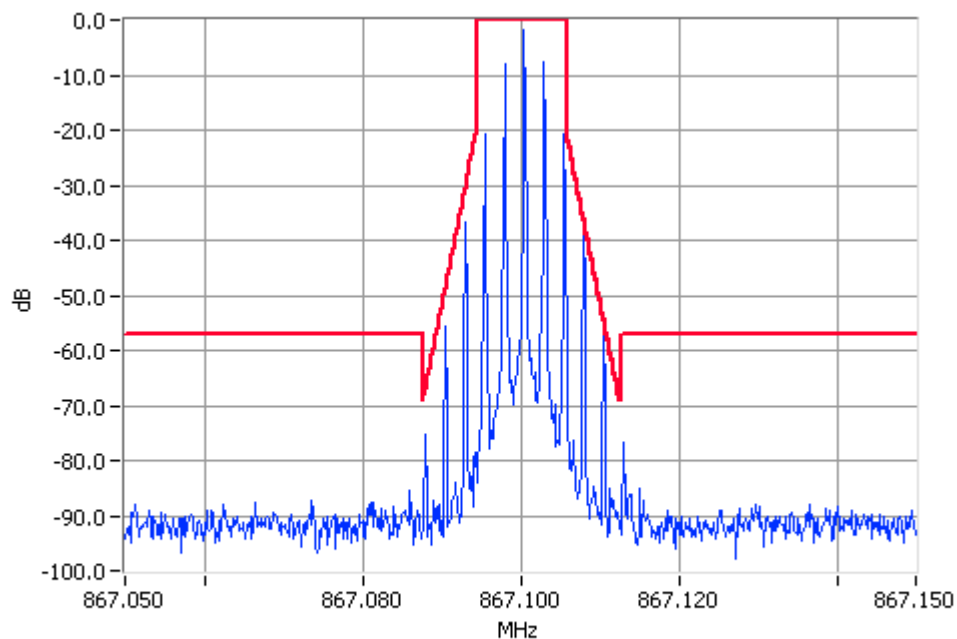
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 867.1 MHz 5W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

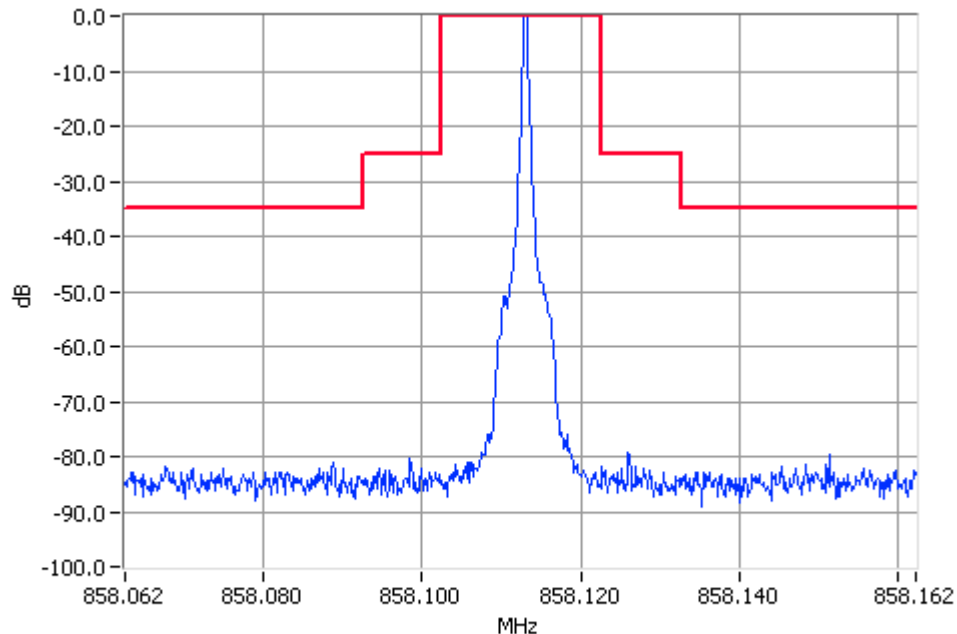
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ANALOGUE VOICE

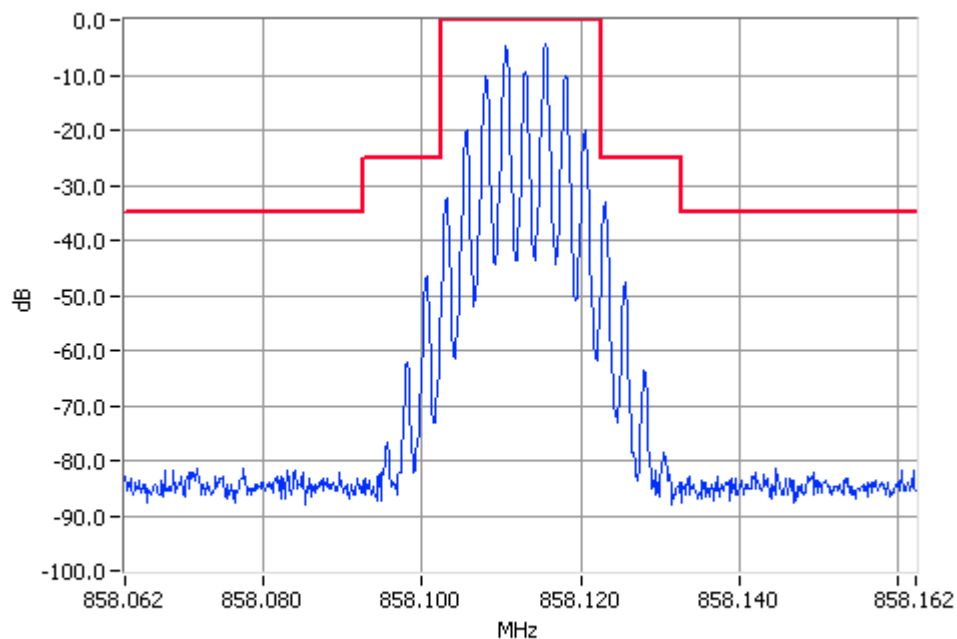
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 858.1125 MHz 5W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 5W Pass
RBW=300Hz VBW=3000Hz

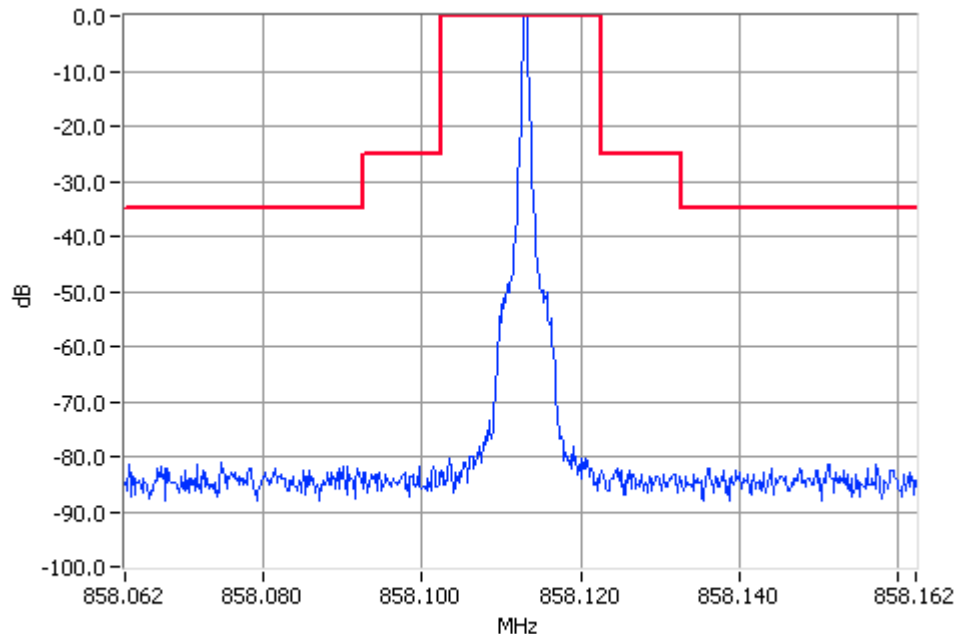
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ANALOGUE VOICE

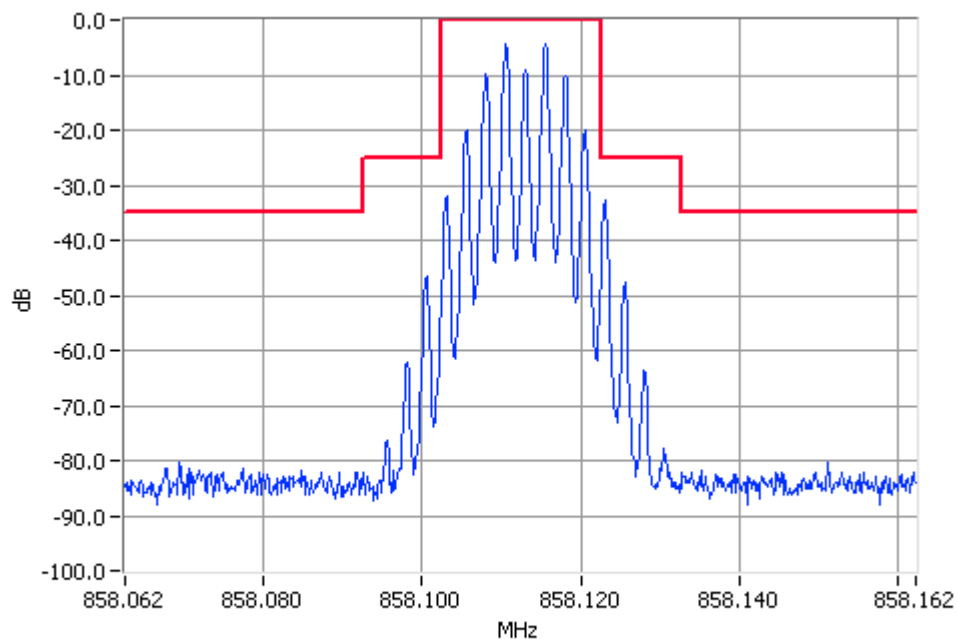
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 858.1125 MHz 1W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz



Analogue Modulation 858.1125MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

