LABORATORY TEST REPORT

RADIO PERFORMANCE MEASUREMENTS

for the

TPDH5A Handportable Transceiver

Tested in accordance with:

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11
RSS-Gen Issue 3

Report Revision:	1
Issue Date:	7-August-2013

PREPARED BY:	Garry Pringle	Test Technician
CHECKED & APPROVED BY:	M.C. James	Laboratory Technical Manager

OATS FCC LISTING REGISTRATION: 837095
OATS IC LISTING REGISTRATION: SITE# 737A-1

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

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TABLE OF CONTENTS

REVISION

Date	Revision	Comments
7-August-2013	1	Initial test report

INTRODUCTION

This report demonstrates that the TPDH5A handportable transceiver complies with FCC 47 Parts 22, 74 & 90, and RSS-119 Issue 11 & RSS-Gen Issue 3. This radio supports analog, digital FFSK, P25 phase-1, P25 phase-2, and Digital Mobile Radio modulations:

Modulation		Channel Spacing	Speech Channels	Symbol Rate (symbols/sec)	Data Rate (bps)
Analogue FM		12.5 kHz 25.0 kHz	1	-	-
FFSK	Fast Frequency Shift Keying	12.5 kHz 25.0 kHz	-	1200	1200
		12.5 kHz 25.0 kHz	-	2400	2400
Digital Mobile Radio (DMR)	4 Level FSK (2 slot TDMA) (ETSI TS102 361-1)	12.5 kHz	2	4800	9600
APCO P25 Phase 1	C4FM (TIA 102)	12.5 kHz	1	4800	9600
APCO P25 Phase 2	H-CPM (2 slot TDMA) (TIA 102)	12.5 kHz	2	6000	12000

Type Approval Testing of the T03-00043-JCDB
Serial number 25465117
Frequency range 400 → 470 MHz

in accordance with:
FCC 47 CFR Parts 22, 74 and 90
RSS-119 Issue 11 & RSS-Gen Issue 3

REPORT PREPARED FOR
Tait Communications
PO Box 1645
558 Wairakei Road
Christchurch
New Zealand

DESCRIPTION OF SAMPLE

Manufacturer	Tait Limited
Equipment:	Handportable Transceiver
Type:	TPDH5A
Product Code:	T03-00043-JCDB
Serial Number(s):	25465117
Quantity:	1

HARDWARE & SOFTWARE

DMR & Analog

Type	Code and Version
Hardware ID	TPDB1X-H500_0006
Boot Code	QPD1B_S00_3.00.03.0001
DSP	QPD1A_E00_1.01.00.0024
Radio Application	QPD1F_E00_1.01.00.0024
FPGA Image	QPD1G_S00_1.02.00.0010

P25 PHASE-1

Type	Code and Version
Hardware ID	TPDB1X-H500_0006
Boot Code	QPD1B_S00_3.00.03.0001
DSP	QPD1A_A00_1.01.01.0017
Radio Application	QPD1F_A00_1.01.01.0017
FPGA Image	QPD1G_S00_1.02.00.0010

P25 PHASE-2

Type	Code and Version
Hardware ID	TPDB1X-H500_0006
Boot Code	QPD1B_S00_3.00.03.0001
DSP	QPD1A_A00_1.01.01.0017
Radio Application	QPD1F_A00_1.01.01.0017
FPGA Image	QPD1G_S00_1.00.02.0001_P2.a

TEST CONDITIONS

All testing was performed between 16th July→ 16th August 2013, and under the following conditions:

Ambient temperature:	15°C → 30°C
Relative Humidity:	20% → 75%
Standard Test Voltage	7.5 V_{DC}

DECLARATION OF CONFORMITY

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

Equipment:	Handportable Transceiver
Type:	TPDH5A
Product Code:	T03-00043-JCDB
Serial Number(s):	25465117
Quantity:	1

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

FCC 47 CFR Parts 22, 74 and 90

RSS-119 Issue 11 & RSS-Gen Issue 3

Signature : ____________________

M.C. James
Laboratory Technical Manager

Date : ____________________

MODULATION TYPES, NECESSARY BANDWIDTH, and EMISSION DESIGNATORS

MODULATION TYPES:

F3E	Analog FM		
F2D	FFSK	1200 bps	2400 bps
FXD	Digital	9600 bps	
FXW	Digital Voice / Data	9600 bps	
F1W	Digital Voice / Data	12000 bps	

CHANNEL SPACINGS: 12.5 kHz 25.0 kHz

EMISSION DESIGNATORS:

Analog FM	11K0F3E	16K0F3E		
FFSK Data 1200bps	6K60F2D	9K60F2D		
FFSK Data 2400bps	7K80F2D	10K80F2D		
Digital Voice / Data	8K10F1E	8K10F7E	8K10F7D	8K10F1D
	8K10F1W			
Digital Voice/Data	7K60FXW	7K60FXD		

CALCULATIONS

Equation: Bn = 2M + 2Dk

(M is highest modulating frequency; D is peak allowable deviation; k is a constant of 1 for FM)

Analog Voice 12.5 kHz Bandwidth

Necessary bandwidth
M = 3.0 kHz
D = 2.5 kHz
Bn = (2x3.0) + (2x2.5) x 1
= 11.0 kHz

Emission Designator
11K0F3E
F3E represents an FM voice transmission

Analog Voice 25.0 kHz Bandwidth

Necessary bandwidth
M = 3.0 kHz
D = 5.0 kHz
Bn = (2x3.0) + (2x5.0) x 1
= 16.0 kHz

Emission Designator
16K0F3E
F3E represents an FM voice transmission

Fast Frequency Shift Keying (FFSK – 1200 bps) 12.5 kHz Bandwidth

Necessary bandwidth
M = 1.8 kHz
D = 1.5 kHz (60% of peak deviation)
Bn = (2 x 1.8) + (2 x 1.5) x 1
= 6.6 kHz

Emission Designator
6K60F2D
F2D represents a FM data transmission with the use of a modulating sub carrier

Fast Frequency Shift Keying (FFSK – 1200 bps) 25.0 kHz Bandwidth

Necessary bandwidth
M = 1.8 kHz
D = 3.0 kHz (60% of peak deviation)
Bn = (2 x 1.8) + (2 x 3.0) x 1
= 9.6 kHz

Emission Designator
9K60F2D
F2D represents a FM data transmission with the use of a modulating sub carrier

Emission Designators - Continued

Fast Frequency Shift Keying (FFSK – 2400 bps) 12.5 kHz Bandwidth

Necessary bandwidth	Emission Designator
M = 2.4 kHz	**7K80F2D**
D = 1.5 kHz (60% of peak deviation)	F2D represents a FM data transmission with
Bn = (2 x 2.4) + (2 x 1.5) x 1	the use of a modulating sub carrier
= 7.8 kHz	

Fast Frequency Shift Keying (FFSK – 2400 bps) 25.0 kHz Bandwidth

Necessary bandwidth	Emission Designator
M = 2.4 kHz	**10K80F2D**
D = 3.0 kHz (60% of peak deviation)	F2D represents a FM data transmission with
Bn = (2 x 2.4) + (2 x 3.0) x 1	the use of a modulating sub carrier
= 10.8 kHz	

Digital Voice / Data C4FM 4800 bps

Digital Voice/data transmissions use a 4 level frequency shift keying modulation scheme. The necessary bandwidth has been measured using the 99% energy rule, and in accordance with TIA/EIA 102 CAAB 2.2.5.2

Digital Voice 12.5 kHz Bandwidth P25 phase 1

99% bandwidth	Emission Designator
= 8.1 kHz	**8K10F1E**
	F1E represents a digital FM voice transmission
	8K10F7E
	F7E represents two or more channels containing quantized or digital voice information

Digital Voice 12.5 kHz Bandwidth P25 phase 2

99% bandwidth	Emission Designator
= 8.1 kHz	**8K10F1W**
	F1W represents a single FM telephony channel

Digital Voice 12.5 kHz Bandwidth DMR

99% bandwidth	Emission Designator
= 7.6 kHz	**7K60FXW**
	FXW represents a FM Time Division Multiple Access (TDMA) combination of data and telephony

Digital Data 12.5 kHz Bandwidth P25 phase 1

99% bandwidth	Emission Designator
= 8.1 kHz	**8K10F1D**
	F1D represents an digital FM data transmission
	8K10F7D
	F7D represents two or more channels containing quantized or digital information

Digital Data 12.5 kHz Bandwidth P25 phase 2

99% bandwidth	Emission Designator
= 8.1 kHz	**8K10F1W**
	F1W represents digital FM data transmission

Digital Data 12.5 kHz Bandwidth DMR

99% bandwidth	Emission Designator
= 7.6 kHz	**7K60FXD**
	FXD represents FM Time Division Multiple Access (TDMA) data only

TEST RESULTS

TRANSMITTER OUTPUT POWER (CONDUCTED)

SPECIFICATION: FCC 47 CFR 2.1046
RSS-119 5.4

GUIDE: TIA/EIA-603D 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: 4 W and 1 W

Nominal 4 W	406.2MHz	429.9 MHz	450.1MHz	459.9MHz	469.9MHz
Measured (W)	3.9	3.8	3.8	3.8	3.6
Variation (%)	-3.0	-5.8	-4.8	-5.6	-9.1
Variation (dB)	-0.1	-0.3	-0.2	-0.2	-0.4
Nominal 1 W	406.2MHz	429.9 MHz	450.1MHz	459.9MHz	469.9MHz
Measured (W)	0.96	0.93	0.96	0.95	0.89
Variation (%)	-3.7	-6.5	-3.8	-5.1	-11.5
Variation (dB)	-0.2	-0.3	-0.2	-0.2	-0.5
Measurement Uncertainty ± 0.6 dB					

LIMIT CLAUSES:

FCC 47 CFR 90.205 (s)
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.

RSS-119 5.4
The output power shall be within ±1.0 dB of the manufacturer's rated power.

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603D 2.2.6

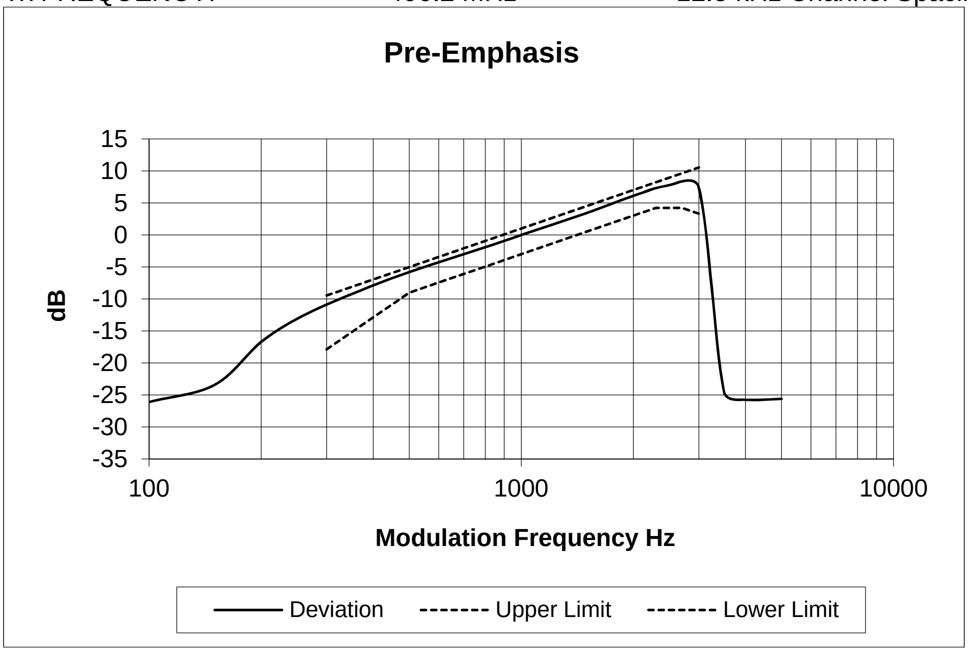
MEASUREMENT PROCEDURE:
1. Refer Annex A for Equipment set up.
2. An audio input tone of 1000Hz was applied with the level set to obtain 20% of maximum deviation. This was used as the 0dB reference point.
3. The AF was varied while the audio level was held constant.
4. The response in dB relative to 1000Hz was measured.

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

LIMIT CLAUSE: TIA/EIA-603D 3.2.6

SPECIFICATION: FCC CFR 2.1047 (a)

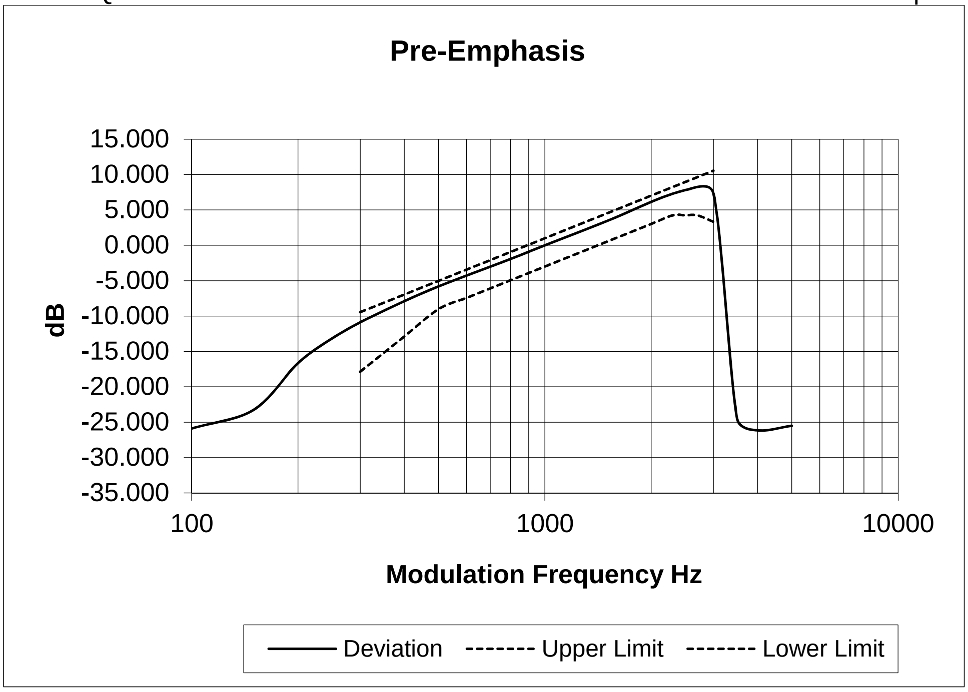
Tx FREQUENCY: 406.2 MHz 12.5 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

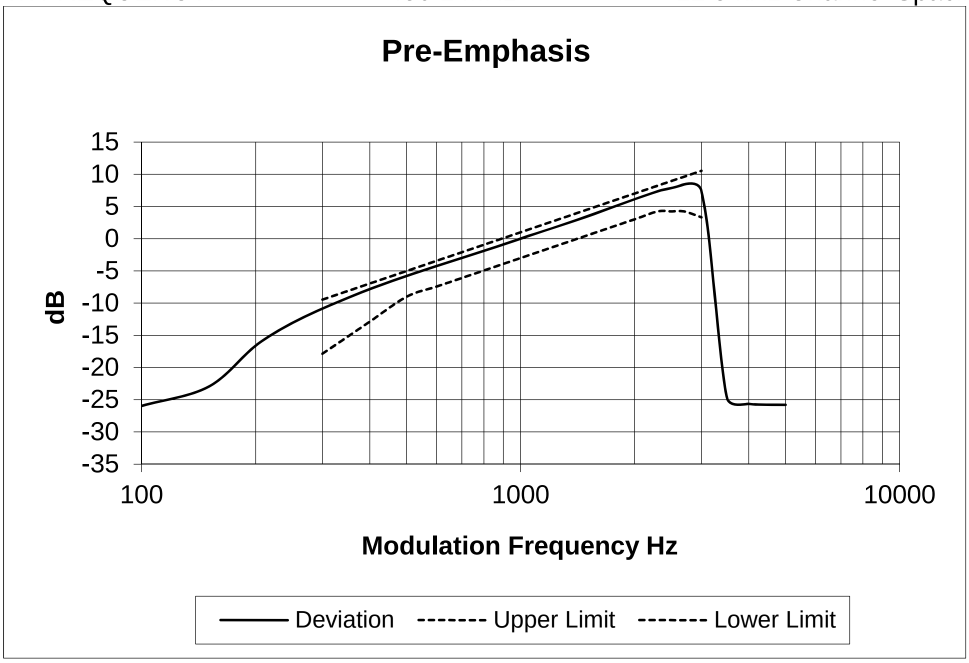
SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 429.9 MHz 12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

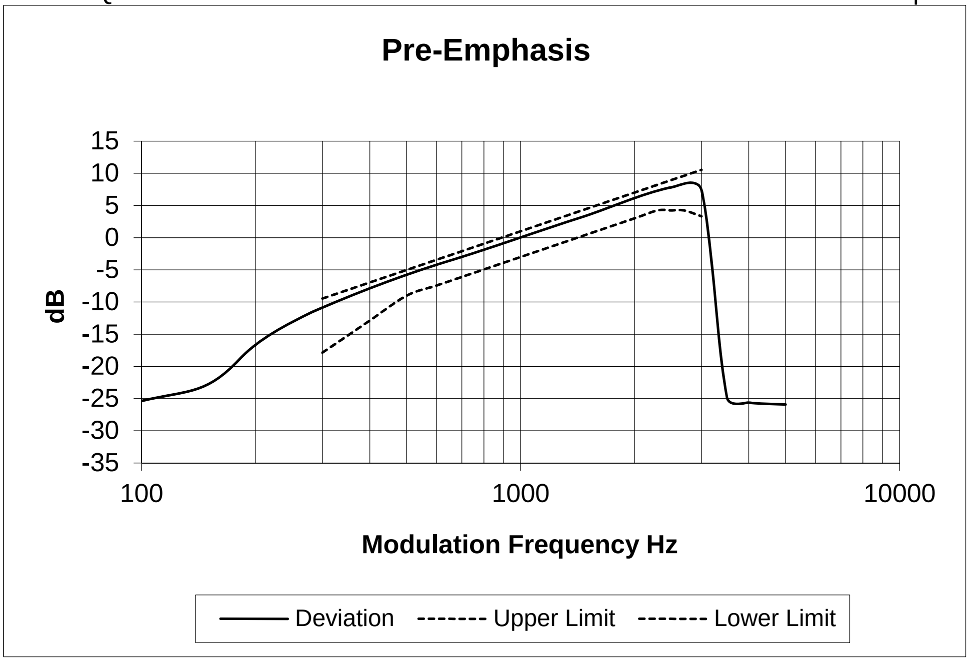
Tx FREQUENCY: 450.1 MHz 12.5 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