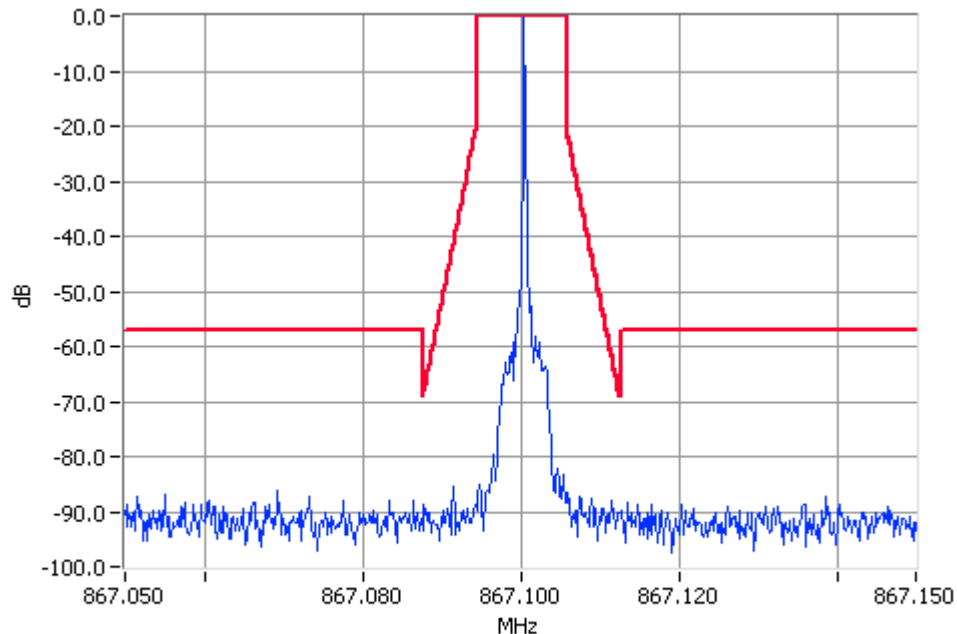
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ANALOGUE VOICE

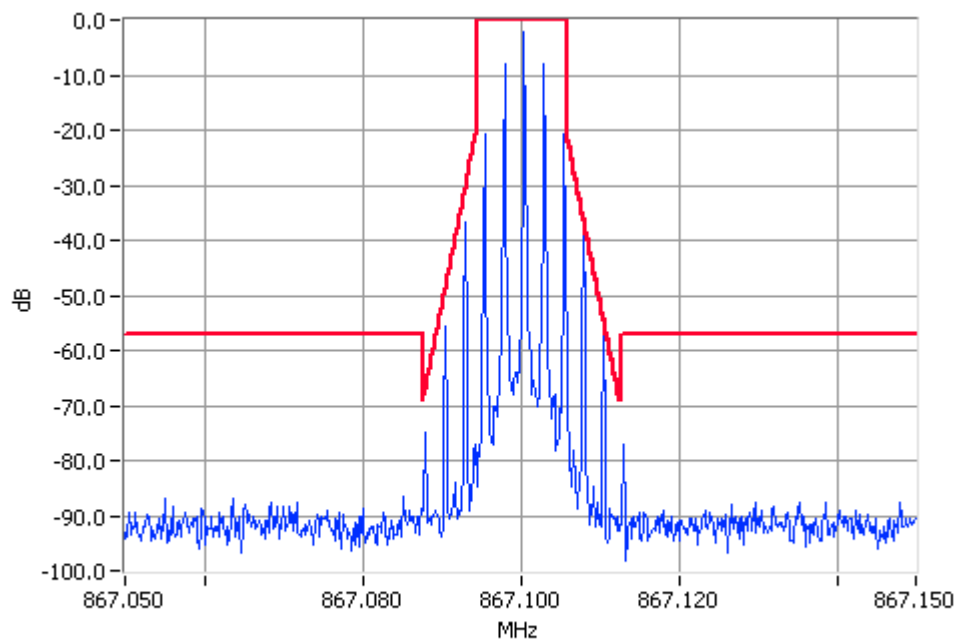
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 867.1 MHz 5W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

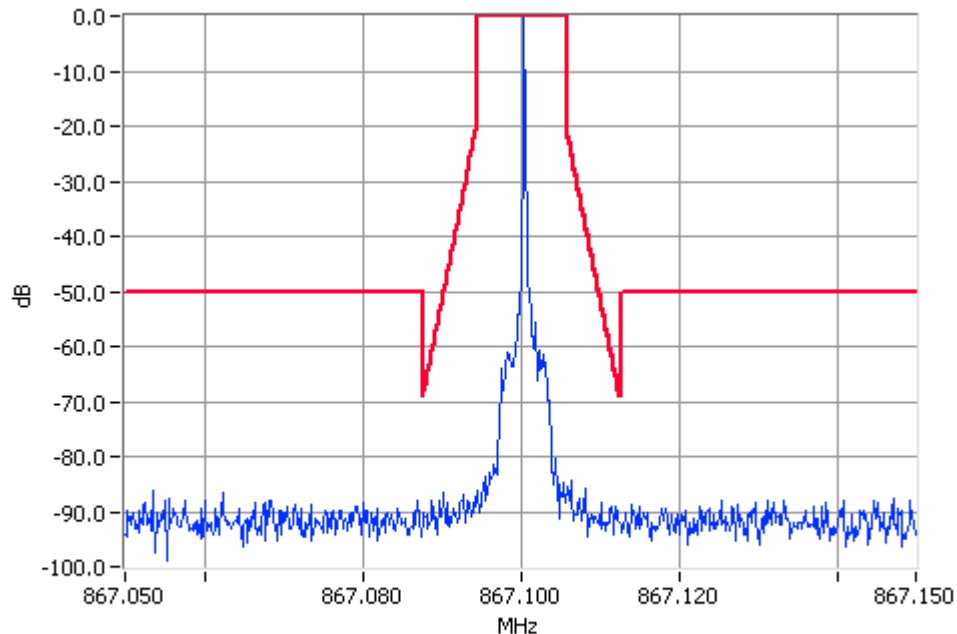
OCCUPIED BANDWIDTH

ANALGUE VOICE

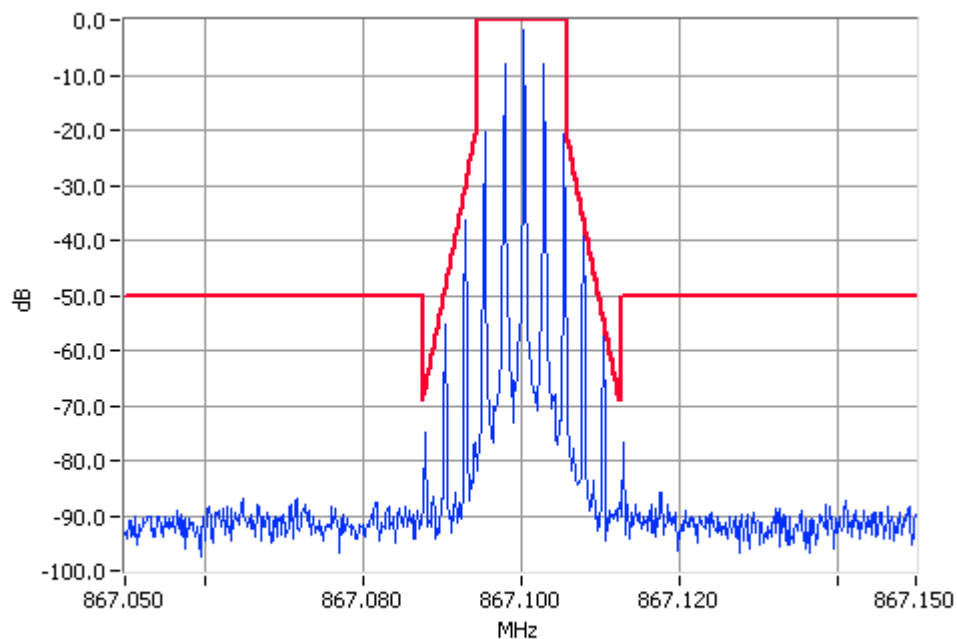
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 867.1 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz