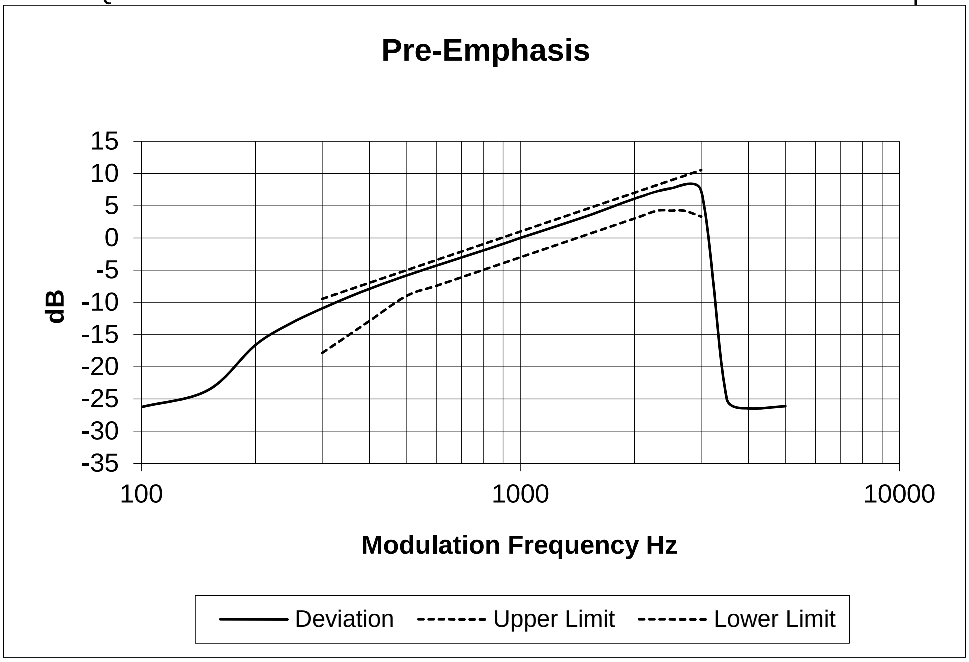
SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 459.9 MHz 12.5 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

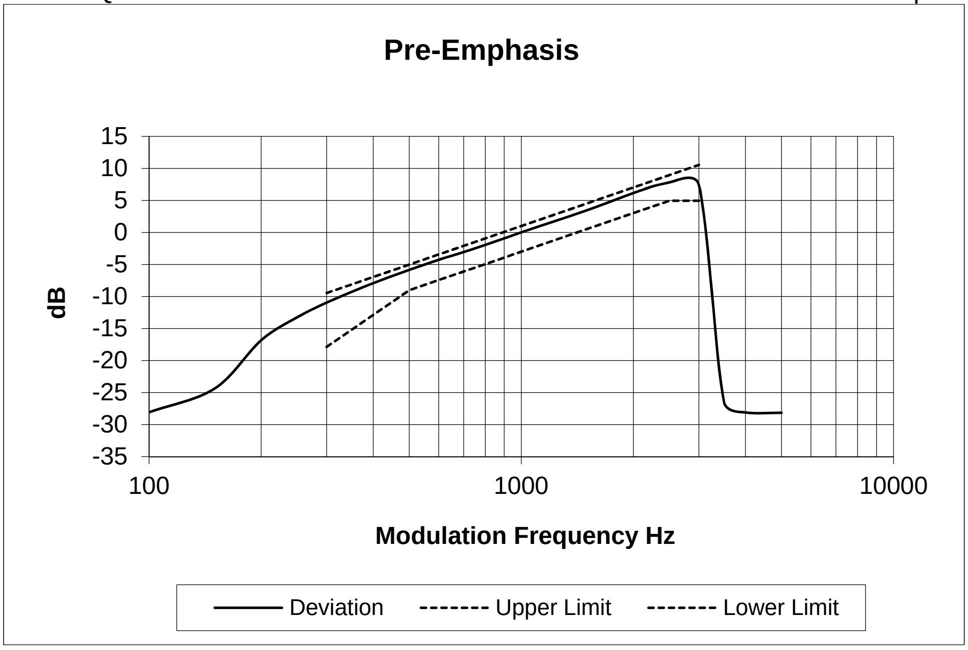
Tx FREQUENCY: 469.9 MHz 12.5 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

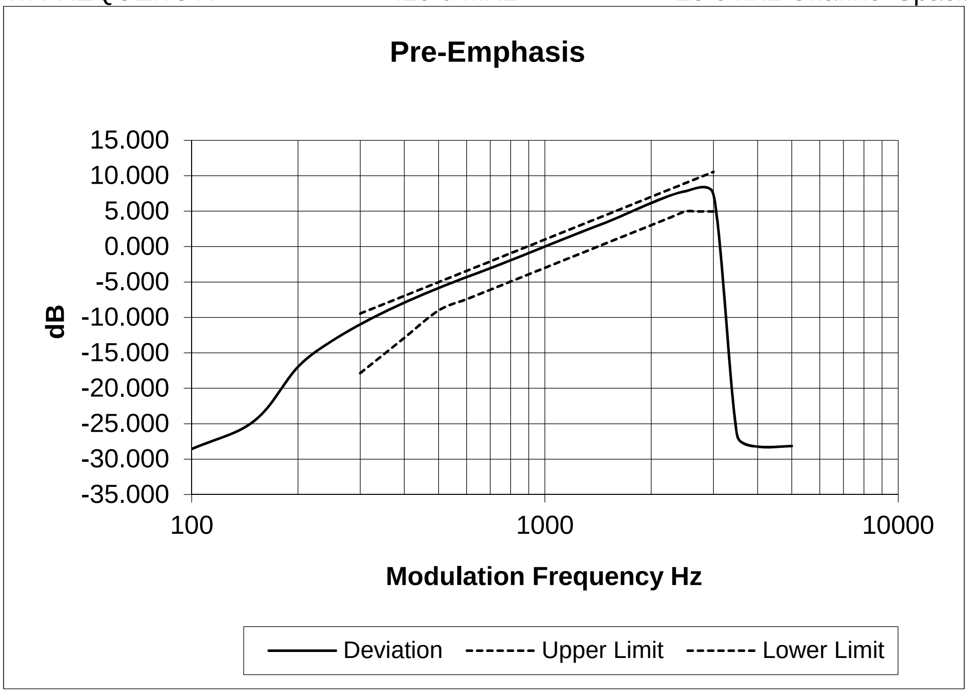
SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 406.2 MHz 25.0 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

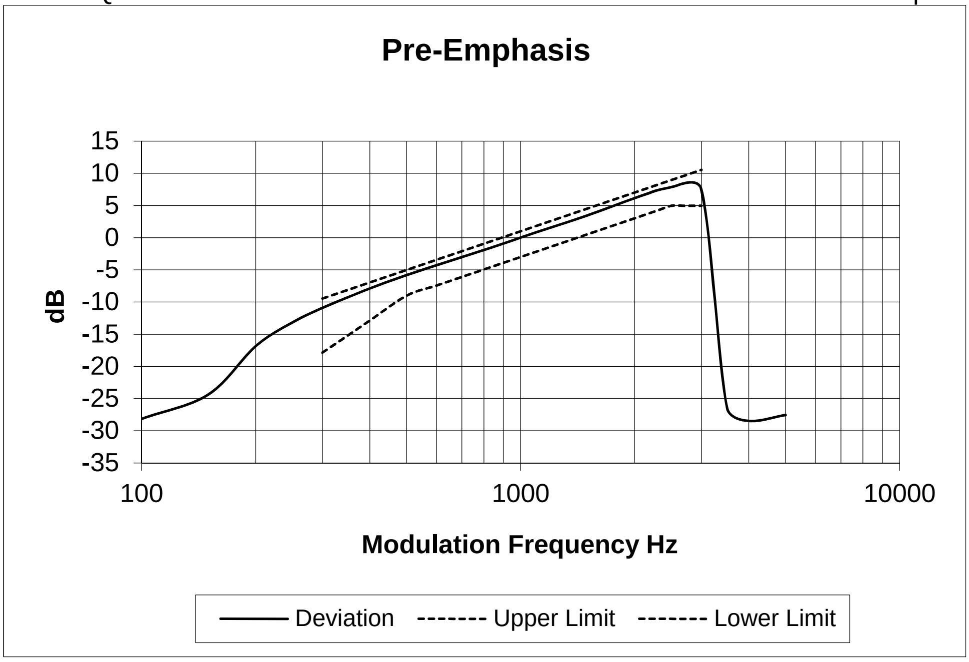
Tx FREQUENCY: 429.9 MHz 25.0 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

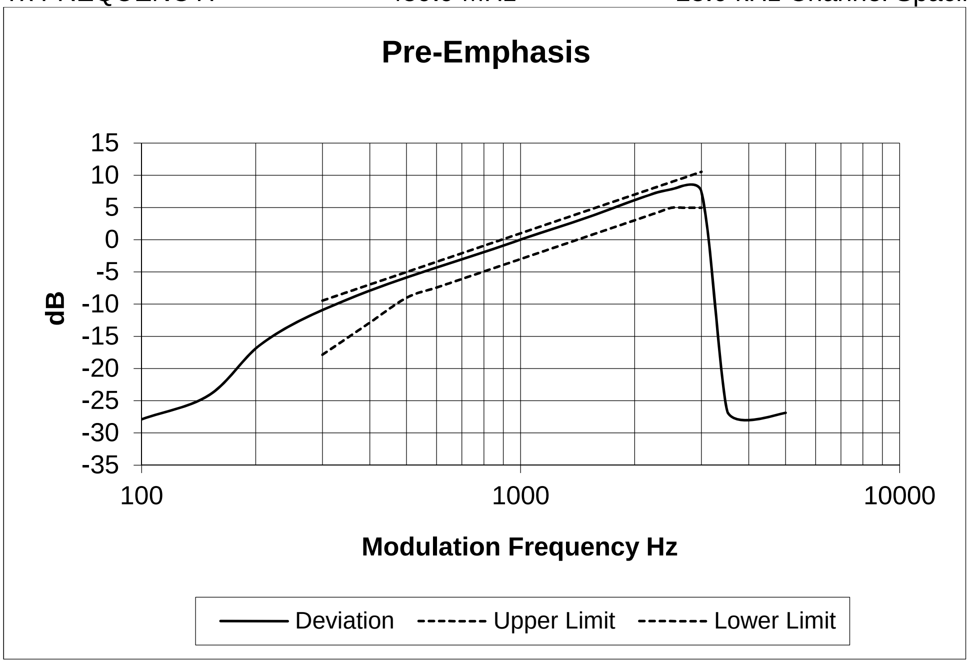
SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 450.1 MHz 25.0 kHz Channel Spacing



SPECIFICATION: FCC CFR 2.1047 (a)

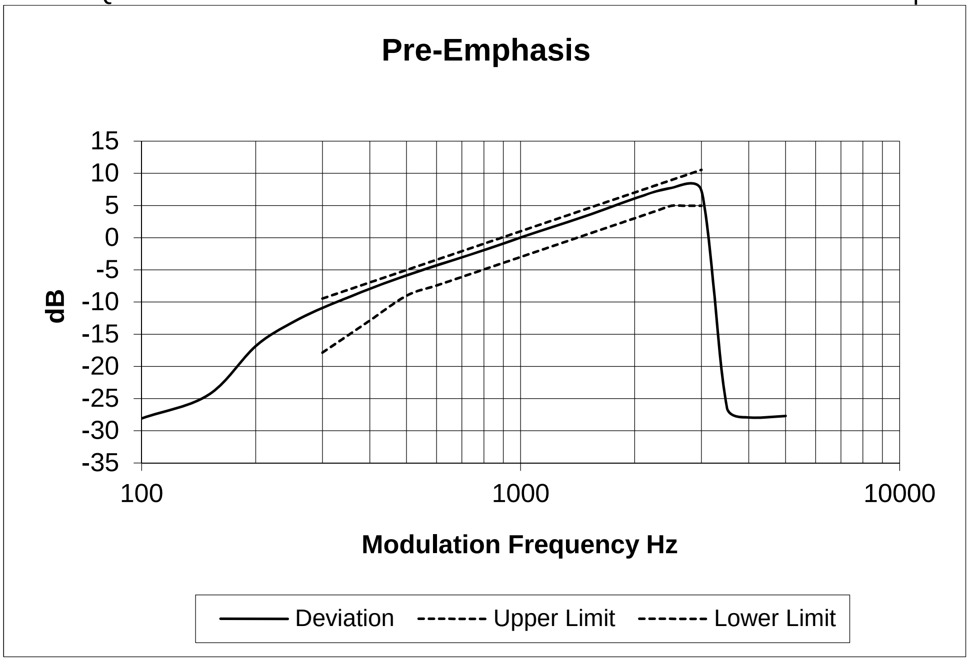
Tx FREQUENCY: 459.9 MHz 25.0 kHz Channel Spacing



Transmitter Audio Frequency Response – Pre-emphasis

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 469.9 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC 47 CFR 2.1047 (b)

GUIDE: TIA/EIA-603D 2.2.3

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.

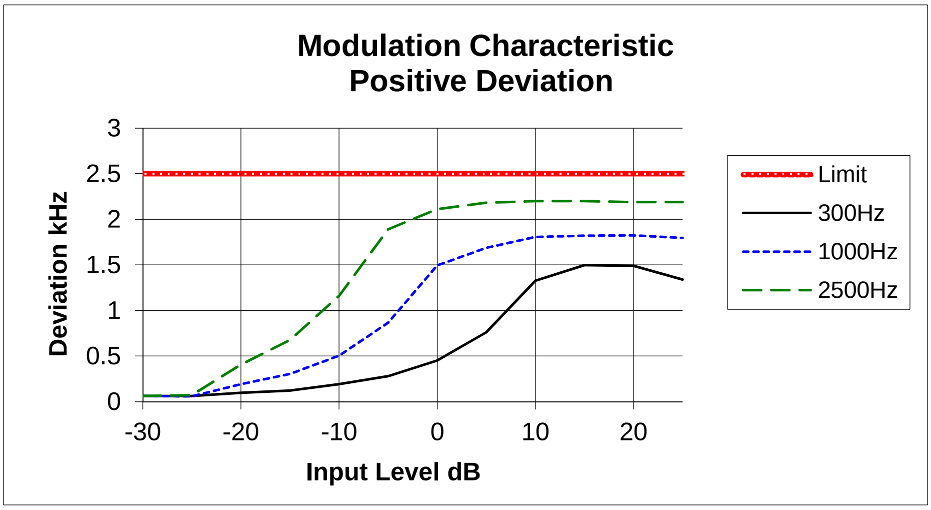
MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

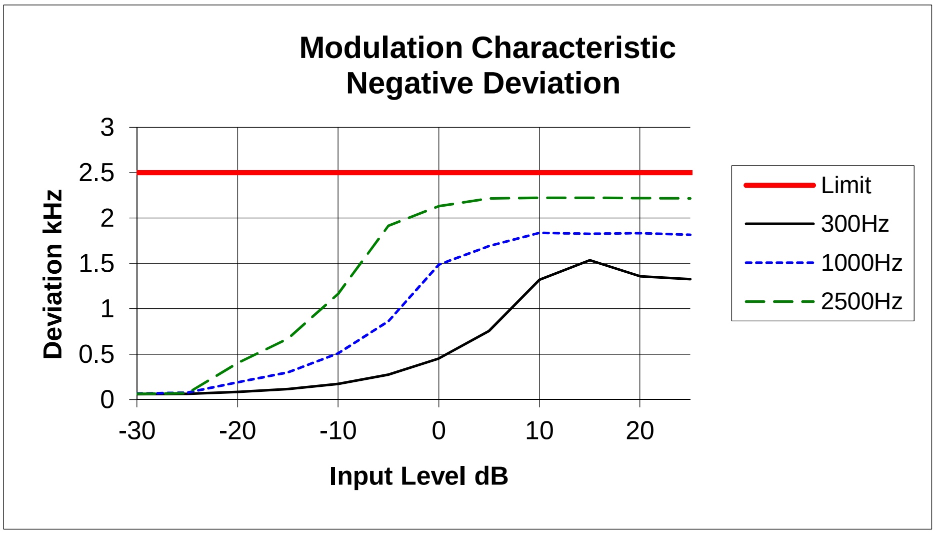
LIMIT CLAUSE: TIA/EIA-603D 1.3.4.4

Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 406.2 MHz 12.5 kHz Channel Spacing

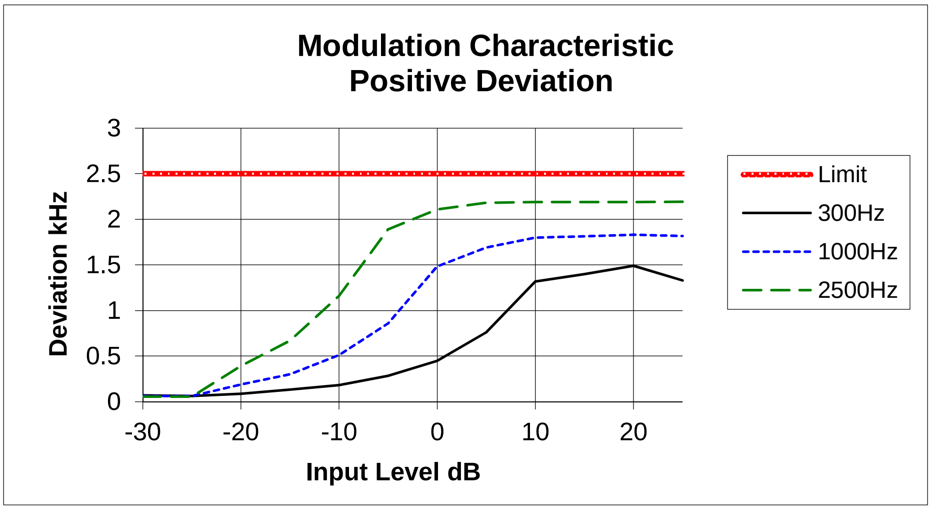


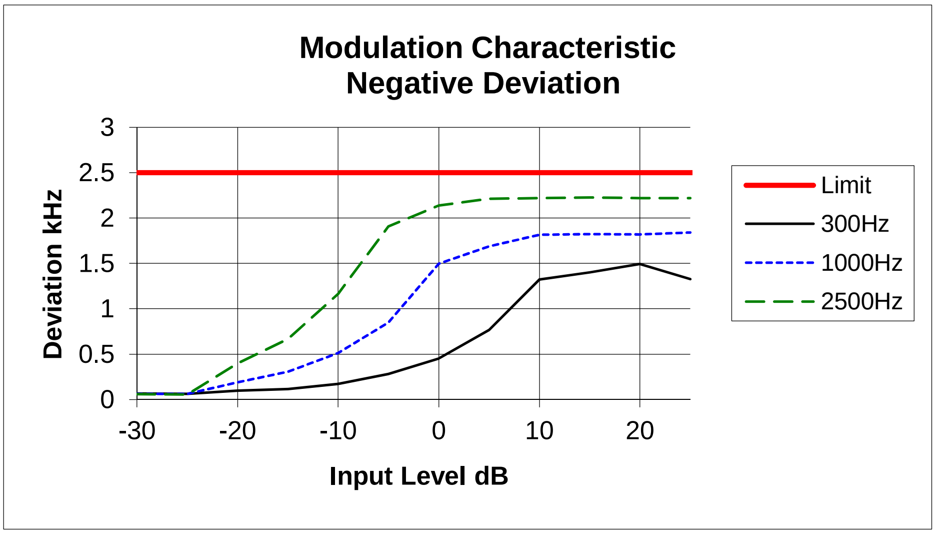


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 429.9 MHz 12.5 kHz Channel Spacing

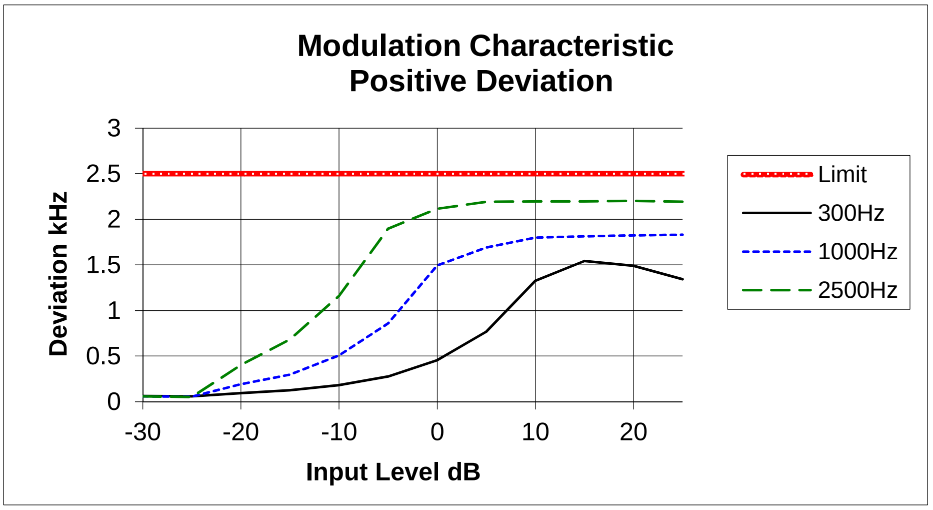


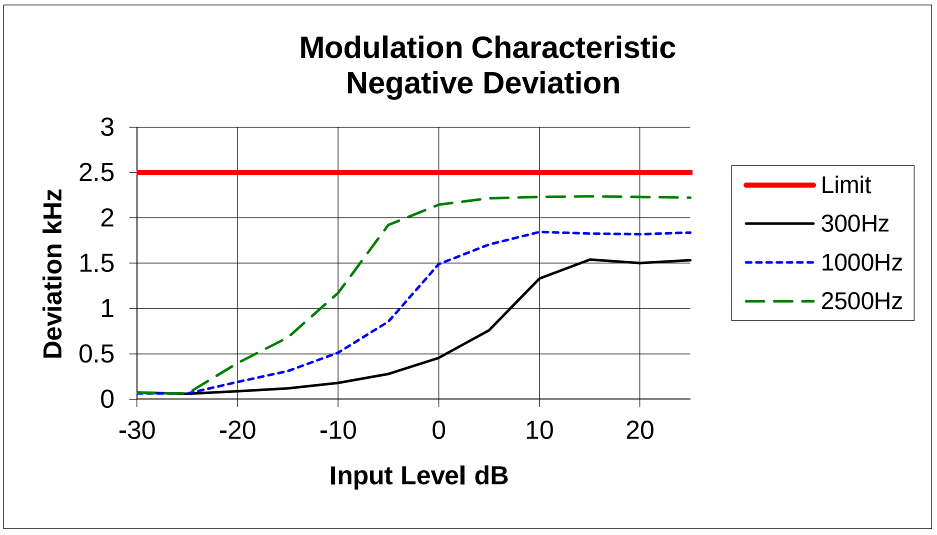


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 450.1 MHz 12.5 kHz Channel Spacing

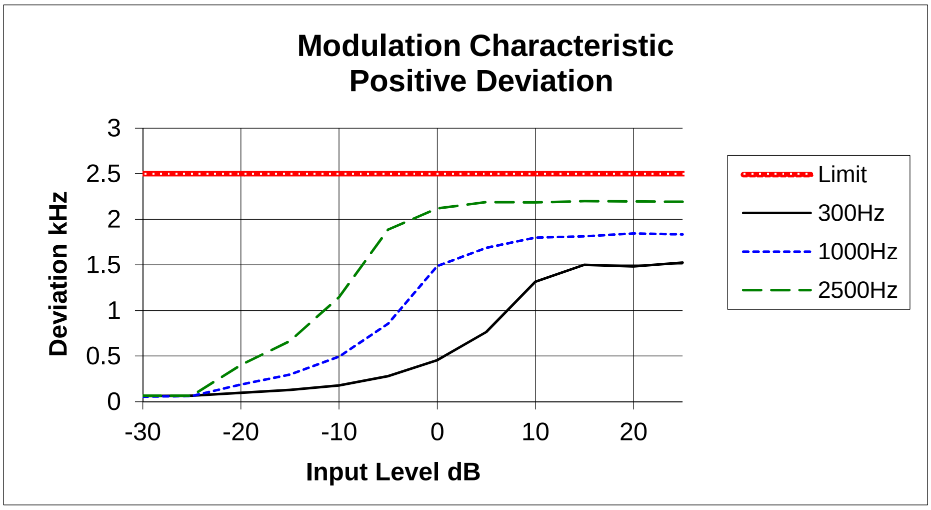


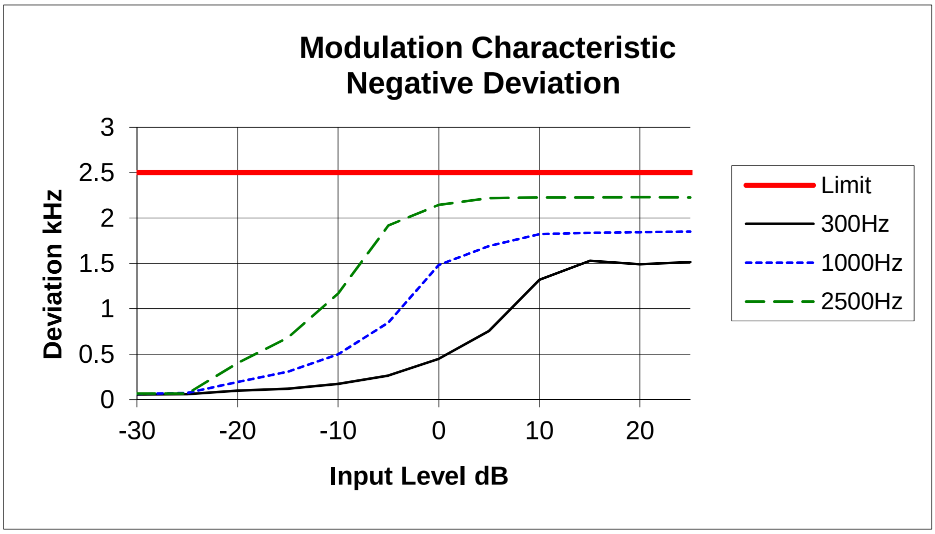


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 459.9 MHz 12.5 kHz Channel Spacing

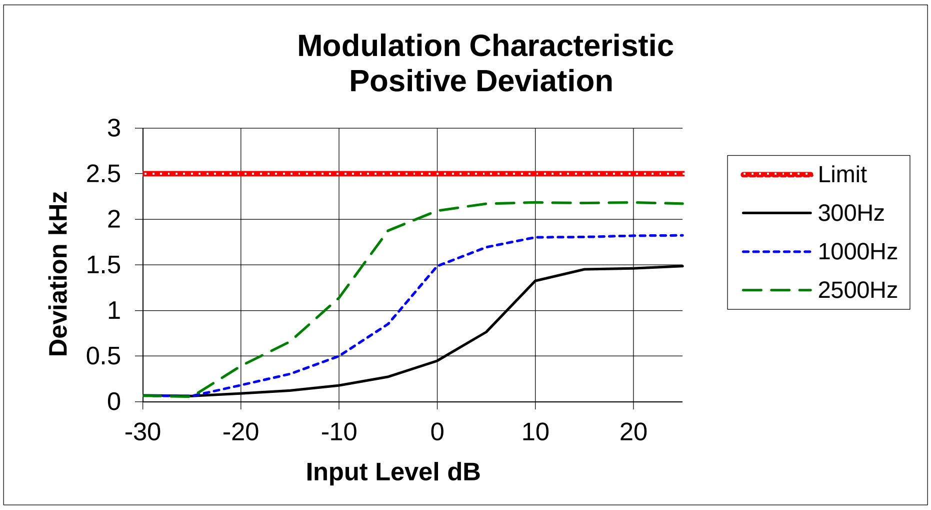


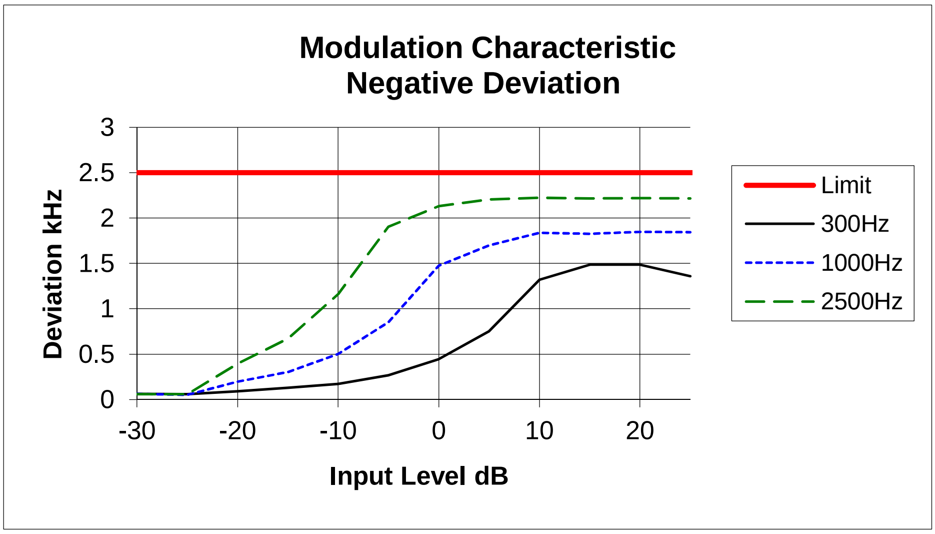


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 469.9 MHz 12.5 kHz Channel Spacing

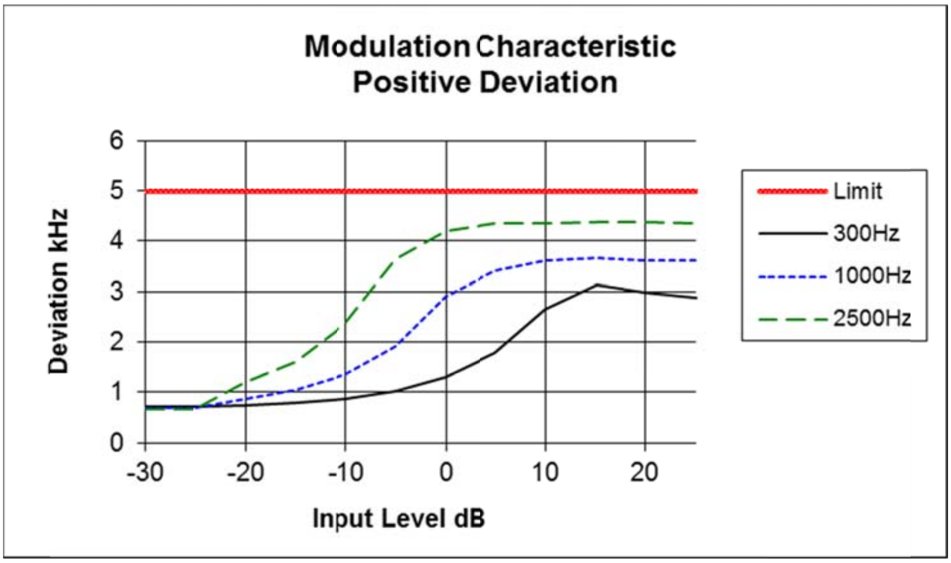


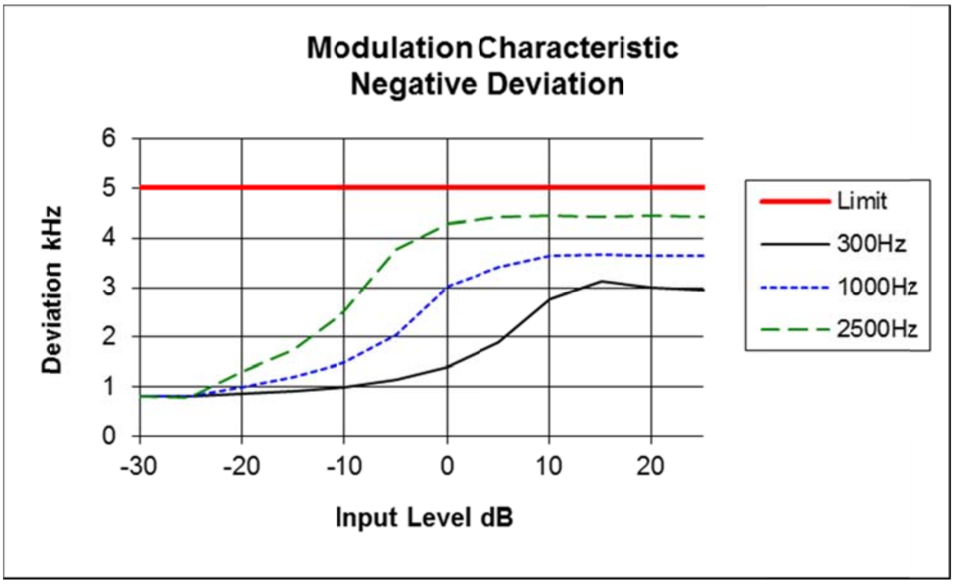


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 406.2 MHz 25.0 kHz Channel Spacing

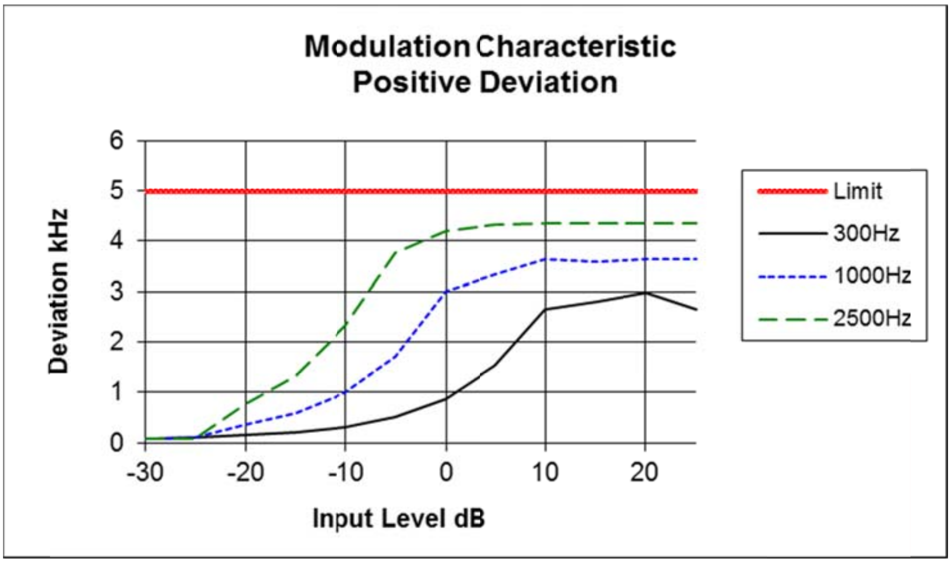


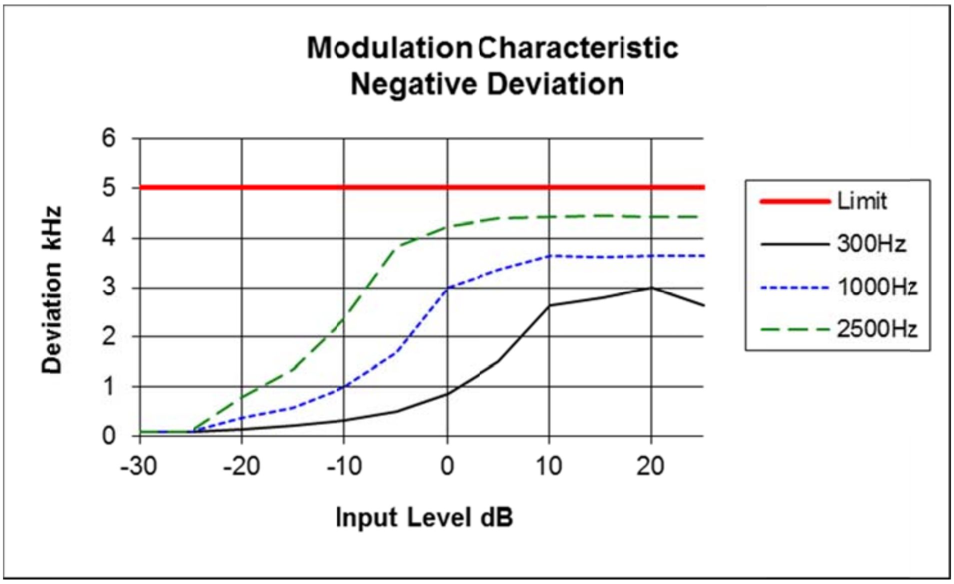


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 429.9 MHz 25.0 kHz Channel Spacing