Analogue Modulation 867.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

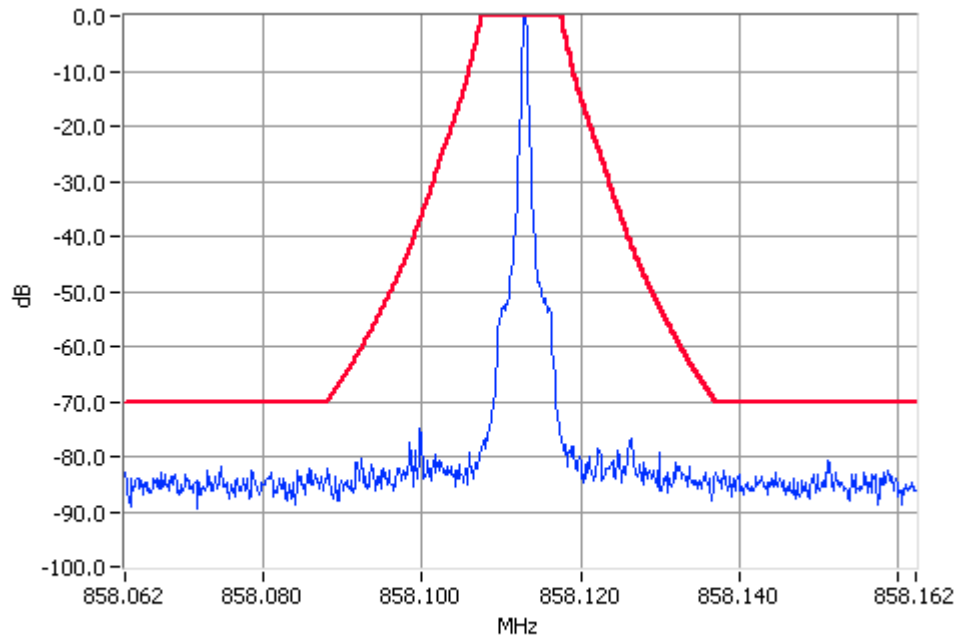
OCCUPIED BANDWIDTH

FFSK

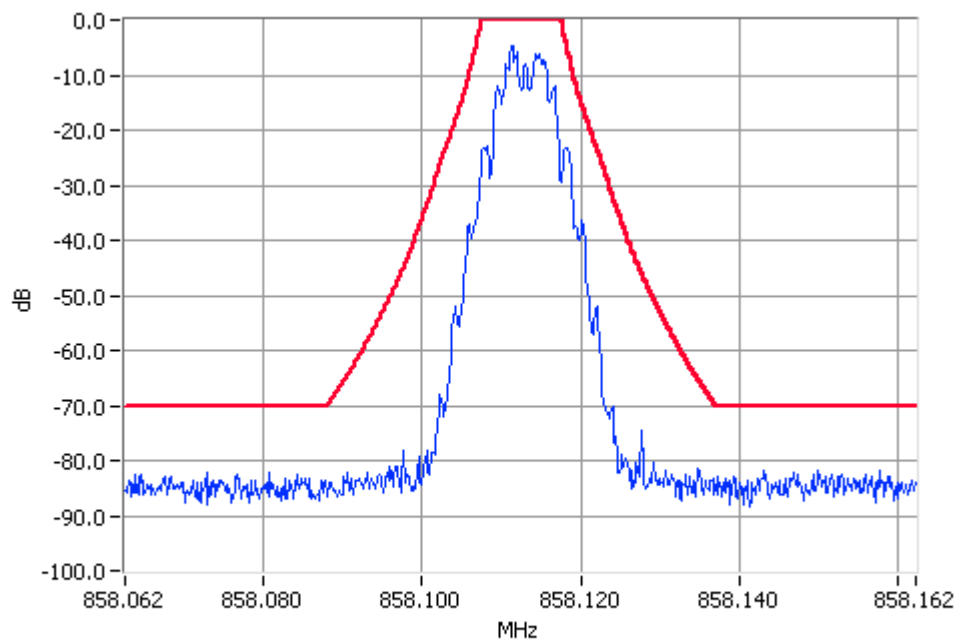
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 858.1125 MHz 100W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 100W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 100W Pass
RBW=300Hz VBW=3000Hz

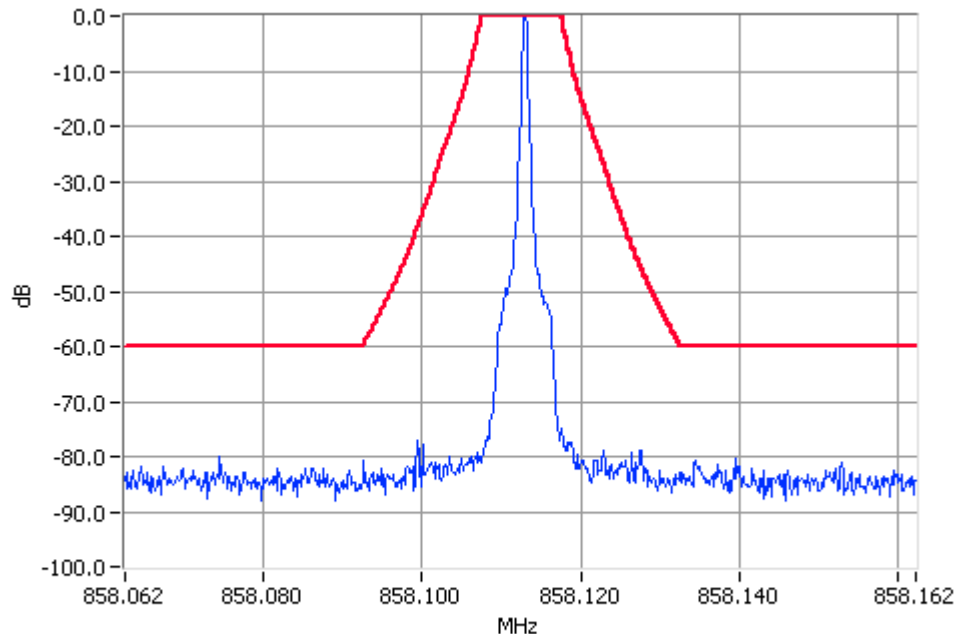
OCCUPIED BANDWIDTH

FFSK

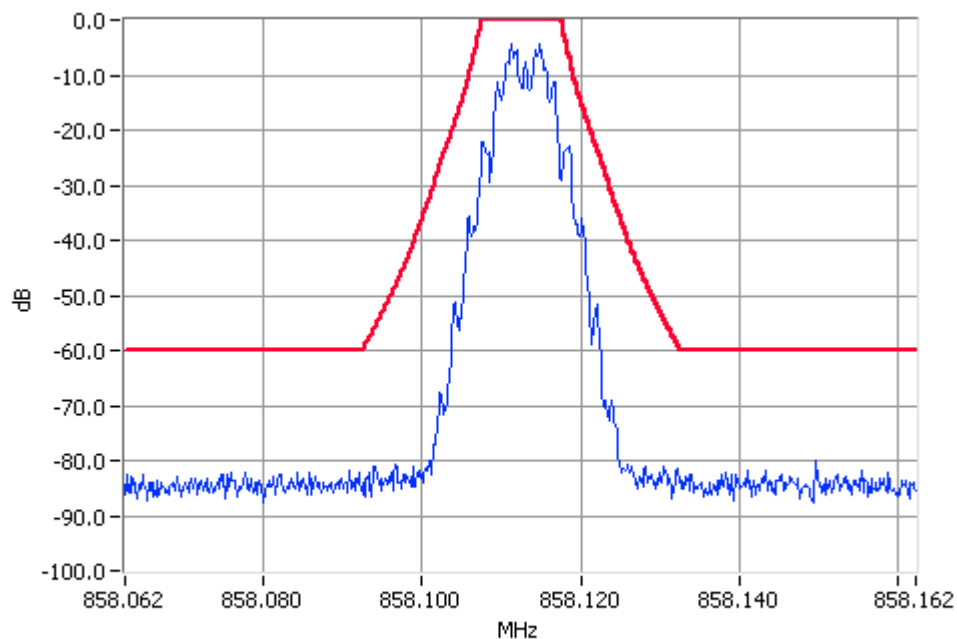
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 858.1125 MHz 10W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 10W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 10W Pass
RBW=300Hz VBW=3000Hz

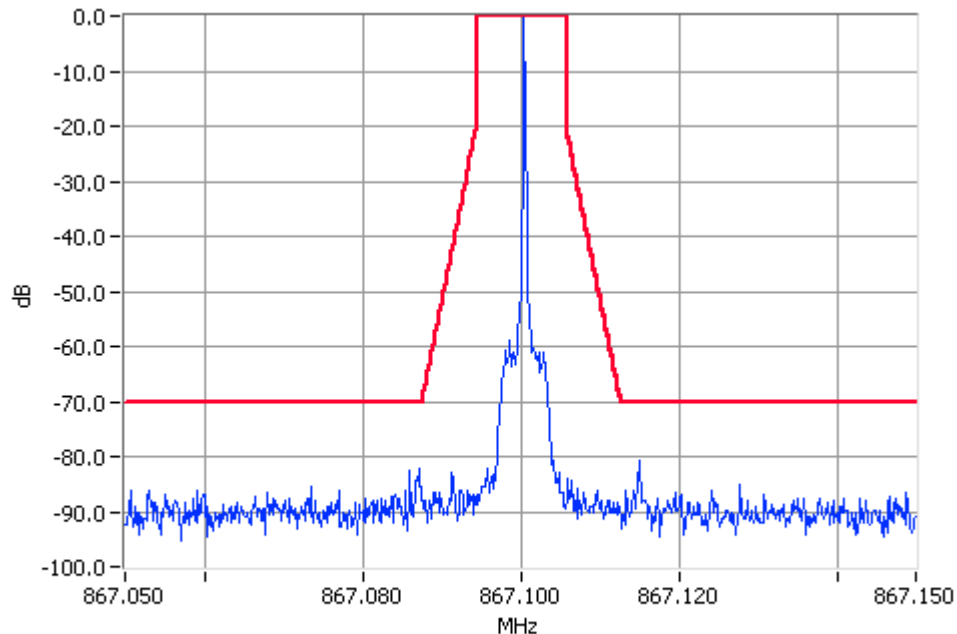
OCCUPIED BANDWIDTH

FFSK

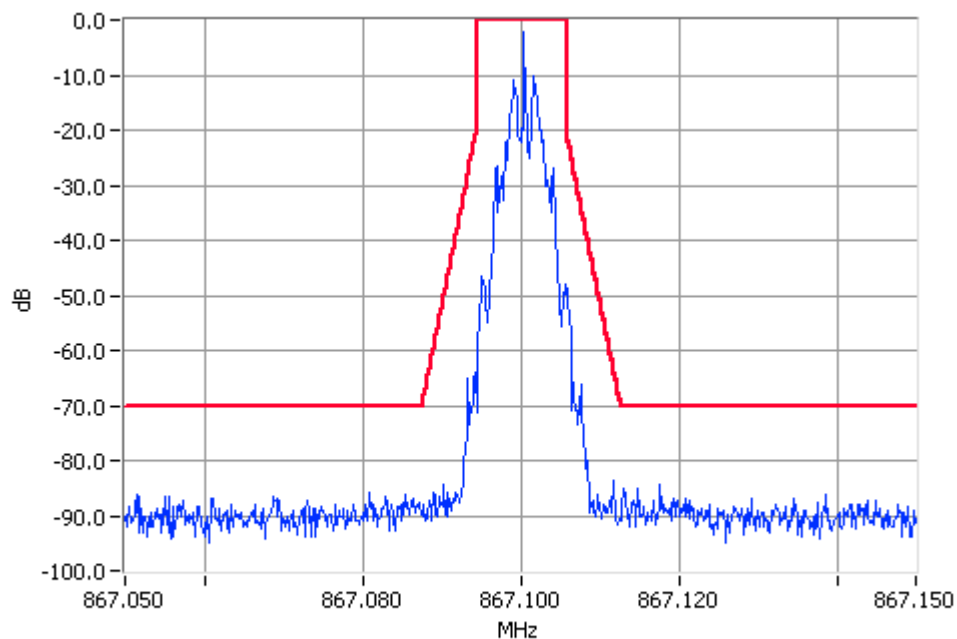
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 867.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