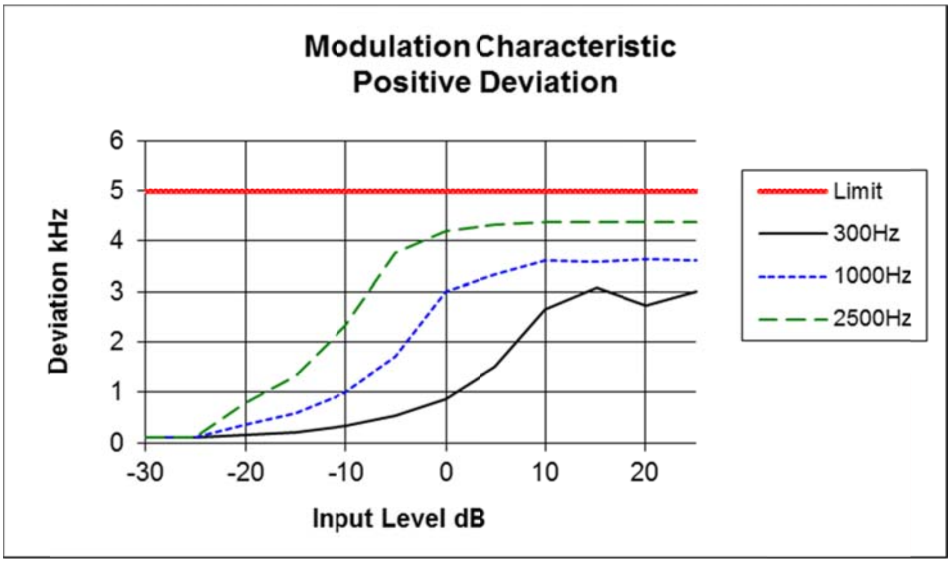


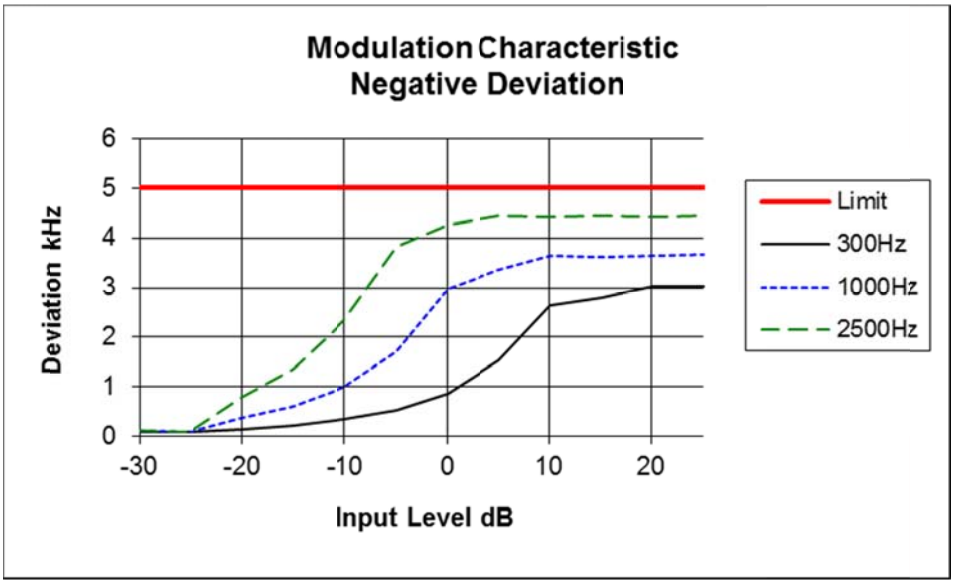


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 450.1 MHz 25.0 kHz Channel Spacing

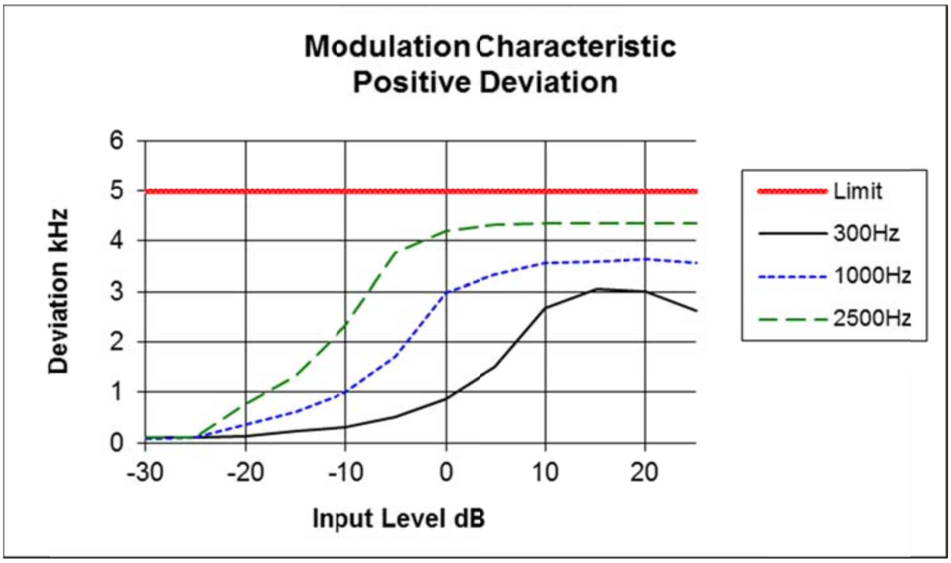


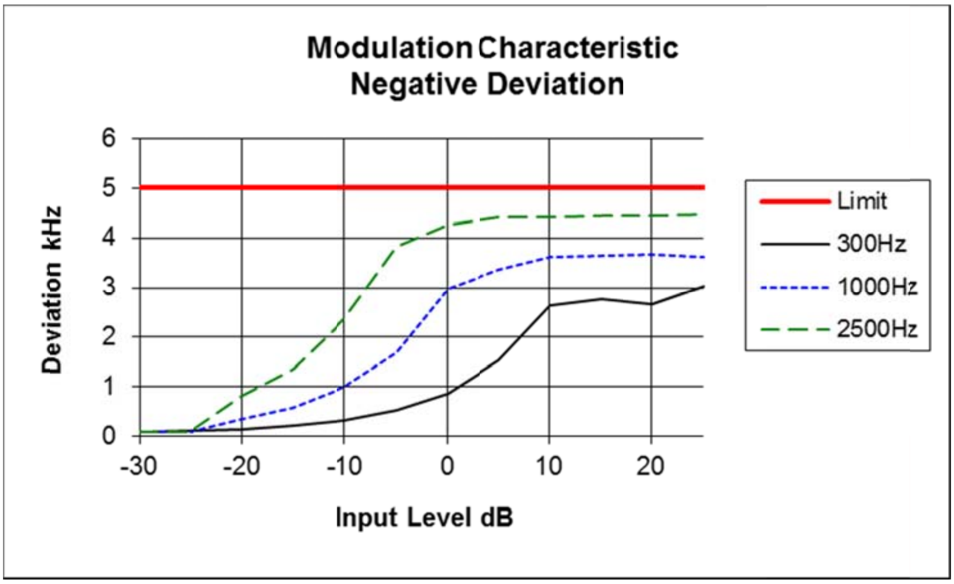


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 459.9 MHz 25.0 kHz Channel Spacing

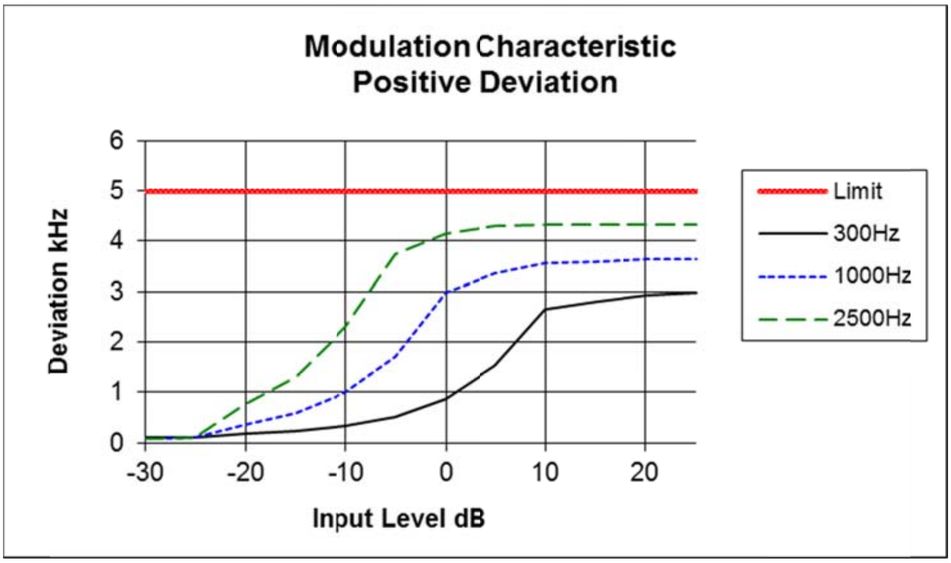


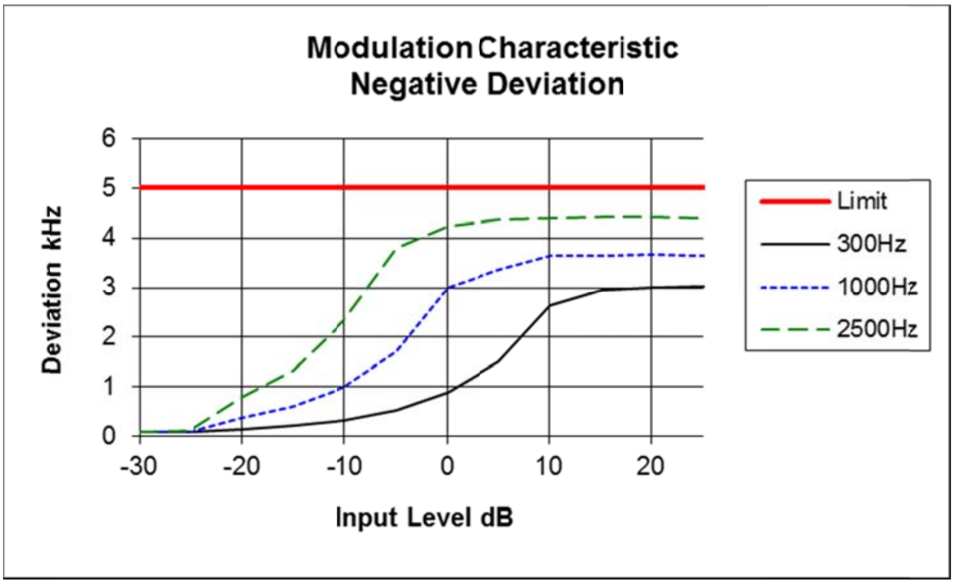


Transmitter Modulation Limiting

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 469.9 MHz 25.0 kHz Channel Spacing





OCCUPIED BANDWIDTH AND SPECTRUM MASKS

SPECIFICATION:	FCC 47 CFR 2.1049 (c)	RSS-119	5.5
GUIDE:	TIA/EIA-603D 2.2.11		

MEASUREMENT PROCEDURE:

1. Refer Annex A for Equipment Set up.
2. For analog measurements: The EUT was modulated by a 2500 Hz 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 = 100 Hz, Video Bandwidth = 1 kHz
   Emission Mask B – Resolution Bandwidth = 300 Hz, 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	RSS-119	5.5

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	Analog; FFSK;	Digital Voice/Data
Emission Mask B	25.0 kHz Channel Spacing	Analog; FFSK;	

DATA SPEED

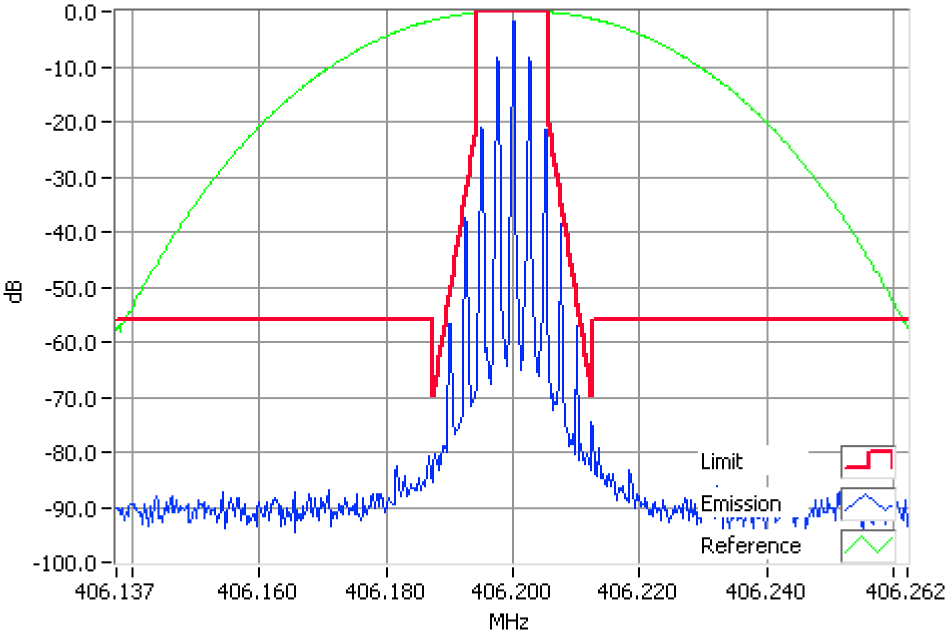
Digital Voice/Data	12.5 kHz Channel Spacing	9600 bps & 12000 bps
FFSK	12.5 kHz Channel Spacing	1200 bps & 2400 bps
FFSK	25.0 kHz Channel Spacing	1200 bps & 2400 bps

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

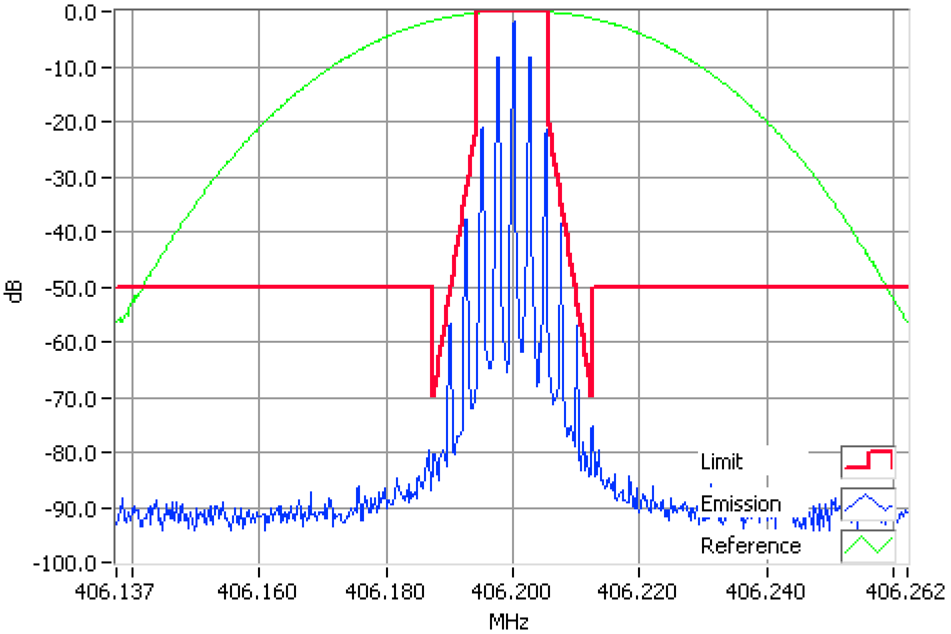
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



Analogue Modulation 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



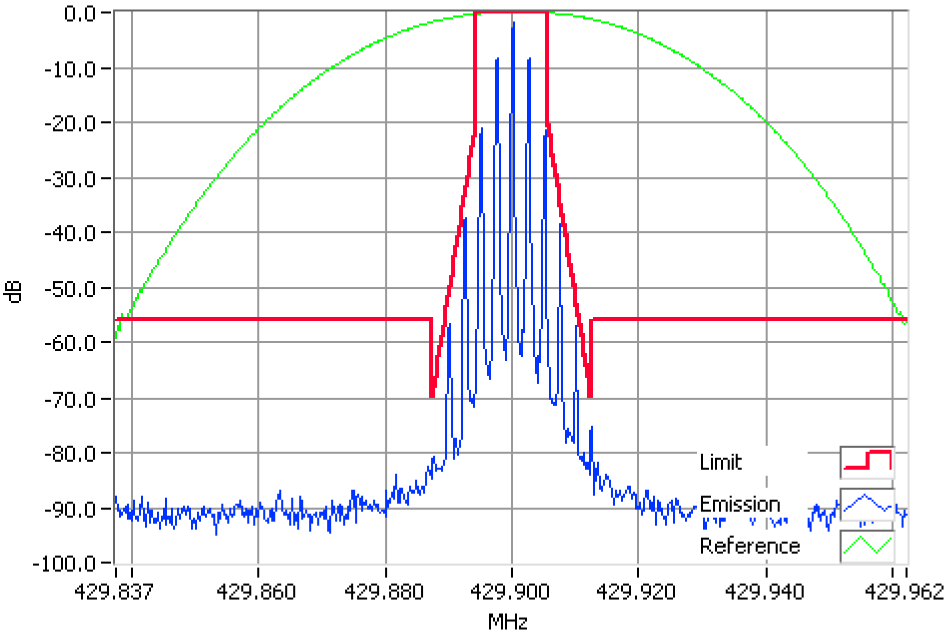
Analogue Modulation 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

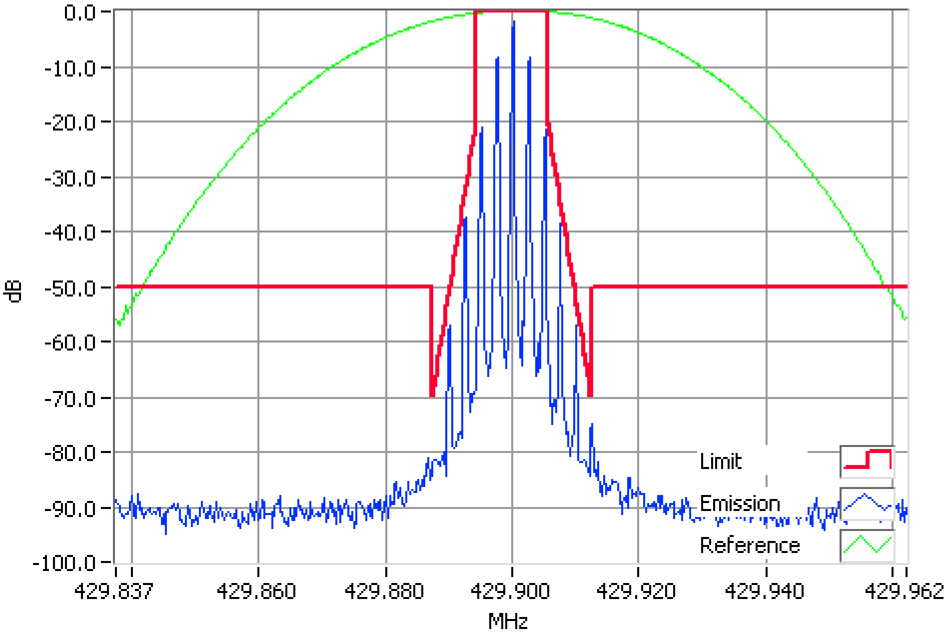
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



Analogue Modulation 429.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing



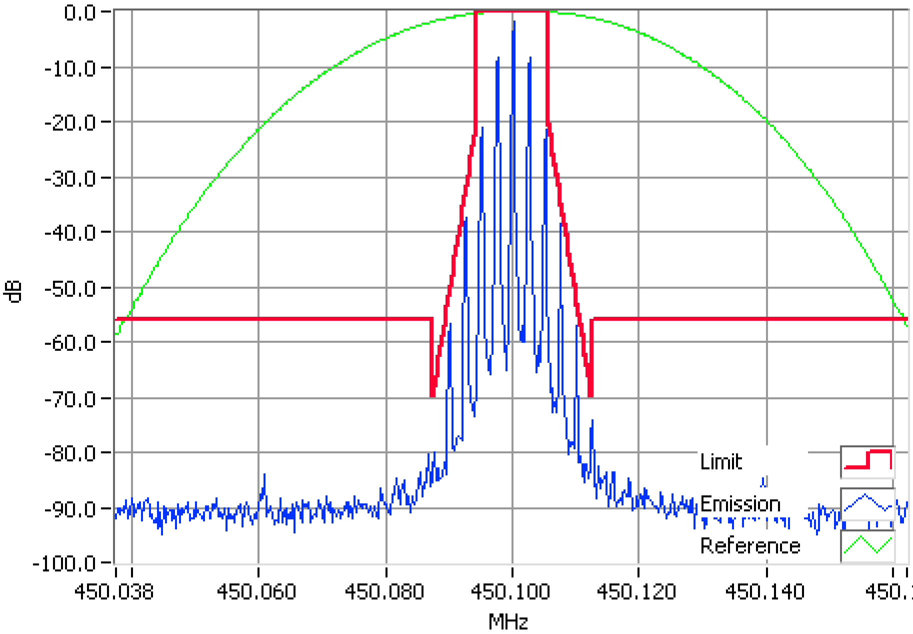
Analogue Modulation 429.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

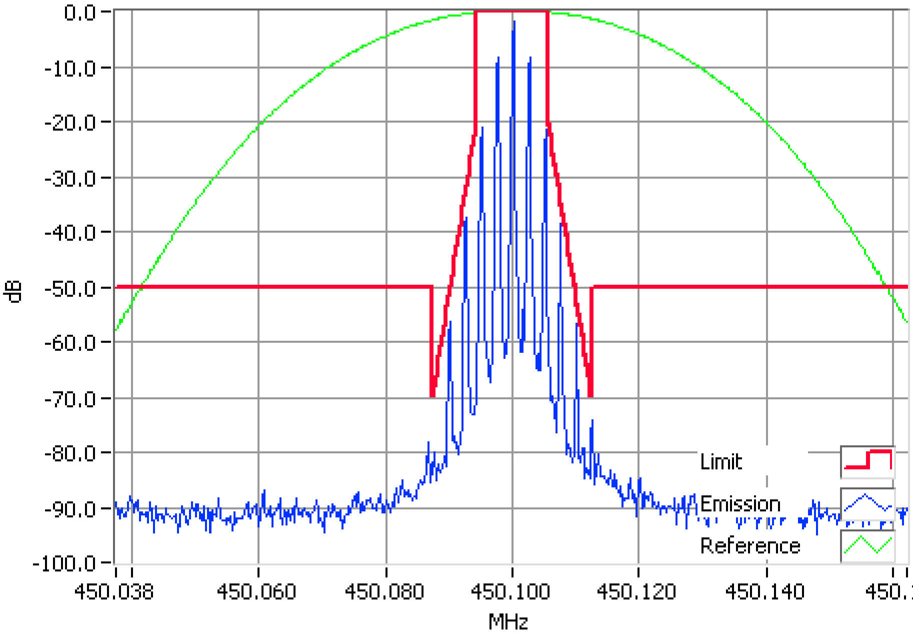
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



Analogue Modulation 450.1000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing



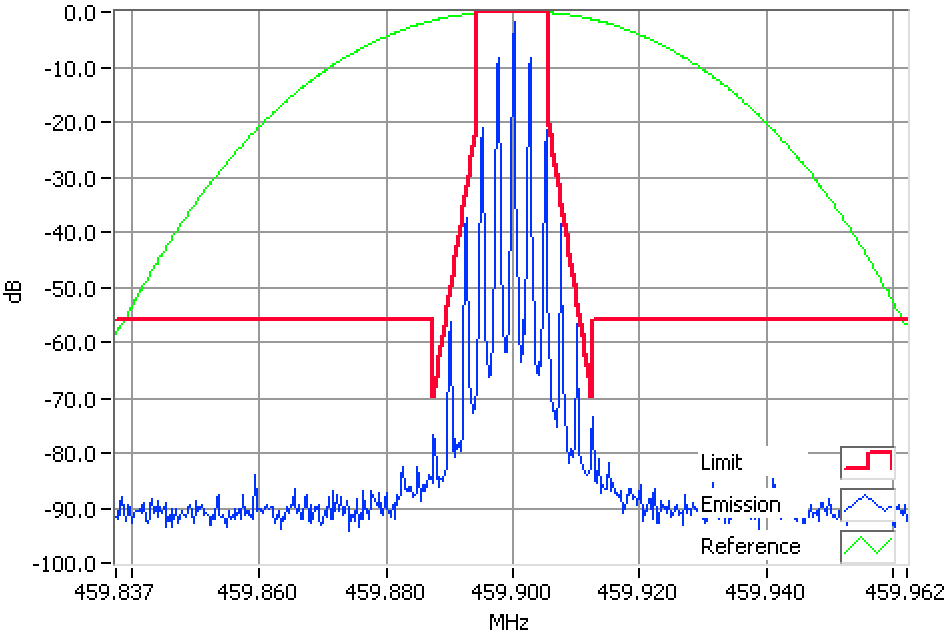
Analogue Modulation 450.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

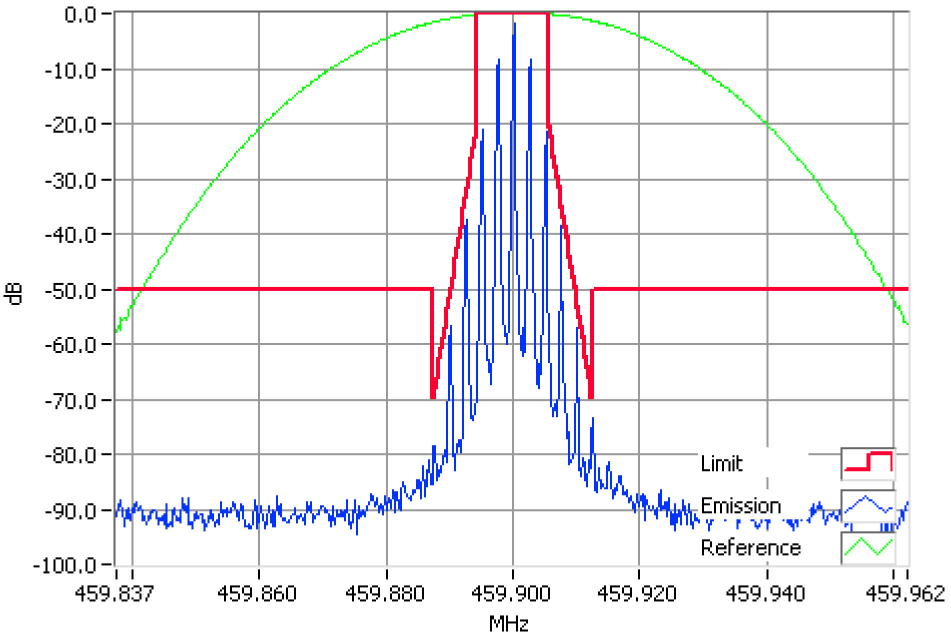
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



Analogue Modulation 459.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing



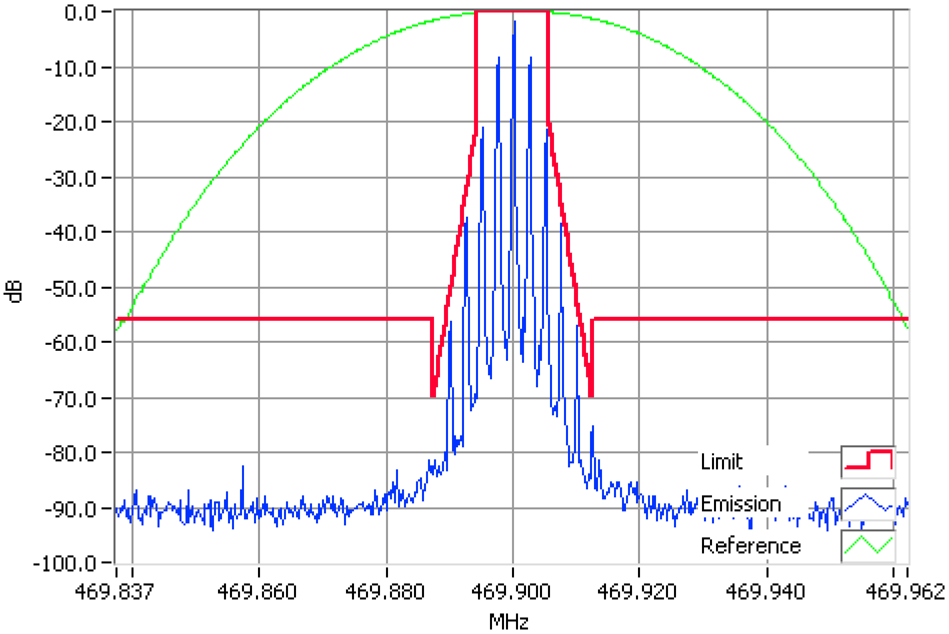
Analogue Modulation 459.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

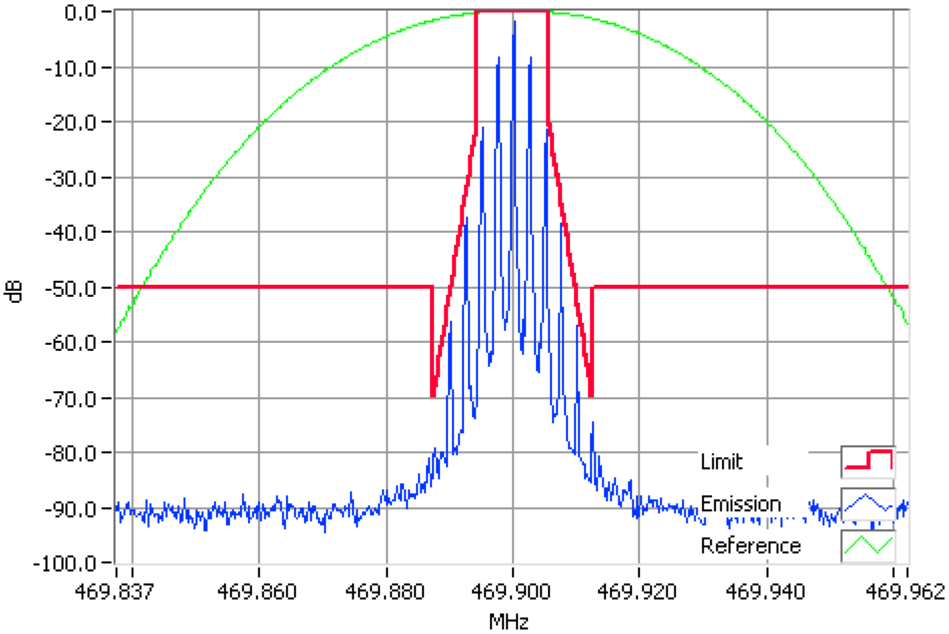
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



Analogue Modulation 469.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing



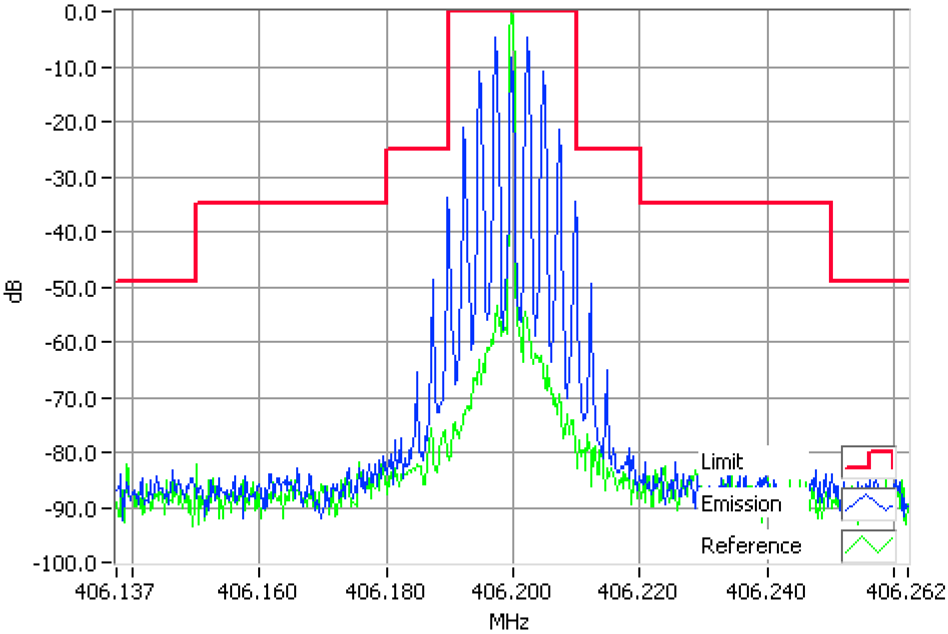
Analogue Modulation 469.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

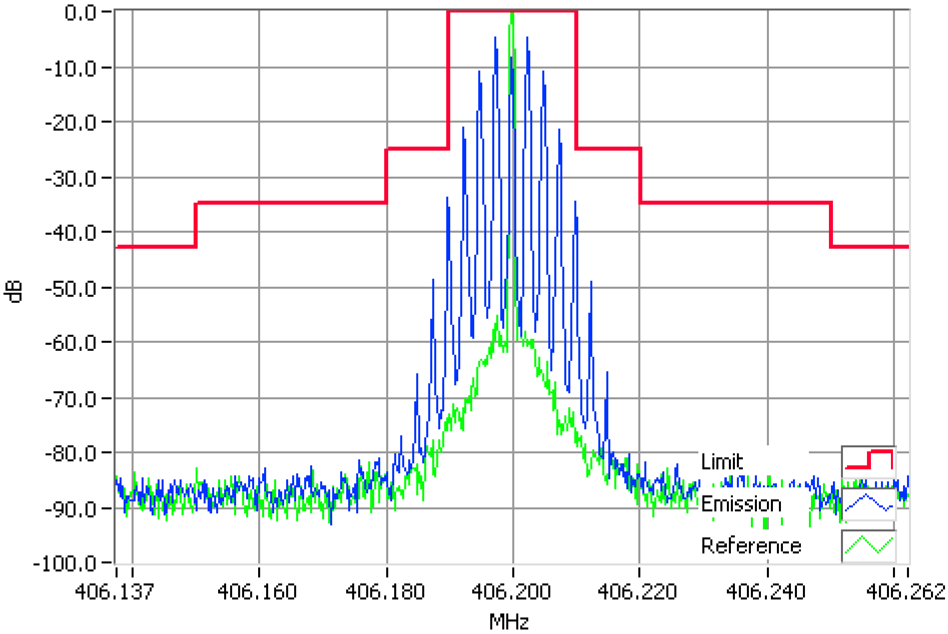
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 25.0 kHz Channel Spacing