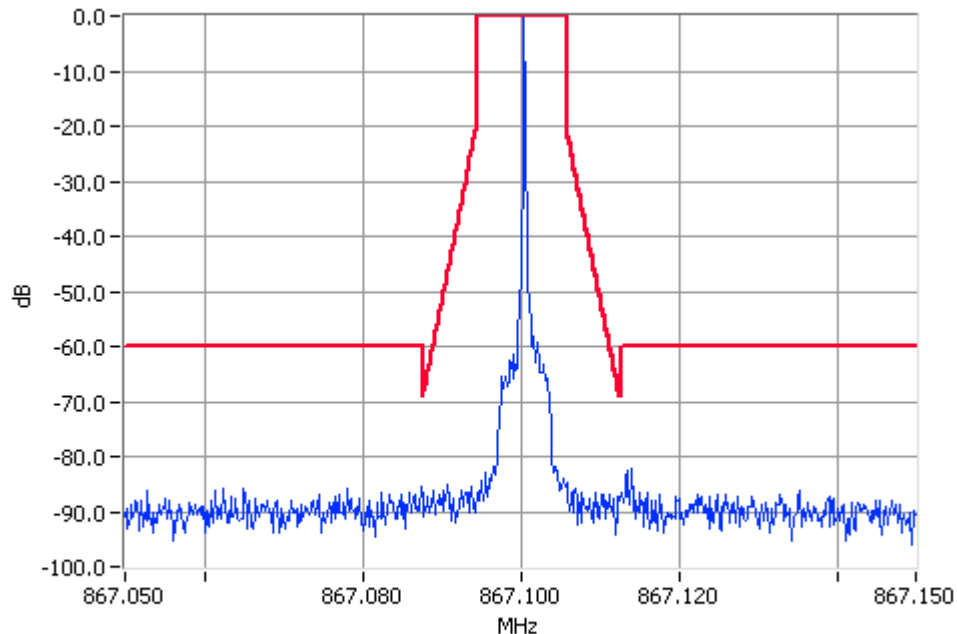
OCCUPIED BANDWIDTH

FFSK

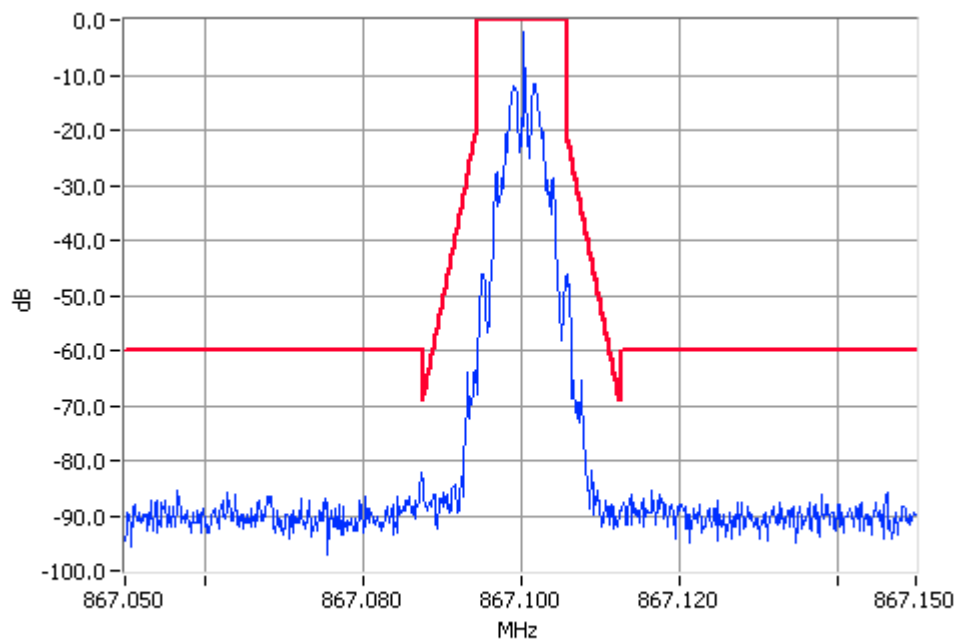
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 100W

Tx FREQUENCY: 867.1 MHz 10W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 10W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 10W Pass
RBW=100Hz VBW=1000Hz

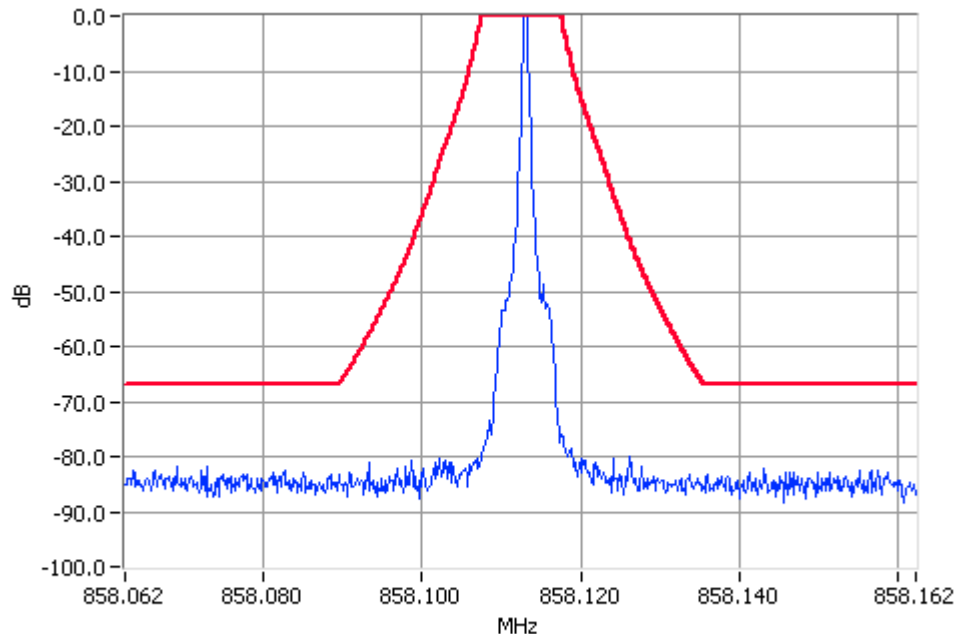
OCCUPIED BANDWIDTH

FFSK

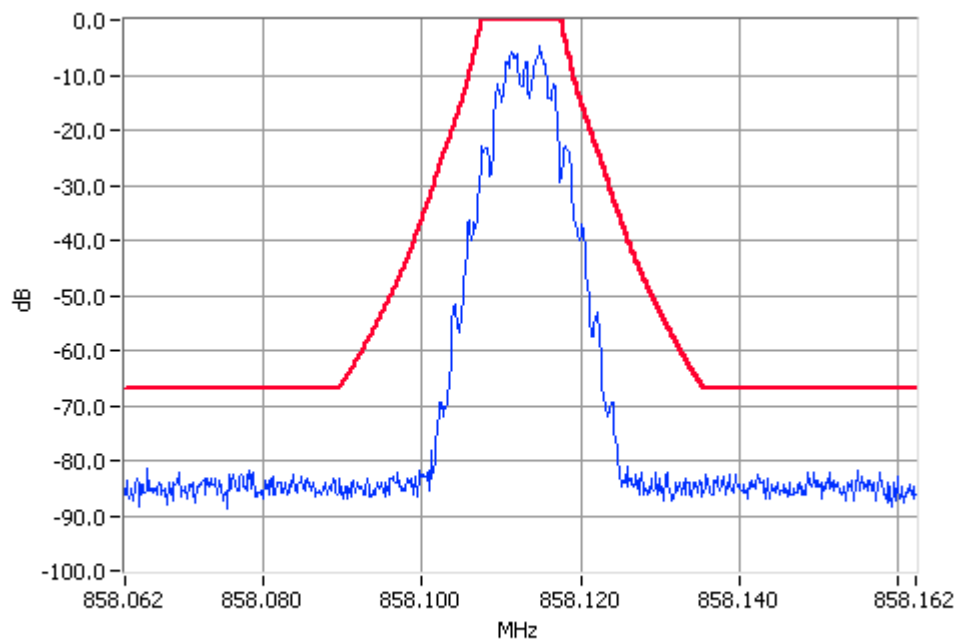
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 858.1125 MHz 50W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 50W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 50W Pass
RBW=300Hz VBW=3000Hz

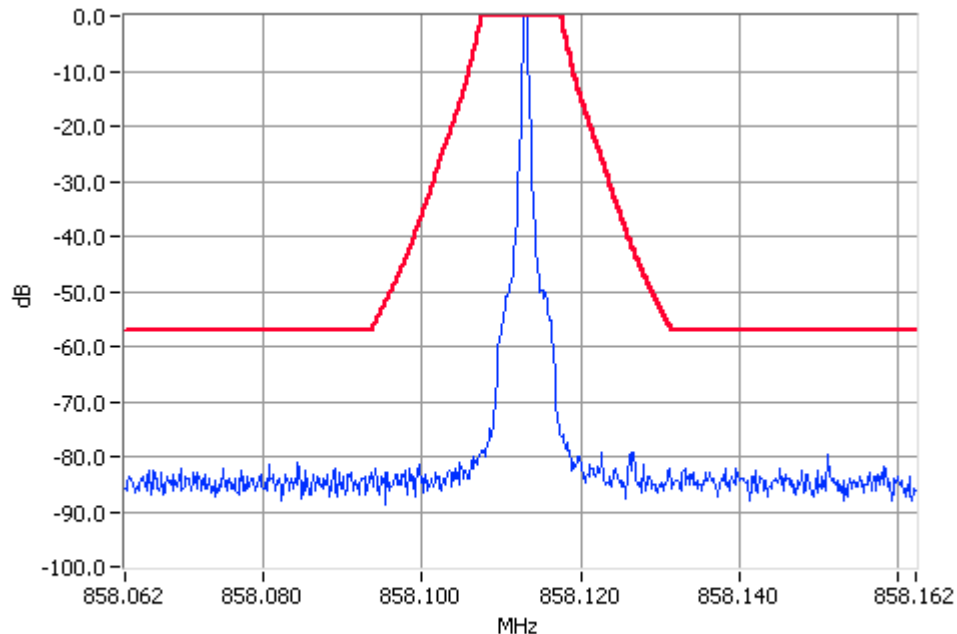
OCCUPIED BANDWIDTH

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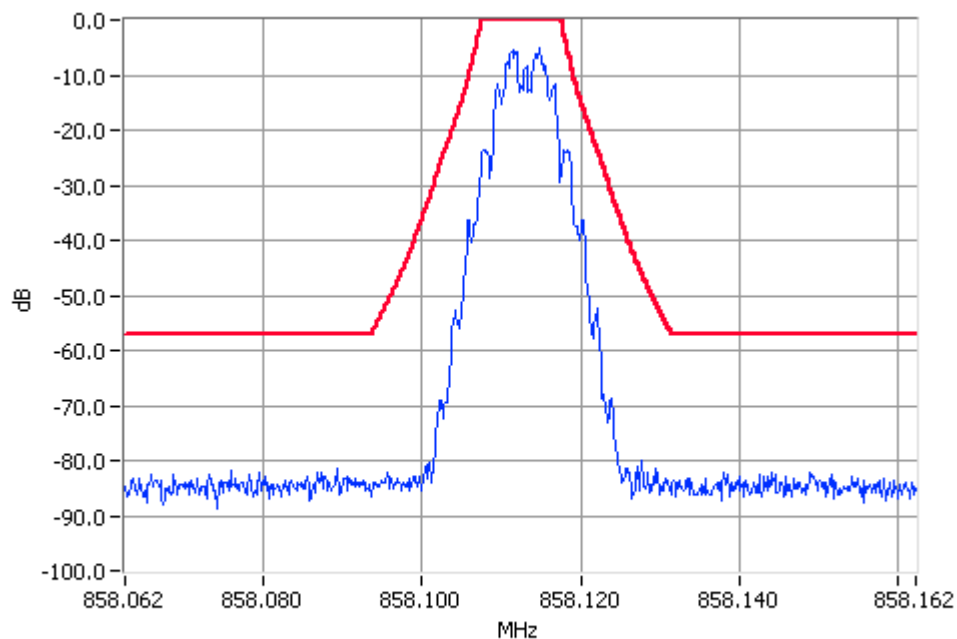
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 858.1125 MHz 5W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 5W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 5W Pass
RBW=300Hz VBW=3000Hz