Analogue Modulation 406.2000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 25.0 kHz Channel Spacing



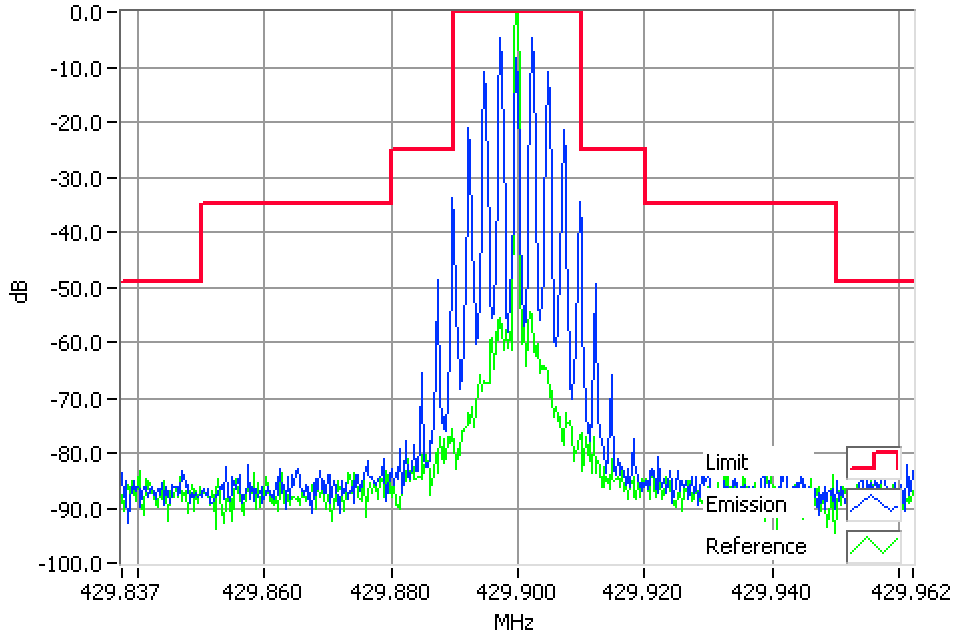
Analogue Modulation 406.2000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

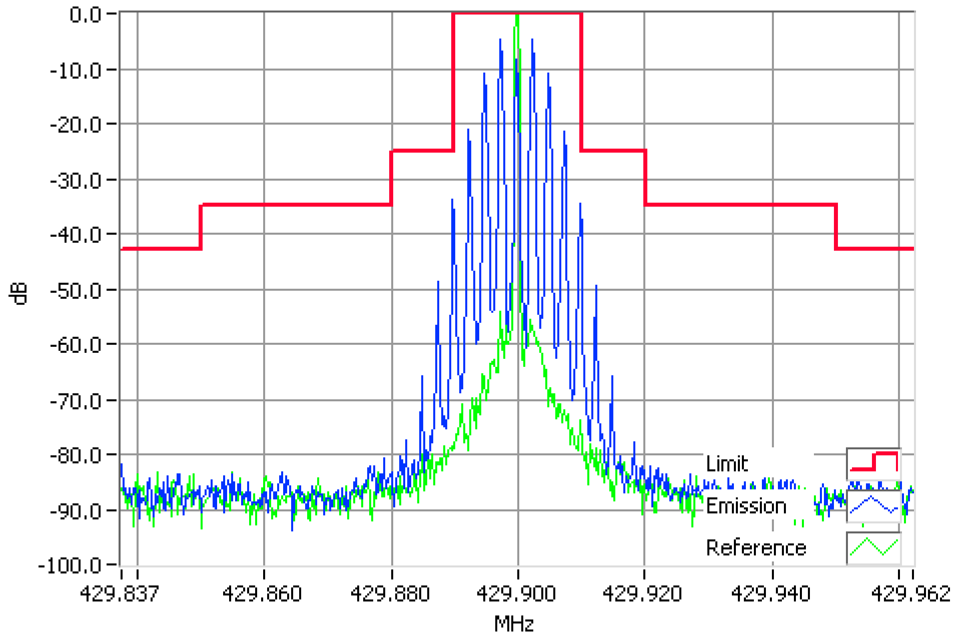
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 25.0 kHz Channel Spacing



Analogue Modulation 429.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 25.0 kHz Channel Spacing



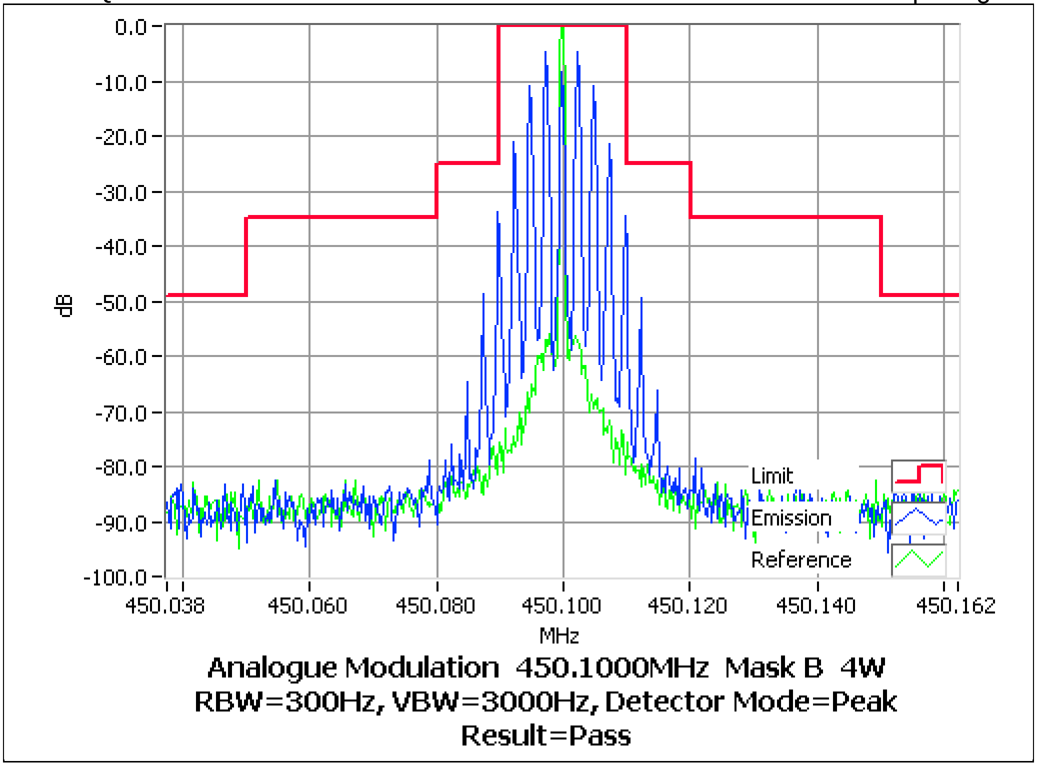
Analogue Modulation 429.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

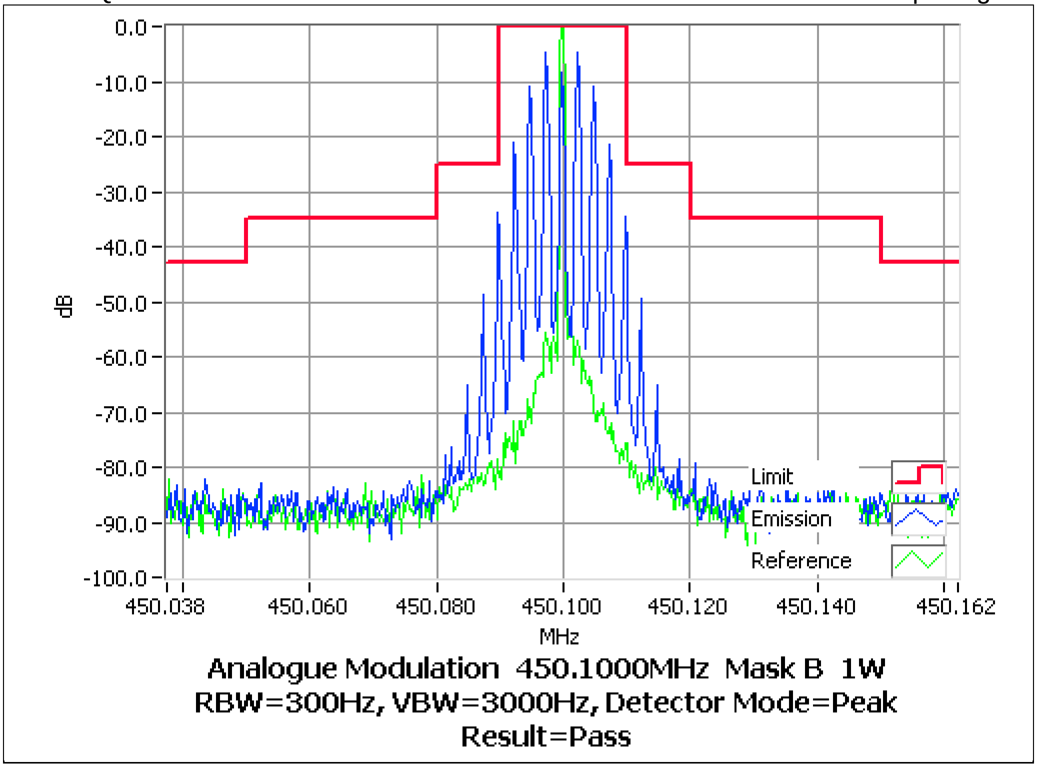
ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 25.0 kHz Channel Spacing



Tx FREQUENCY: 450.1 MHz 1 W 25.0 kHz Channel Spacing

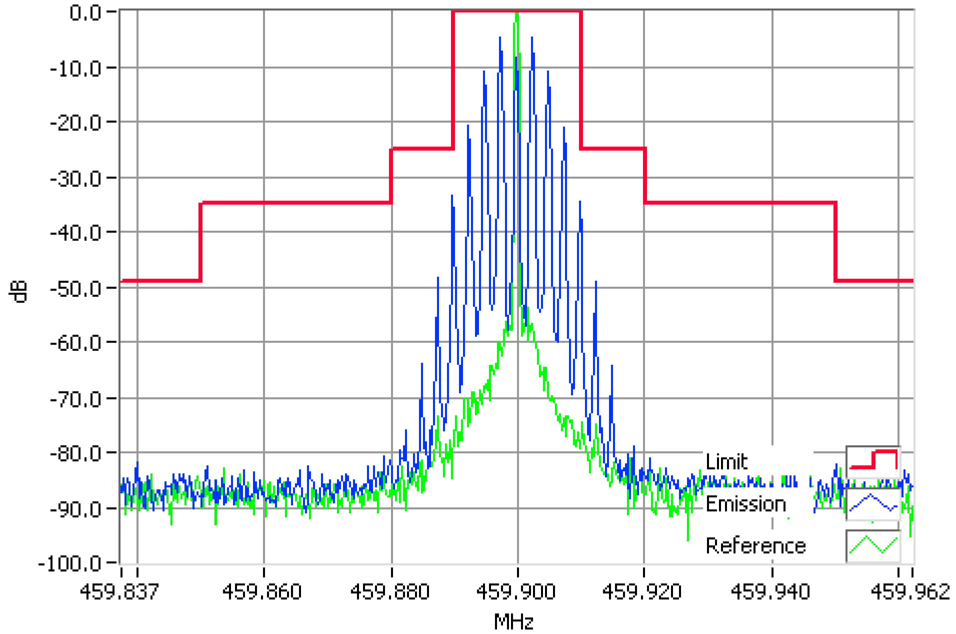


Occupied Bandwidth and Spectrum Masks

ANALOG VOICE

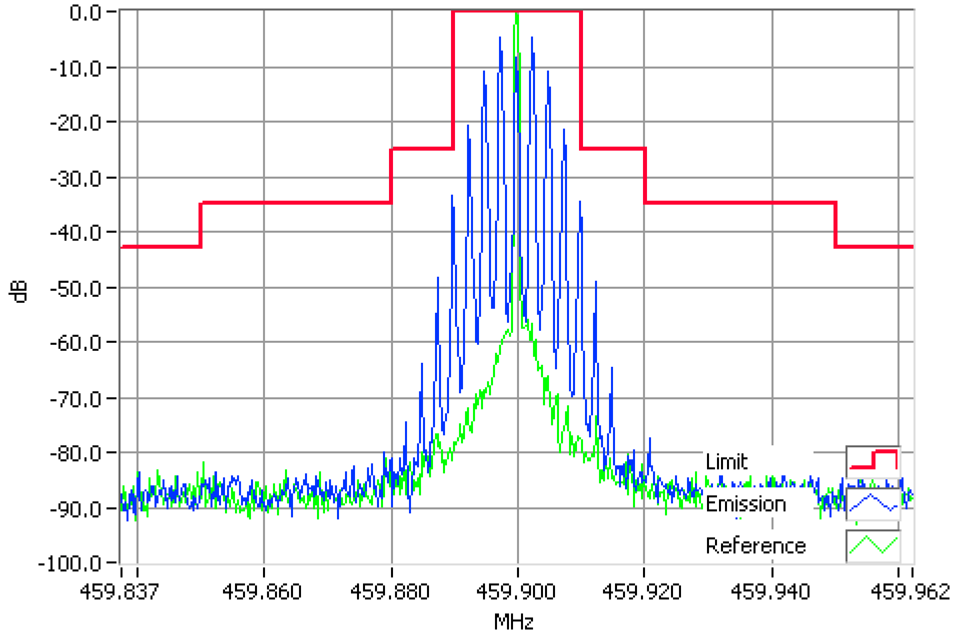
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 25.0 kHz Channel Spacing



Analogue Modulation 459.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 25.0 kHz Channel Spacing



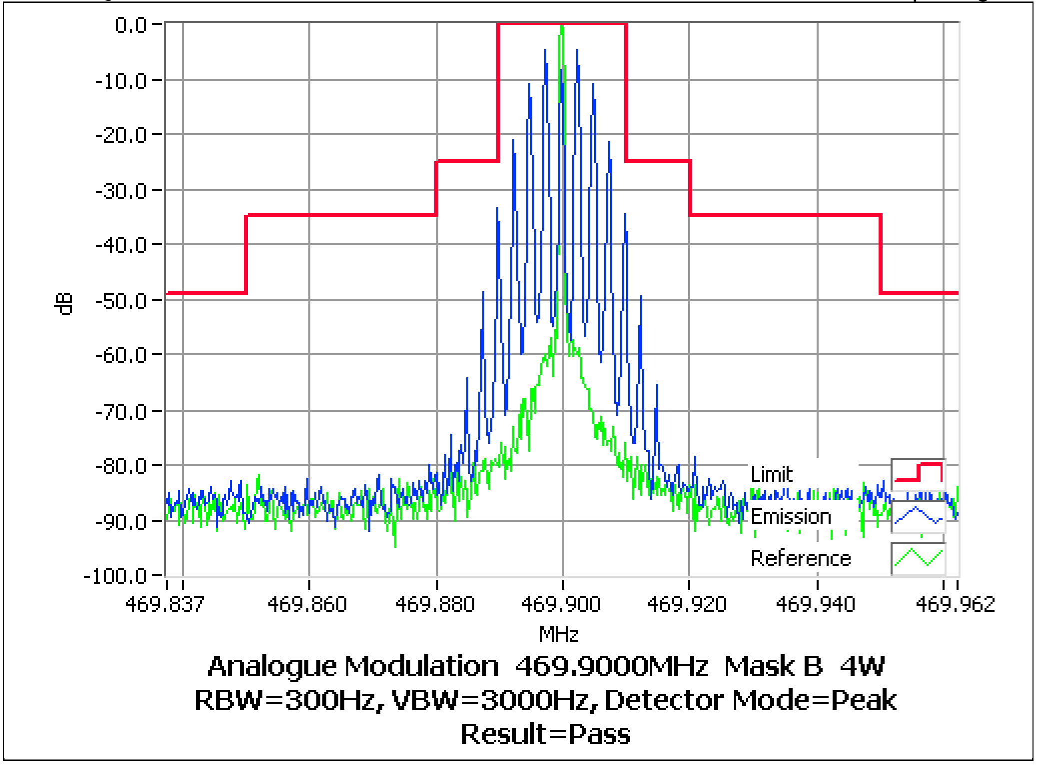
Analogue Modulation 459.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