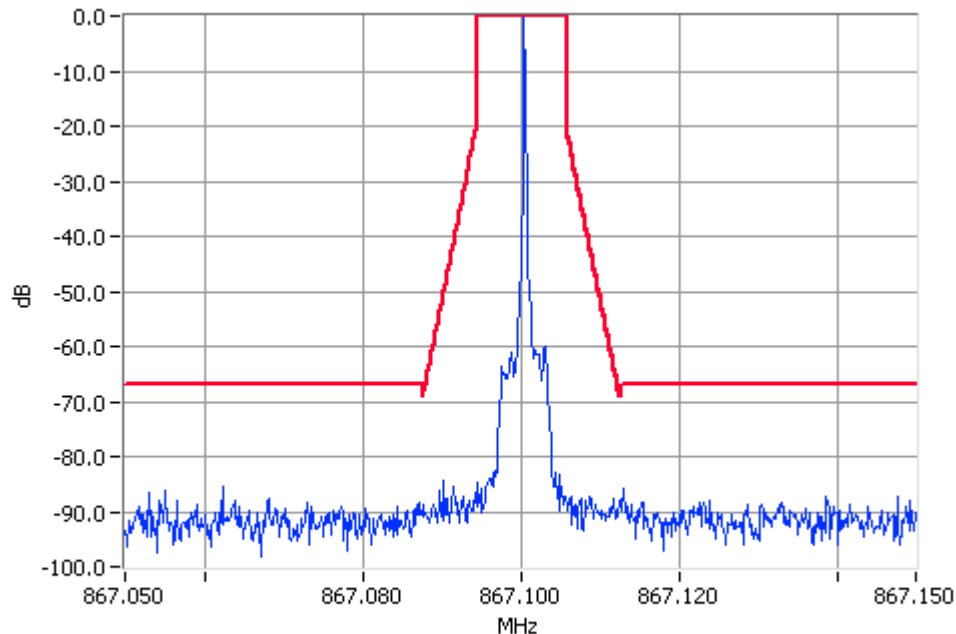
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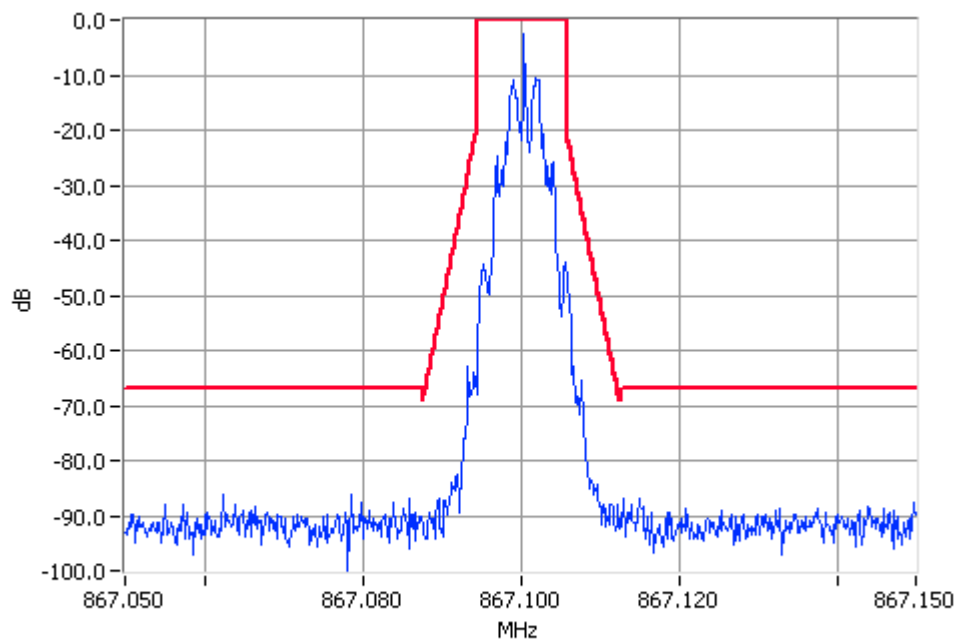
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 867.1 MHz 50W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 50W Pass
RBW=100Hz VBW=1000Hz

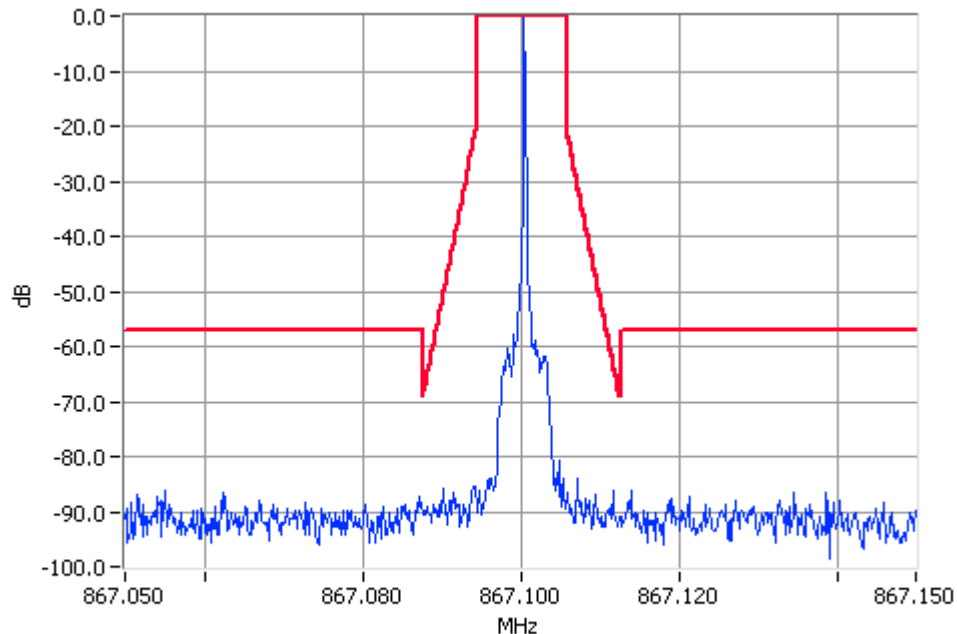
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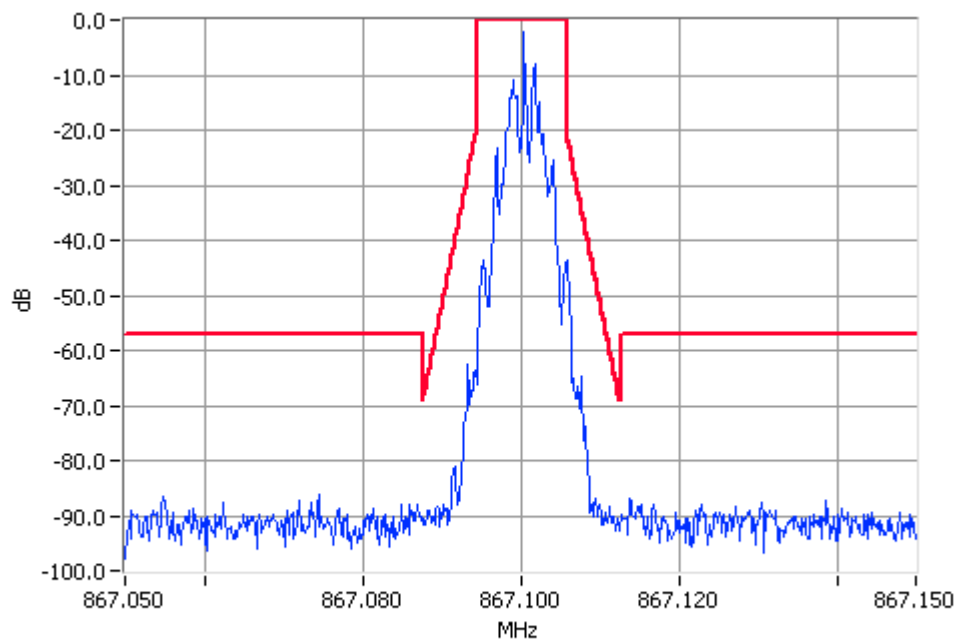
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 50W

Tx FREQUENCY: 867.1 MHz 5W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

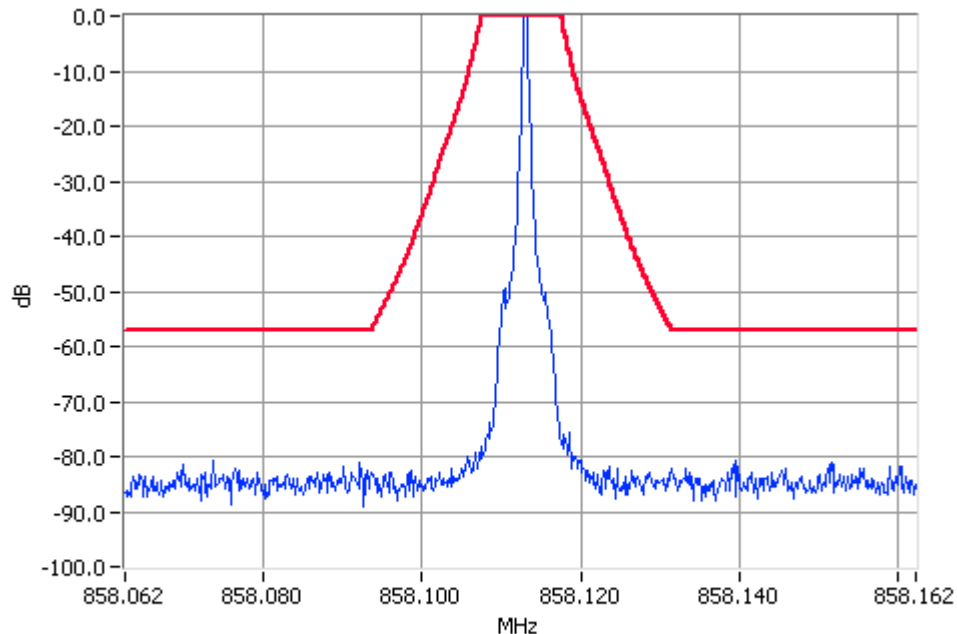
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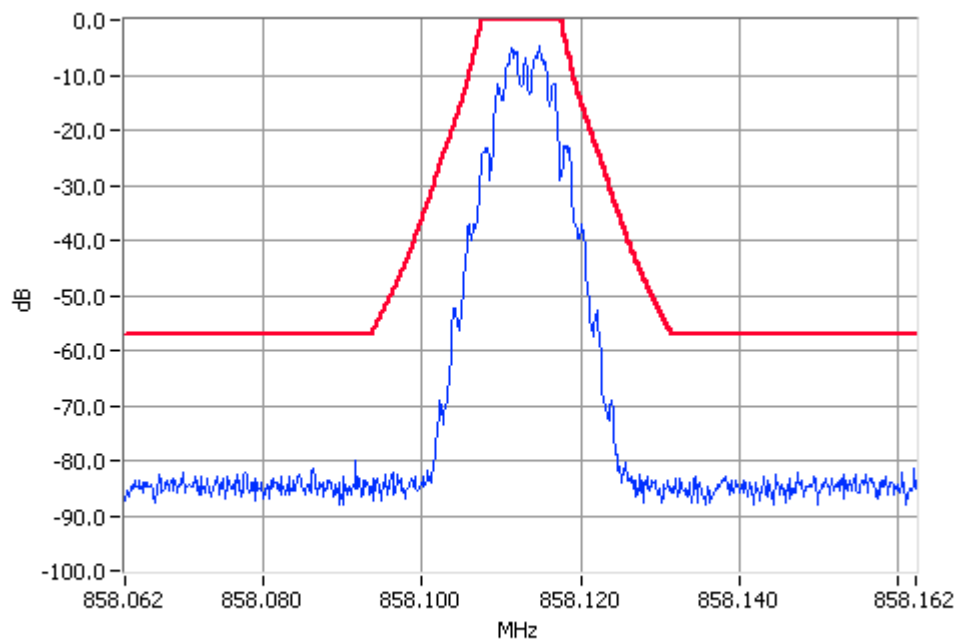
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 858.1125 MHz 5W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 5W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 5W Pass
RBW=300Hz VBW=3000Hz

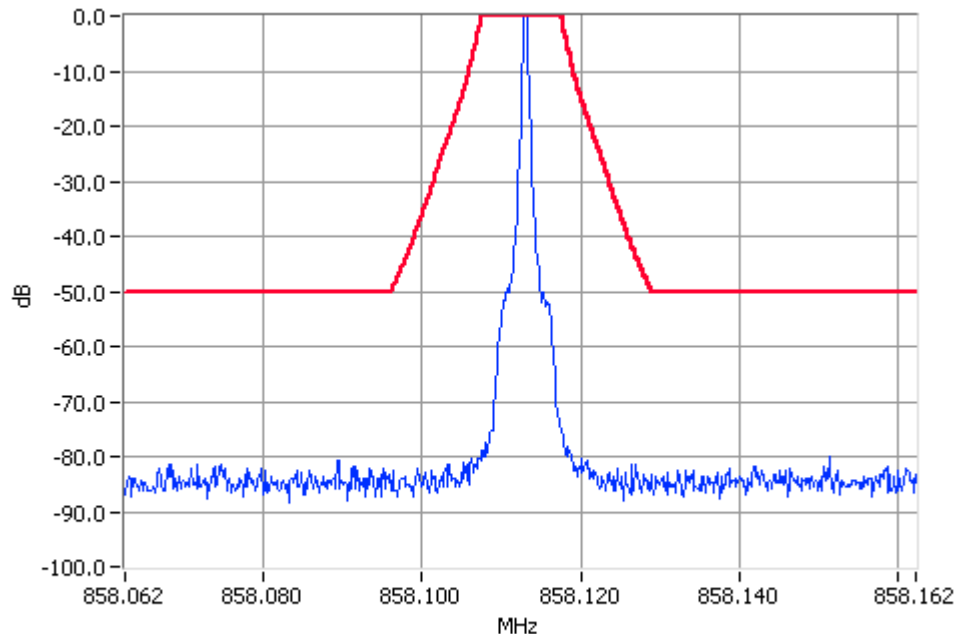
OCCUPIED BANDWIDTH

FFSK

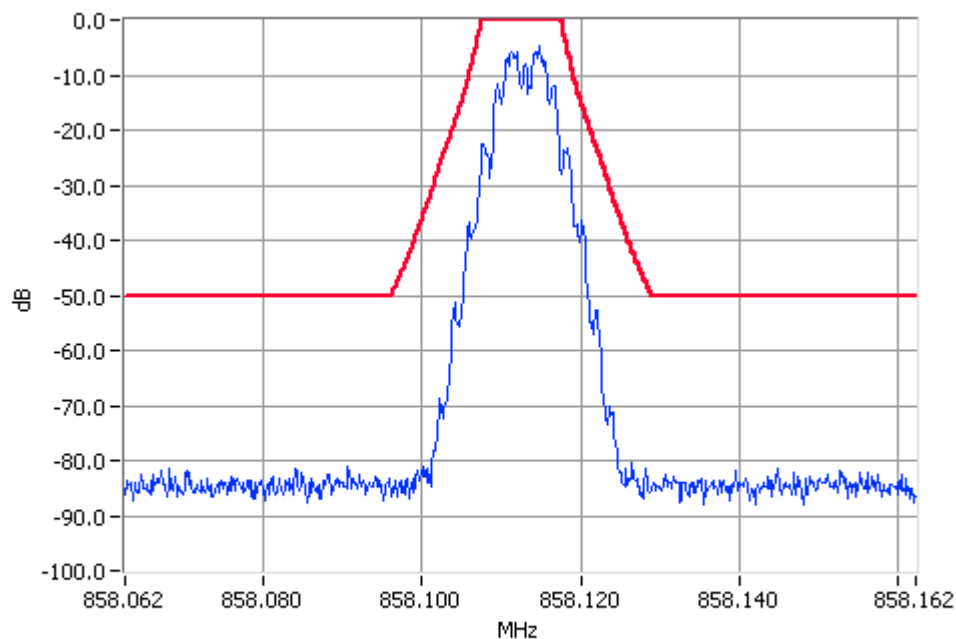
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 858.1125 MHz 1W 25 kHz Channel Spacing



Unmodulated 858.1125MHz Mask G 1W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 858.1125MHz Mask G 1W Pass
RBW=300Hz VBW=3000Hz

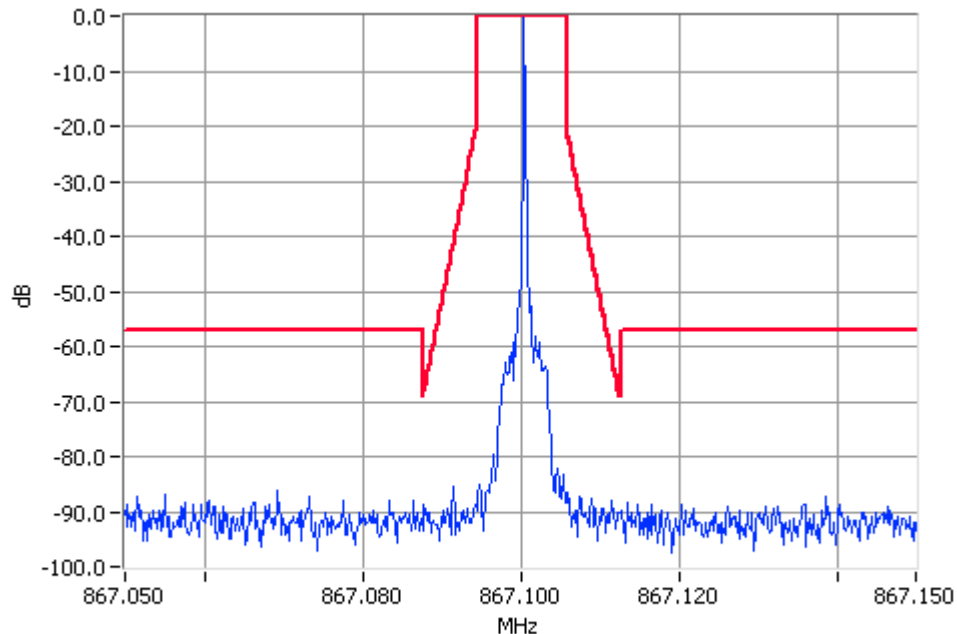
OCCUPIED BANDWIDTH

FFSK

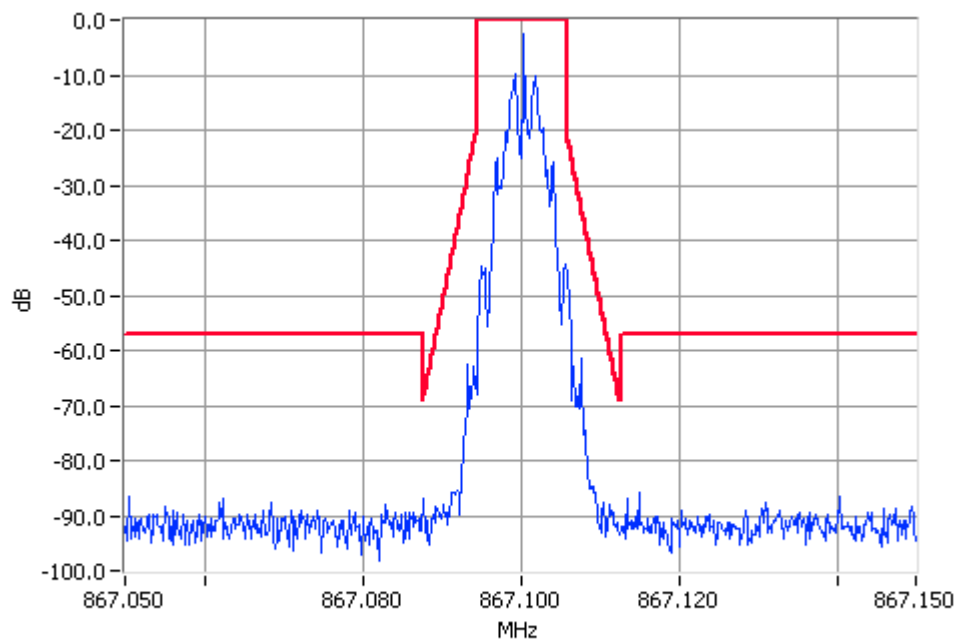
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 867.1 MHz 5W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 5W Pass
RBW=100Hz VBW=1000Hz