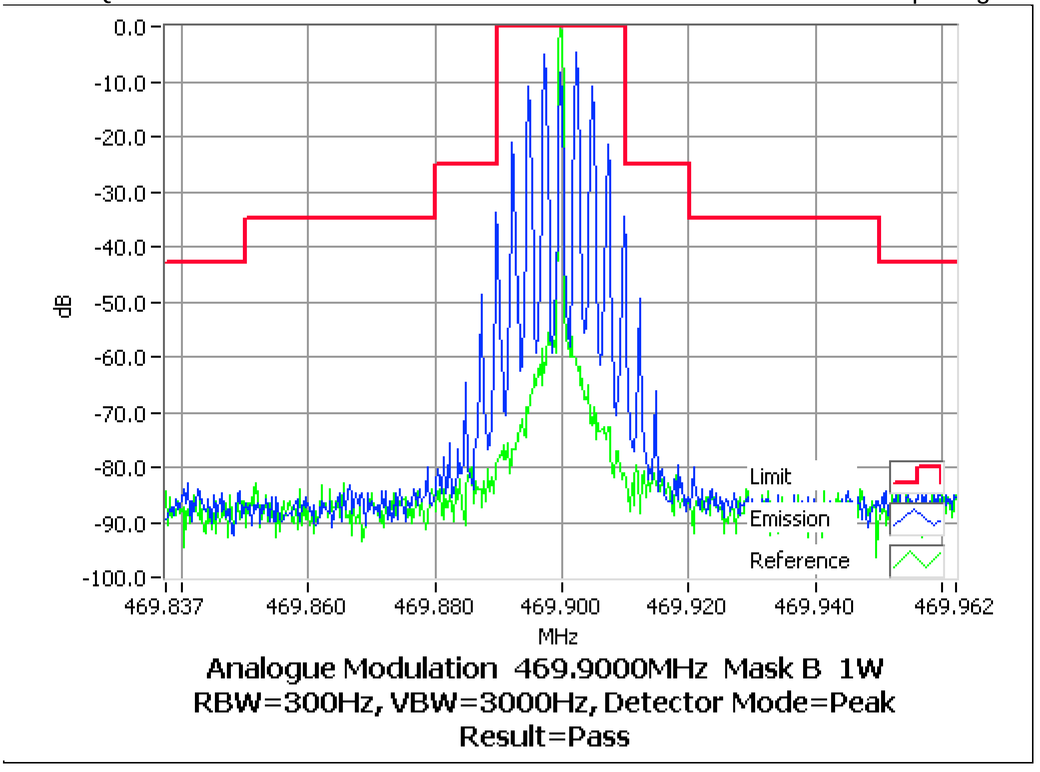
ANALOG VOICE

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 25.0 kHz Channel Spacing



Tx FREQUENCY: 469.9 MHz 1 W 25.0 kHz Channel Spacing

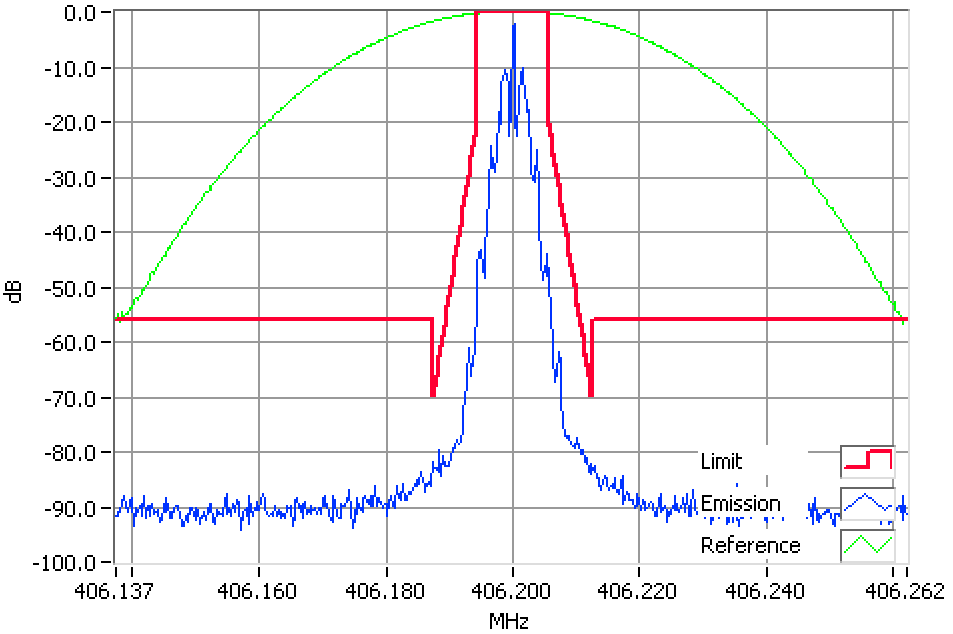


Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

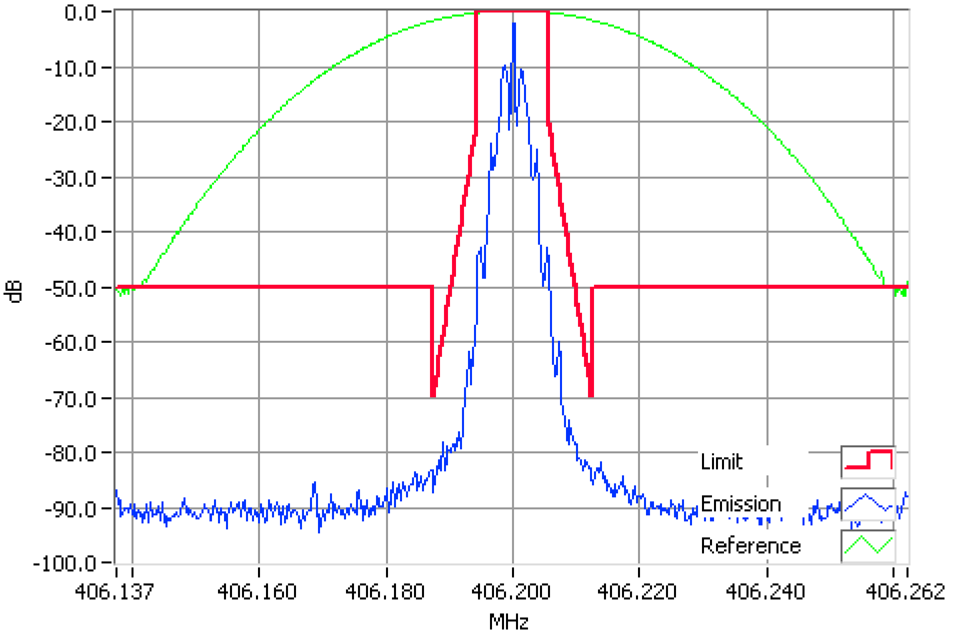
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



FFSK-1200 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



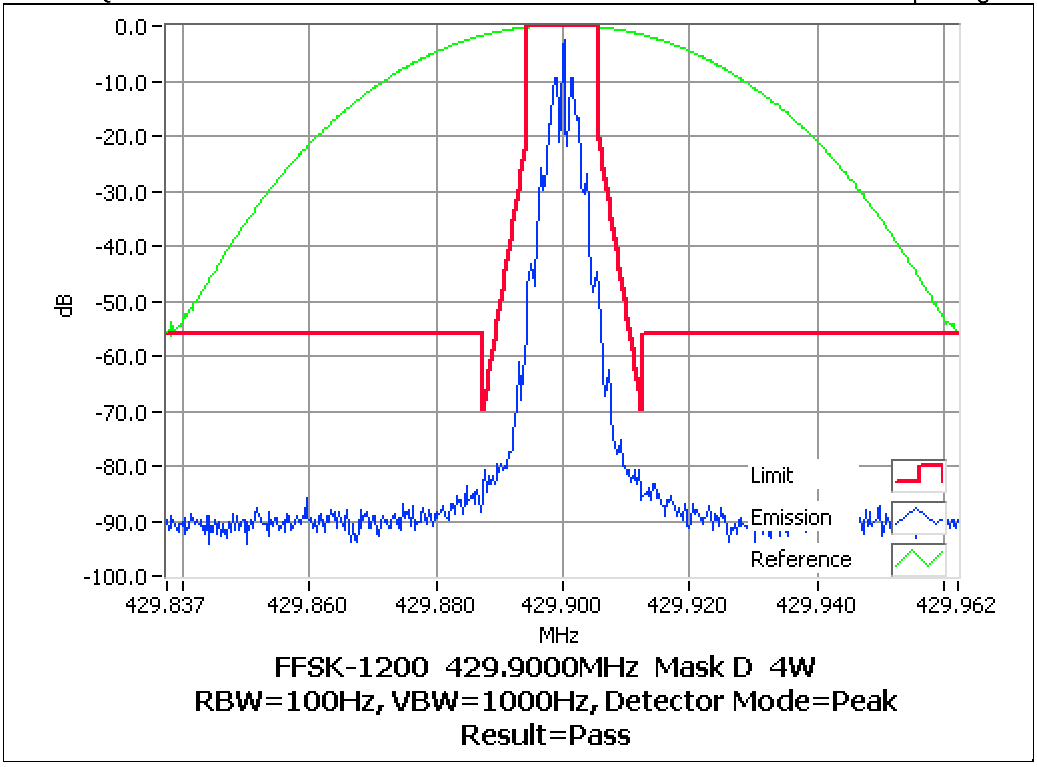
FFSK-1200 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

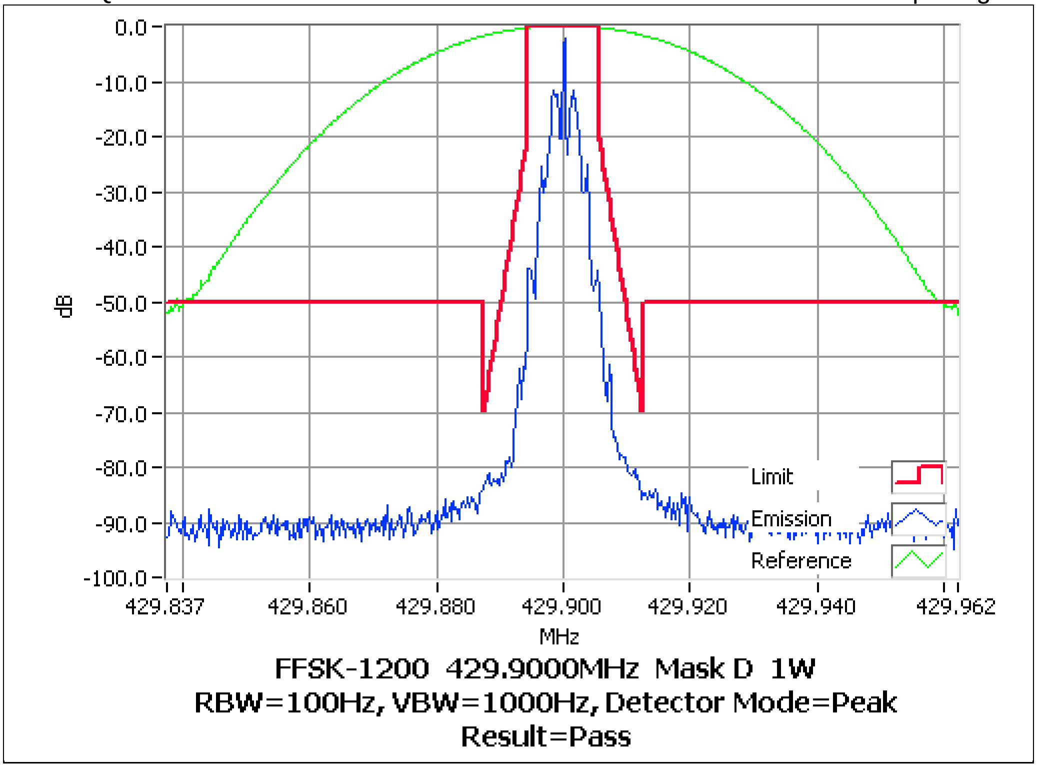
FFSK – 1200 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing

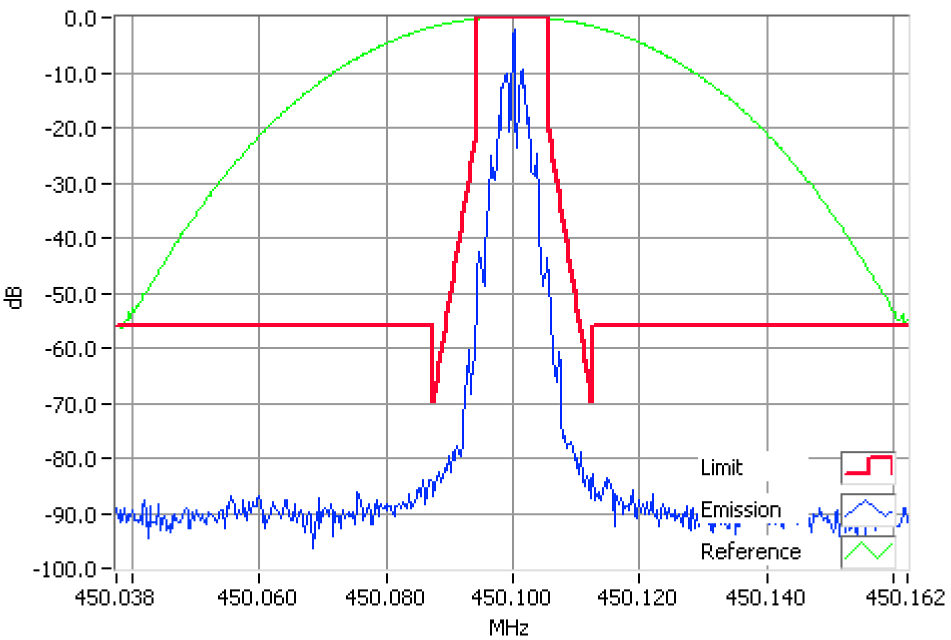


Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

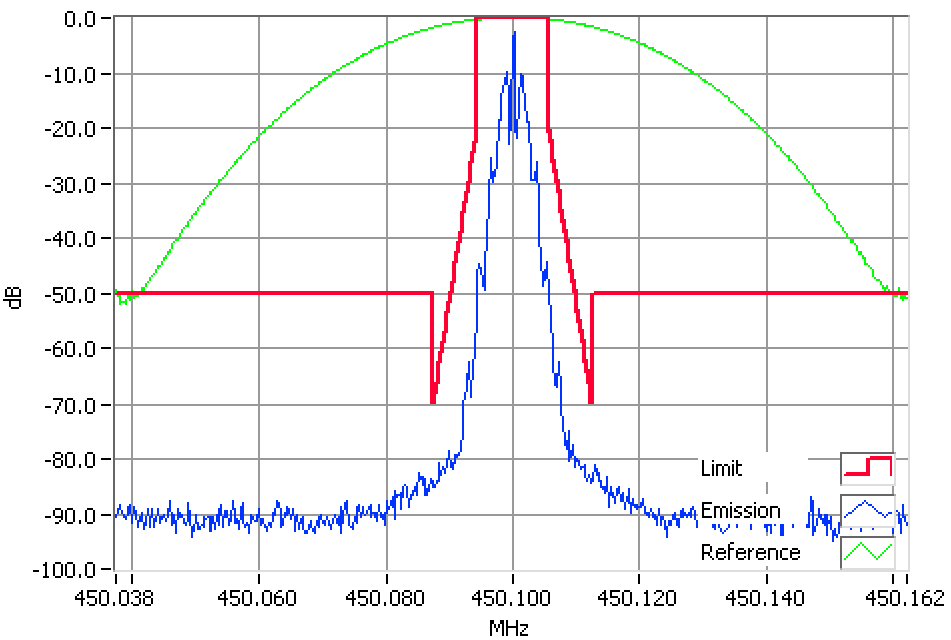
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



FFSK-1200 450.1000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing



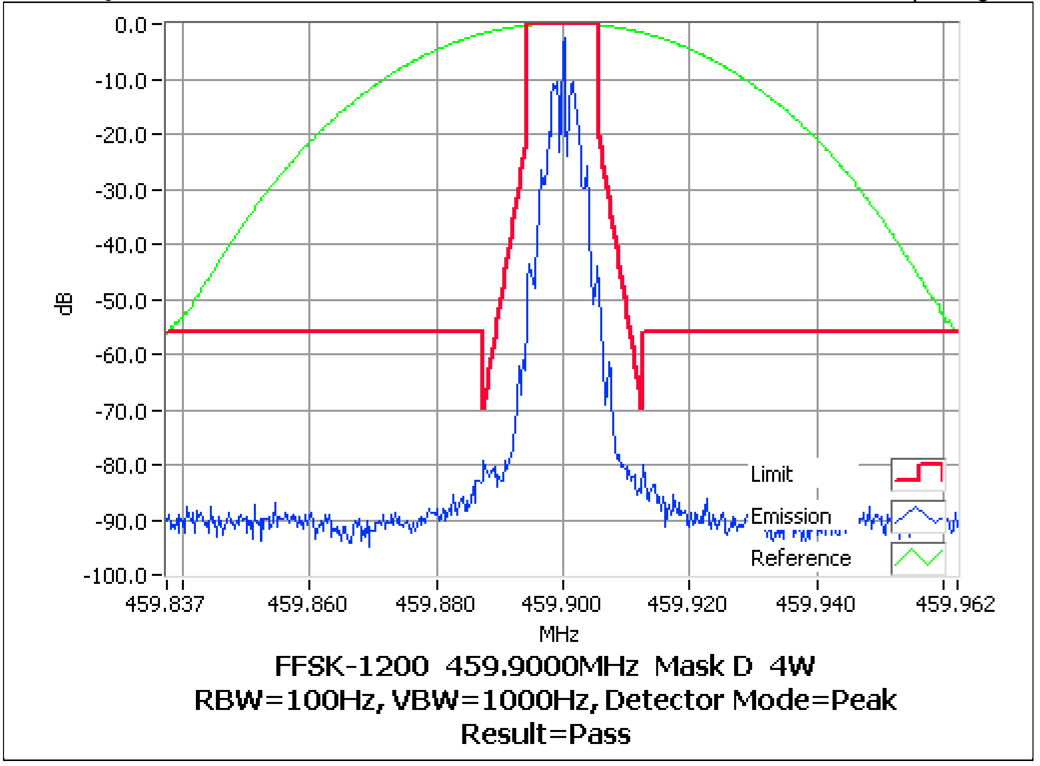
FFSK-1200 450.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