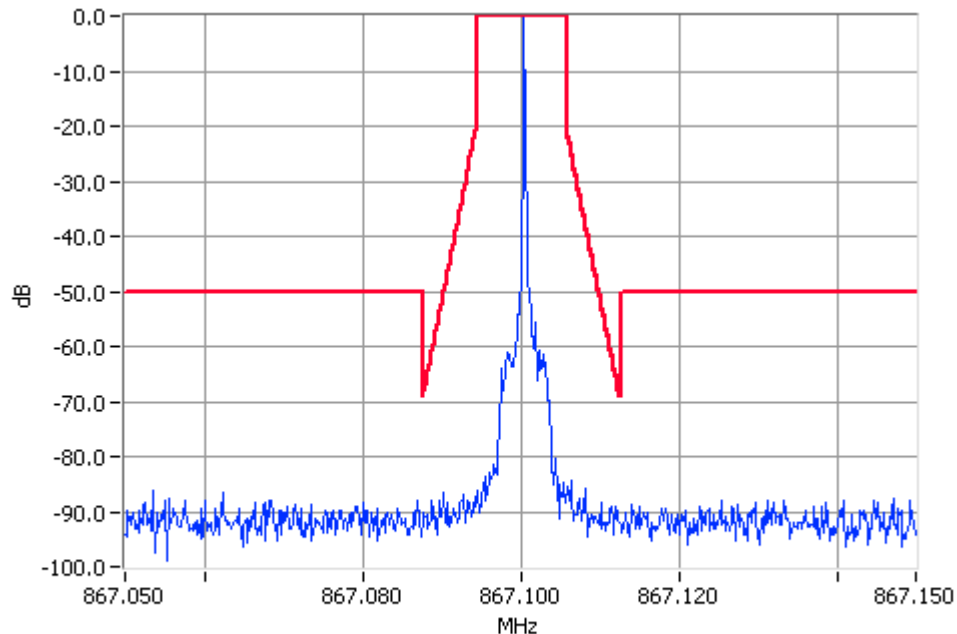
OCCUPIED BANDWIDTH

FFSK

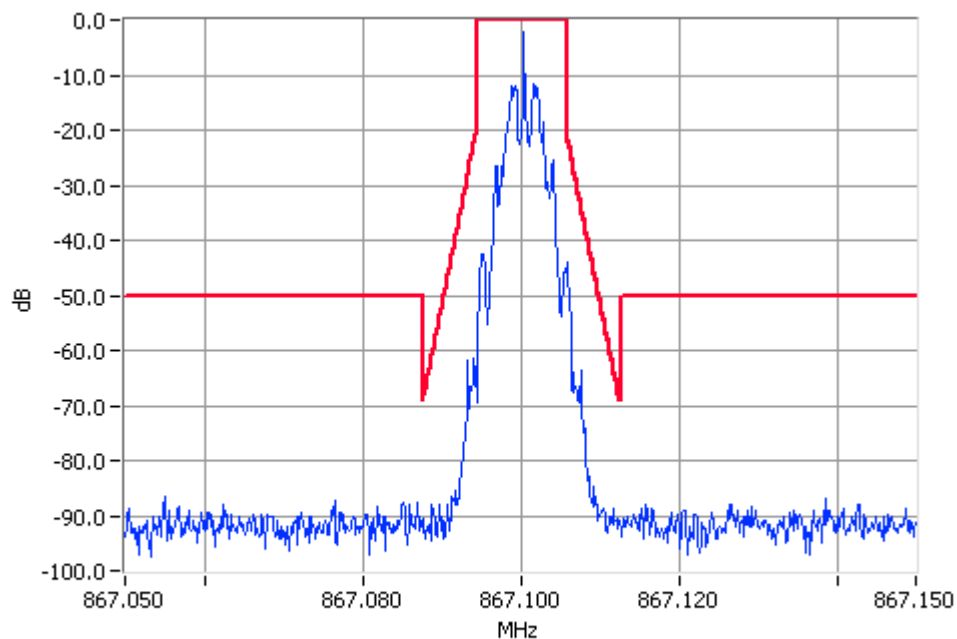
SPECIFICATION: FCC CFR 2.1049 (c)

POWER AMPLIFIER: 5W

Tx FREQUENCY: 867.1 MHz 1W 12.5 kHz Channel Spacing



Unmodulated 867.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz



Digital Modulation 867.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

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.

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: 858.1125 MHz

Power Amplifier: 100W		
25 kHz Channel Spacing	858.1125 MHz @ 100 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
2574.3371	-39.1	-89.1
3432.4495	-32.1	-82.1
4290.5620	-34.1	-84.1
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-13 dBm	53 dBc
100 W	-13 dBm	63 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	867.1 MHz @ 100 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1734.1999	-40.0	-90
2601.2998	-38.4	-88.4
3468.3998	-30.6	-80.6
4335.4997	-32.6	-82.6
No other 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-20 dBm	60 dBc
100 W	-20 dBm	70 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	867.1 MHz @ 10 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-20 dBm	60 dBc
100 W	-20 dBm	70 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 50W		
25 kHz Channel Spacing	858.1125 MHz @ 50 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
3432.4496	-33.2	80.2
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-13 dBm	50 dBc
50 W	-13 dBm	60 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 50 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
3468.3996	-32.3	79.3
No other 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
50 W	-20 dBm	67 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 5 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
50 W	-20 dBm	67 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 5W		
25 kHz Channel Spacing	858.1125 MHz @ 5 W	Emission Mask B
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 B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
1 W	-13 dBm	43 dBc
5 W	-13 dBm	50 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 5W		
25 kHz Channel Spacing	858.1125 MHz @ 1 W	Emission Mask B
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 B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
1 W	-13 dBm	43 dBc
5 W	-13 dBm	50 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 5 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10} (P_{\text{Watts}})$	
1 W	-20 dBm	50 dBc
5 W	-20 dBm	57 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10} (P_{\text{Watts}})$	
1 W	-20 dBm	50 dBc
5 W	-20 dBm	57 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 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 100W		
25 kHz Channel Spacing	858.1125 MHz @ 100 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1716.2250	-31.24	-81.24
2574.3375	-38.17	-88.17
3432.4500	-26.01	-76.01
4290.5625	-35.15	-85.15
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
10 W	-13 dBm	53 dBc
100 W	-13 dBm	63 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 100W		
25 kHz Channel Spacing	858.1125 MHz @ 10 W	Emission Mask B
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 B 25 kHz Channel Spacing $43 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-13 dBm	53 dBc
100 W	-13 dBm	63 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	867.1 MHz @ 100 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1734.2000	-32.99	-82.99
2601.3000	-34.50	-84.50
3468.4000	-24.01	-74.01
4335.5000	-27.08	-77.08
No other 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-20 dBm	60 dBc
100 W	-20 dBm	70 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 100W		
12.5 kHz Channel Spacing	867.1 MHz @ 10 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10} (P_{\text{Watts}})$	
10 W	-20 dBm	60 dBc
100 W	-20 dBm	70 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 50W		
25 kHz Channel Spacing	858.1125 MHz @ 50 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1716.2250	-27.44	-74.44
2574.3375	-31.47	-78.47
3432.4500	-34.19	-81.19
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-13 dBm	50 dBc
50 W	-13 dBm	60 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 50W		
25 kHz Channel Spacing	858.1125 MHz @ 5 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1716.2250	-38.71	-75.71
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-13 dBm	50 dBc
50 W	-13 dBm	60 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 50 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1734.2000	-36.04	-83.04
2601.3000	-31.22	-78.22
3468.4000	-27.79	-74.79

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10}(P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
50 W	-20 dBm	67 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 50W		
12.5 kHz Channel Spacing	867.1 MHz @ 5 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
No emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10 \log_{10} (P_{\text{Watts}})$	
5 W	-20 dBm	57 dBc
50 W	-20 dBm	67 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 5W		
25 kHz Channel Spacing	858.1125 MHz @ 5 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1716.2250	-28.31	-65.31
3432.4500	-31.12	-68.12
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
1 W	-13 dBm	43 dBc
5 W	-13 dBm	50 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 858.1125 MHz

Power Amplifier: 5W		
25 kHz Channel Spacing	858.1125 MHz @ 1 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1716.2250	-36.37	-66.37
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10}(P_{\text{Watts}})$	
1 W	-13 dBm	43 dBc
5 W	-13 dBm	50 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 5W		
25 kHz Channel Spacing	867.1 MHz @ 5 W	Emission Mask B
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1734.2000	-29.01	-66.01
3468.4000	-27.15	-64.15
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

Carrier Output Power Watts	Emission Mask B 25 kHz Channel Spacing $43 + 10 \log_{10} (P_{\text{Watts}})$	
1 W	-13 dBm	43 dBc
5 W	-13 dBm	50 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 867.1 MHz

Power Amplifier: 5W		
12.5 kHz Channel Spacing	867.1 MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1734.2000	-35.22	-65.22
No other 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 $50 + 10 \log_{10} (P_{\text{Watts}})$	
1 W	-20 dBm	50 dBc
5 W	-20 dBm	57 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 $+50^{\circ}\text{C}$ 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.

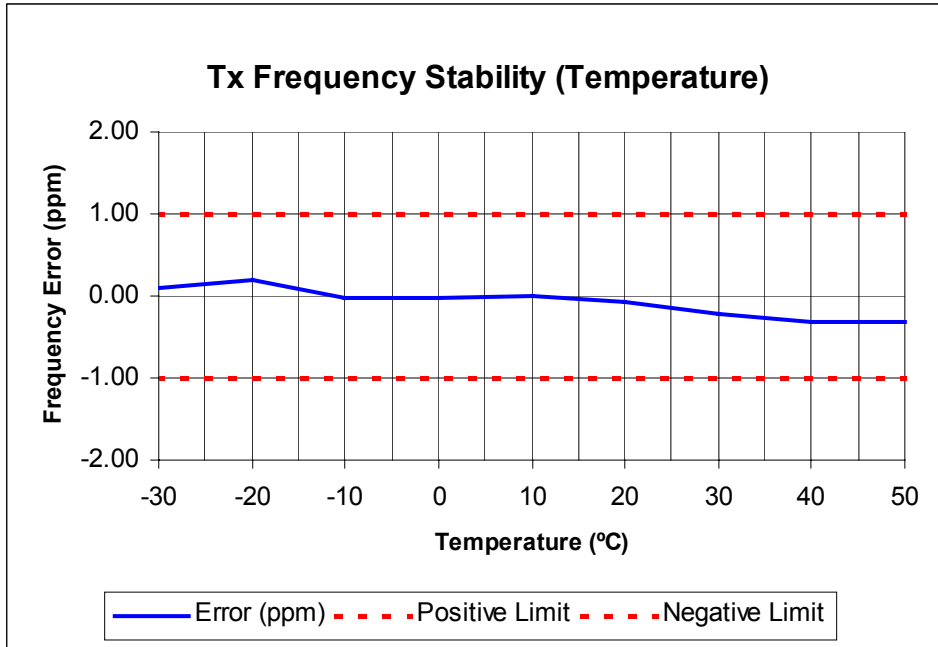
LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range	Frequency Error (ppm)
851 – 866 MHz	1.5
866 – 869 MHz	1

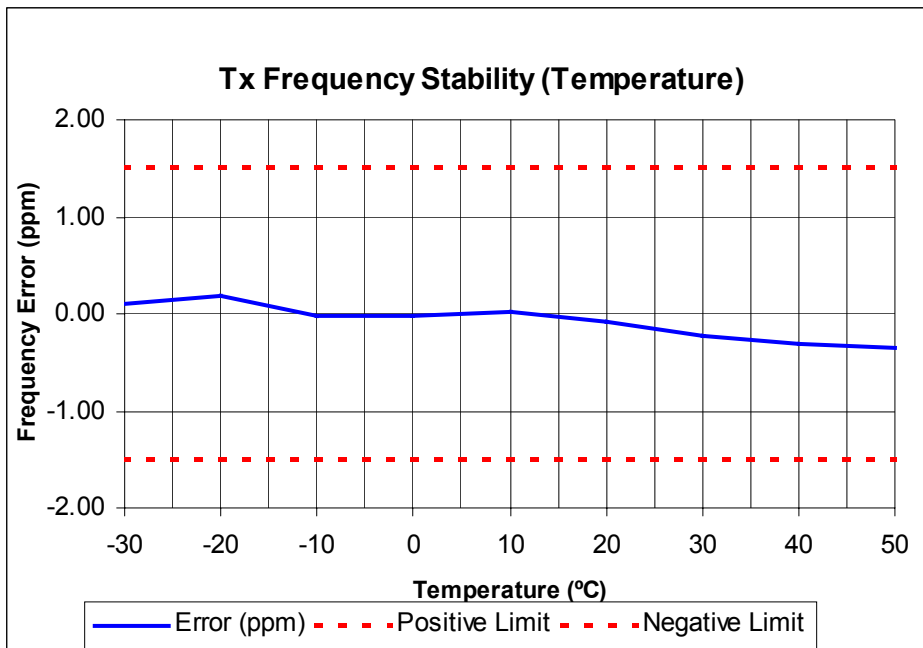
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 867.1 MHz 100W 12.5 kHz channel Spacing



Tx FREQUENCY: 858.1125 MHz 100W 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 ERROR (ppm) @ 858.1125 MHz		
Channel Spacing (kHz)	102 V ac	120 V ac	138 V ac
25	-0.12	-0.11	-0.12
	FREQUENCY ERROR (ppm) @ 867.1 MHz		
Channel Spacing (kHz)	102 V ac	120 V ac	138 V ac
12.5	-0.22	-0.22	-0.21

LIMIT CLAUSE: FCC 47 CFR 90.213

Frequency Range	Frequency Error (ppm)
851 – 866 MHz	1.5
866 – 869 MHz	1

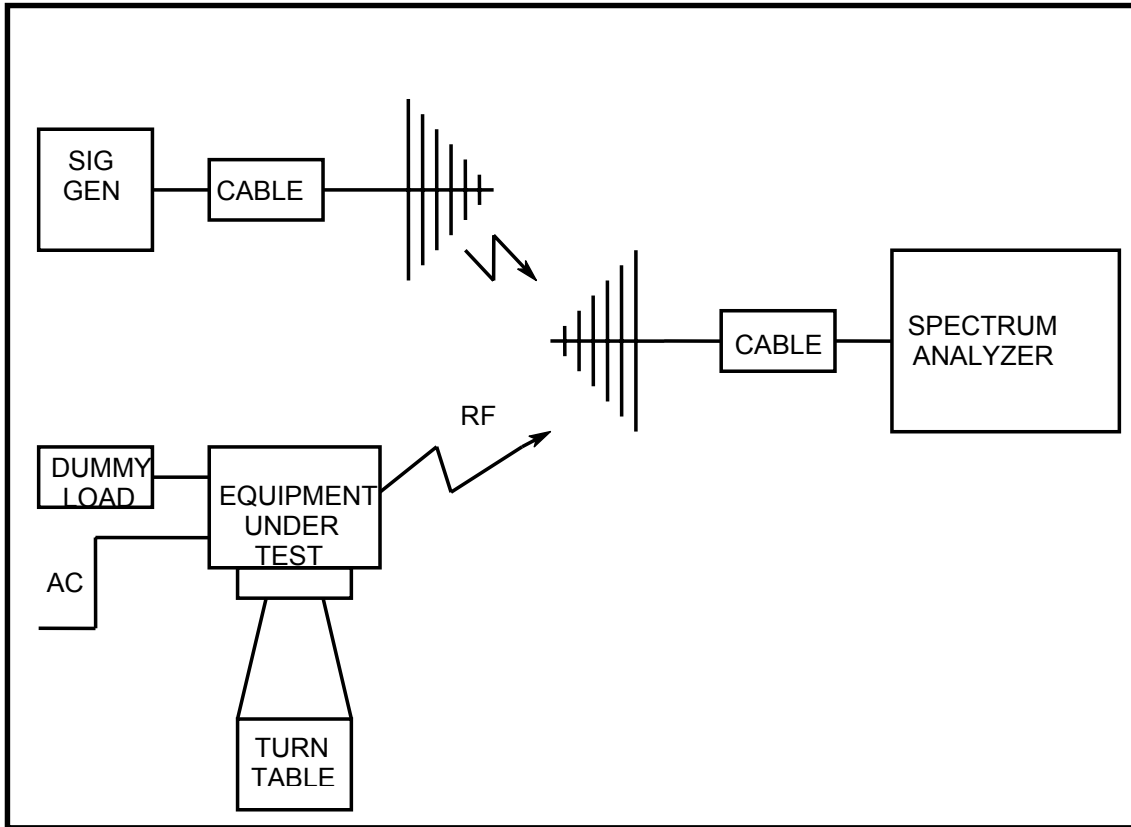
TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1	Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	15-Nov-05
2	Signal Generator	Hewlett Packard	HP8648A	3430U00344	E3579	06-Nov-05
4	Signal Generator	Hewlett Packard	HP8648C	3443U00543	E3558	11-Sep-05
5	Signal Generator	Rohde & Schwarz	SMY01 1062.5502.11	841736/019	E3553	06-Nov-05
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	11-Sep-05
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	15-Sep-05
14	Power Head	Hewlett Packard	HP11722A	2320A00688	E3307	08-Nov-05
22	Oscilloscope	Tektronics	TDS340	B013611	E3585	06-Nov-05
37	Variac	Yamabishi	S-260-5	TX-533	E1737	
40	Reference Dipoles	Emco	3121C DB1	9510-1164	E3559	17-Oct-06
42	Reference Horn Antenna	Emco	DRG3115	9512-4638	E3560	27-Sep-06
43	Horn Antenna	Emco	DRG3115	2084	E3076	27-Sep-06
62	RF Attenuator 150W	Weinschel	57-10-34	LB590	E3674	08-Nov-05
65	RF Attenuator 50W	Weinschel	24-20-44	AW1266	E3562	08-Nov-05
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	07-Nov-05
70	RF Load 150W	Bird	8166	524	E3625	15-Nov-05
82	3m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25033/4A	E3694	19-Nov-05
83	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25006/4A	E3693	19-Nov-05
84	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25005/4A	E3692	15-Jul-05
85	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25004/4A	E3691	15-Jul-05
86	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25003/4A	E3690	13-Aug-05
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	12-Nov-05
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	14-Nov-05
91	20m Coax Cable		RG214/U-50 (Ext Cal)	CBL01	E3404	21-Sep-05
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	14-Oct-05
111	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	06-Nov-05
112	Signal Generator	Agilent	E4433B	US38440446	E4147	30-May-05
114	Signal Generator	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	08-Nov-05
115	Environ. Chamber	Contherm	5400 RHSLT.M	1416	E4051	04-Mar-05
116	Power Head	Hewlett Packard	HP11722A	2716A02037	E1575	10-Sep-05
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	23-Apr-05
128	RF Attenuator	Minicircuits	BW-N10W5	2		21-Sep-05
129	Antenna Tower	Electrometrics	EM-4720-2	112		
130	Controller	Electrometrics	EM-4700	119		
131	Turntable	Electrometrics	EM-4704A	105		
136	Multimeter	Fluke	77	35069359	E3237	09-Nov-05

APPENDIX A

TEST SETUP DETAILS

Radiated Emissions Set up.



All other testing is performed using the 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.