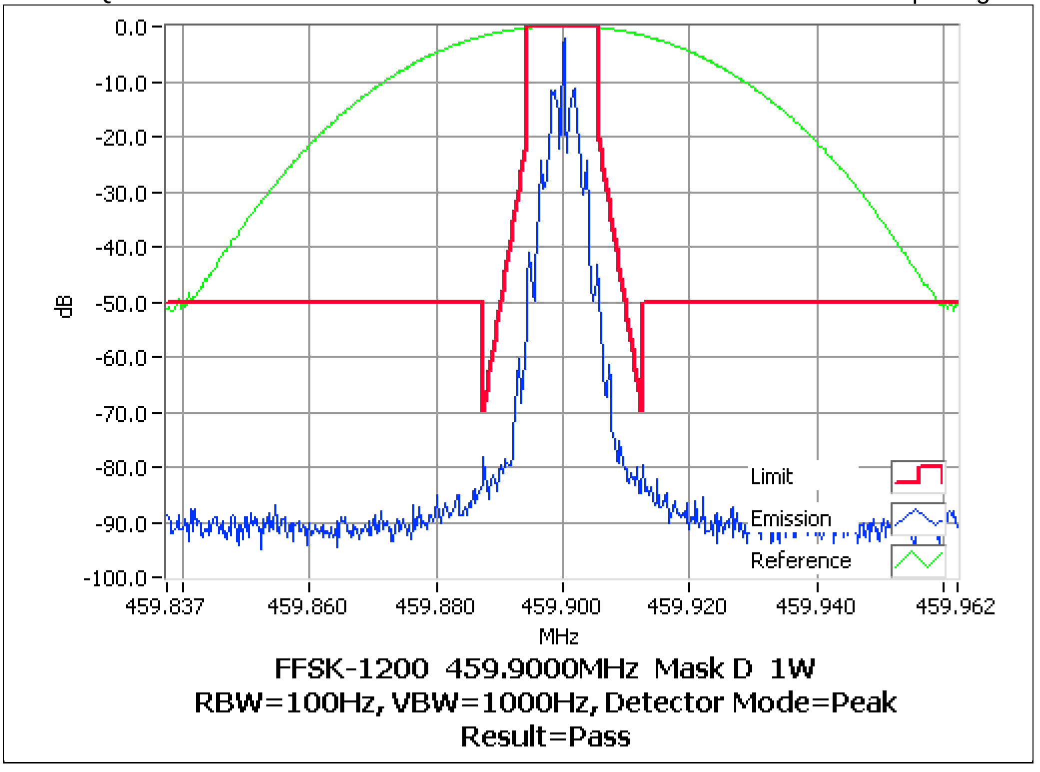
FFSK – 1200 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing

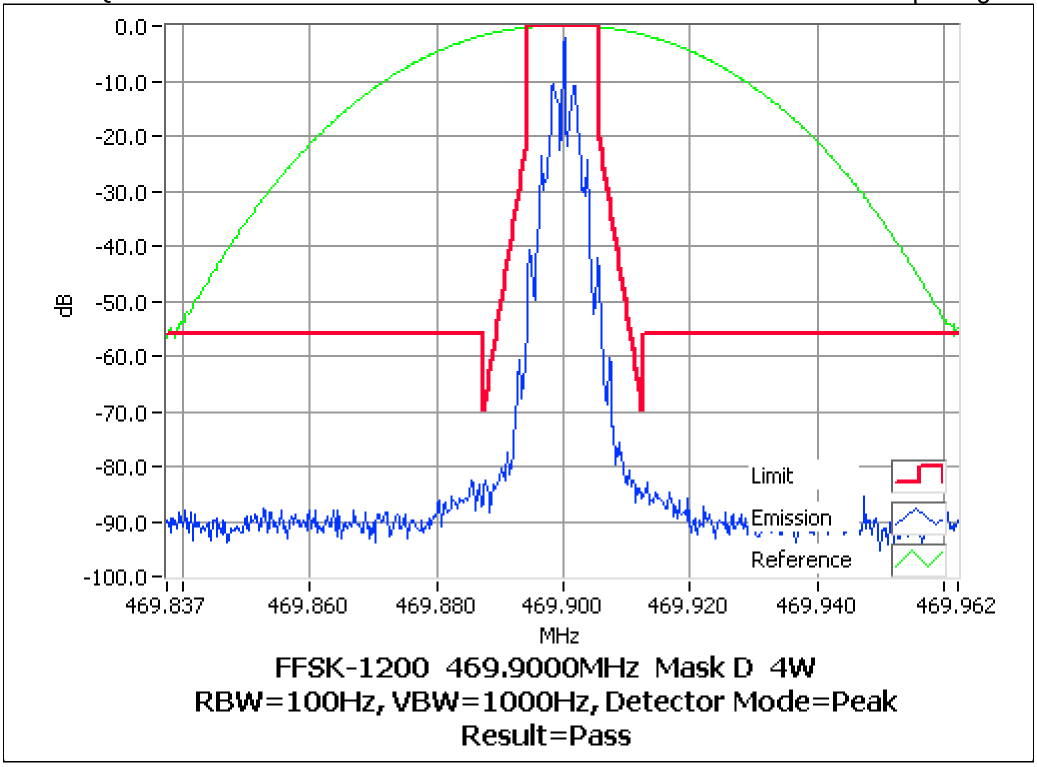


Occupied Bandwidth and Spectrum Masks

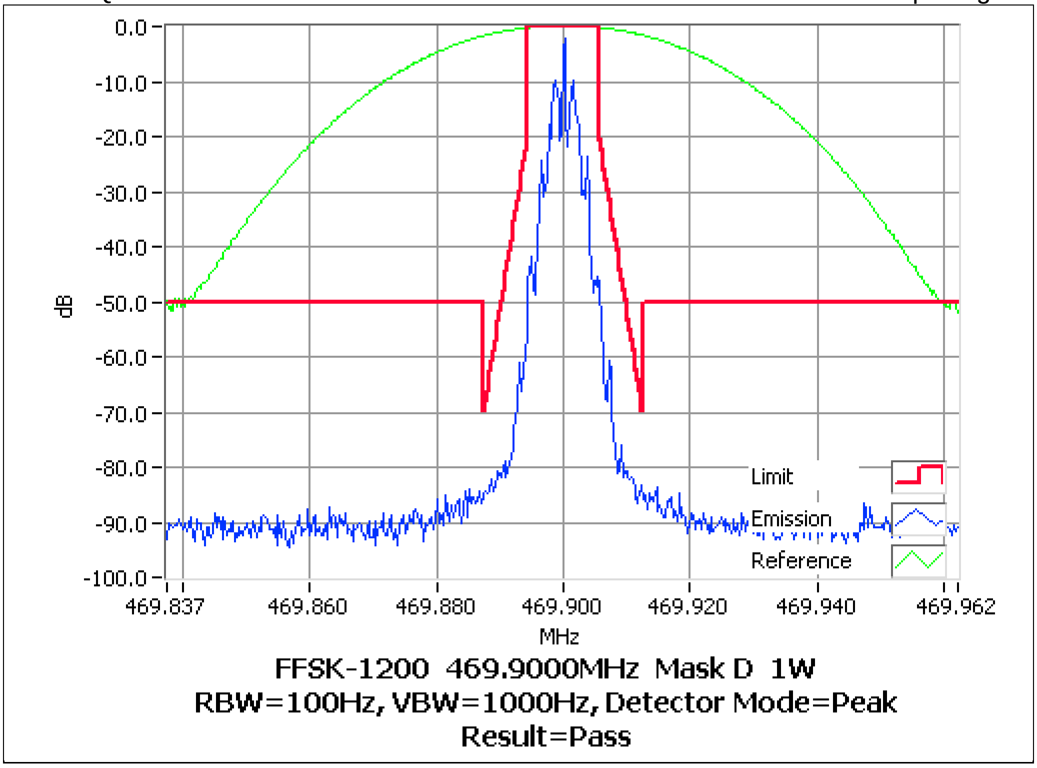
FFSK – 1200 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing

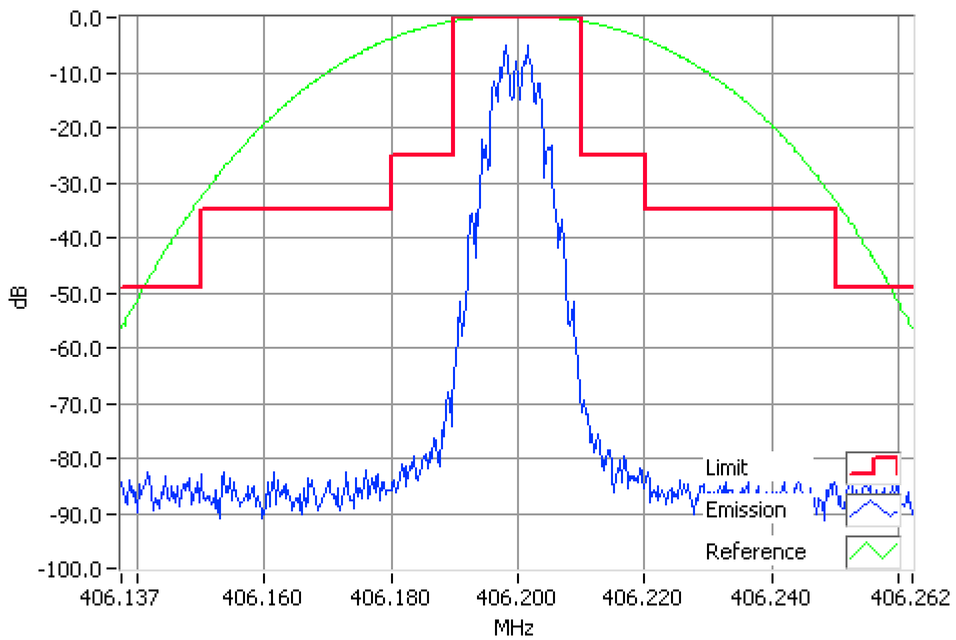


Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

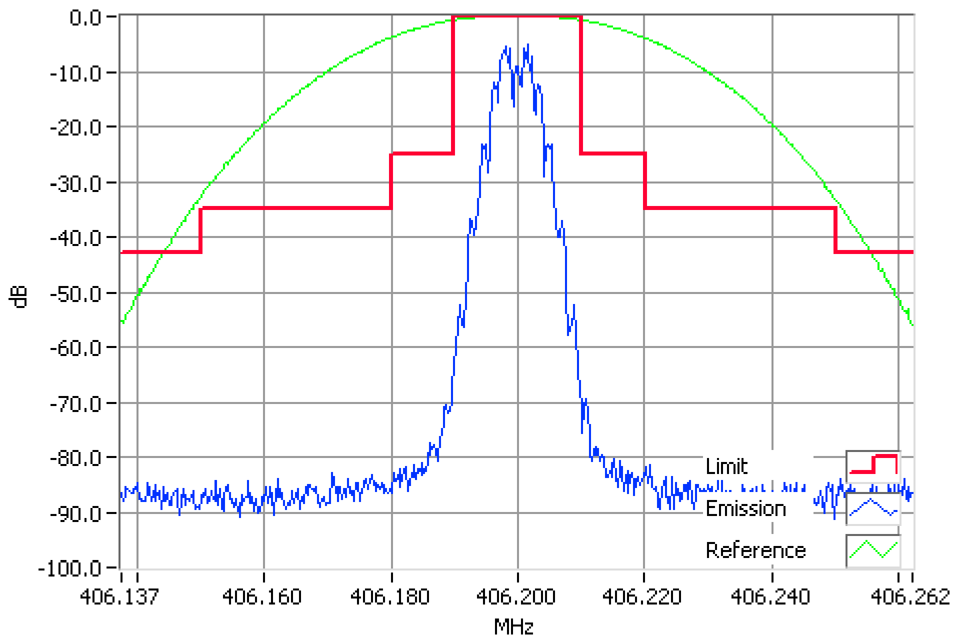
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 25.0 kHz Channel Spacing



FFSK-1200 406.2000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 25.0 kHz Channel Spacing



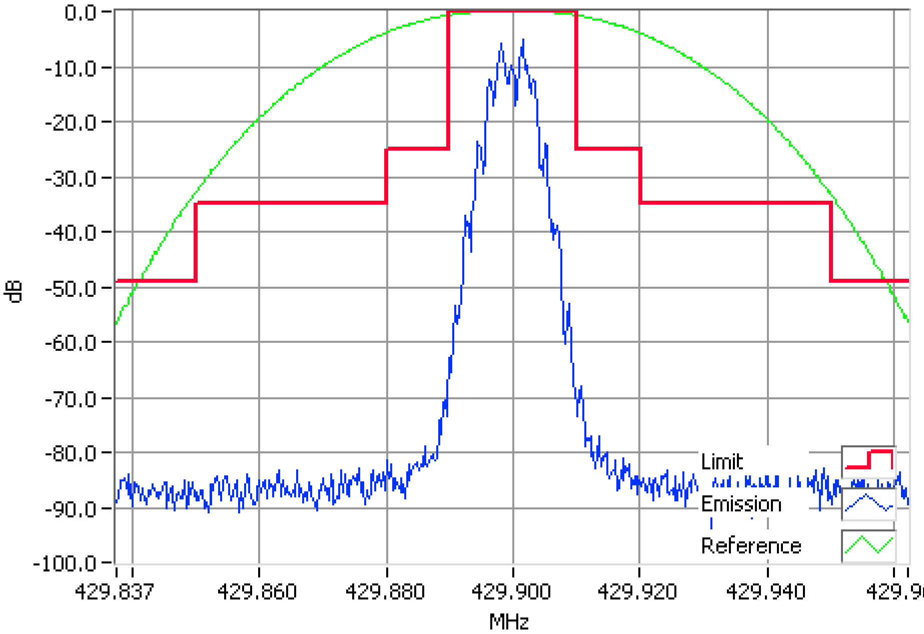
FFSK-1200 406.2000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

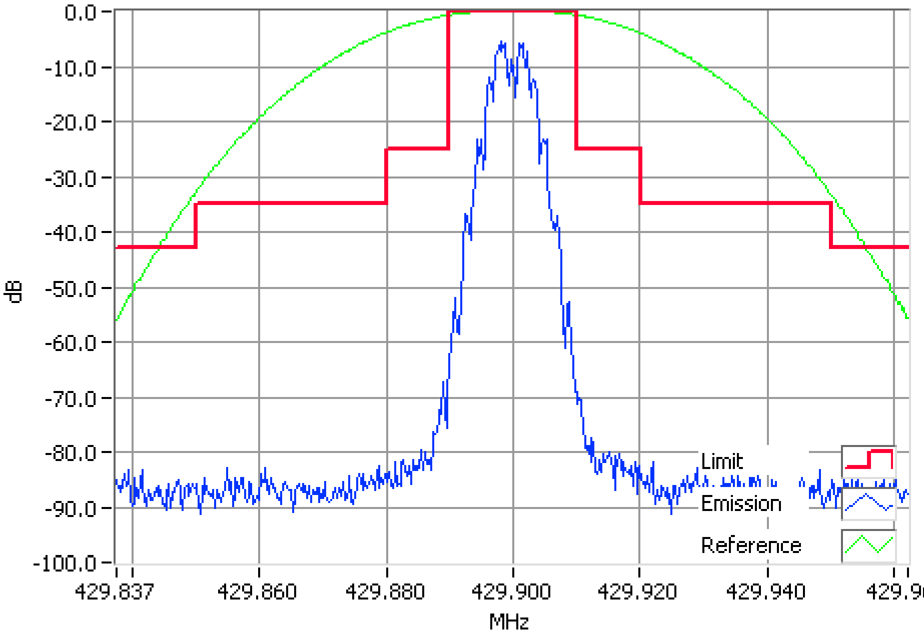
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 25.0 kHz Channel Spacing



FFSK-1200 429.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 25.0 kHz Channel Spacing



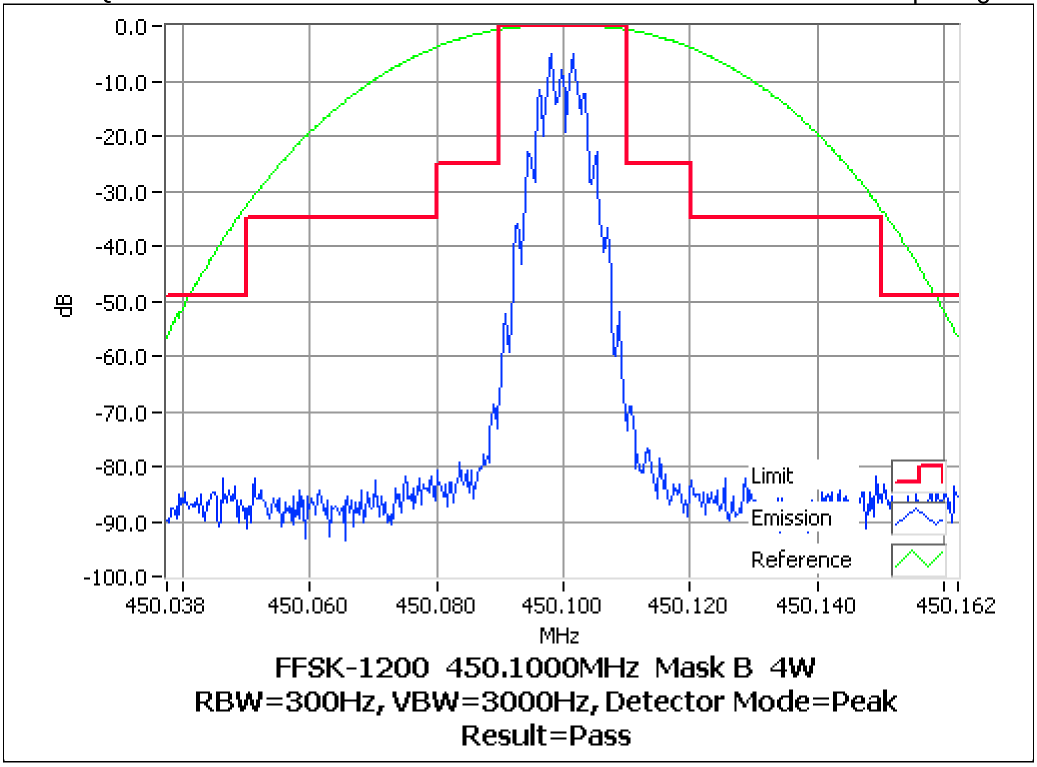
FFSK-1200 429.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

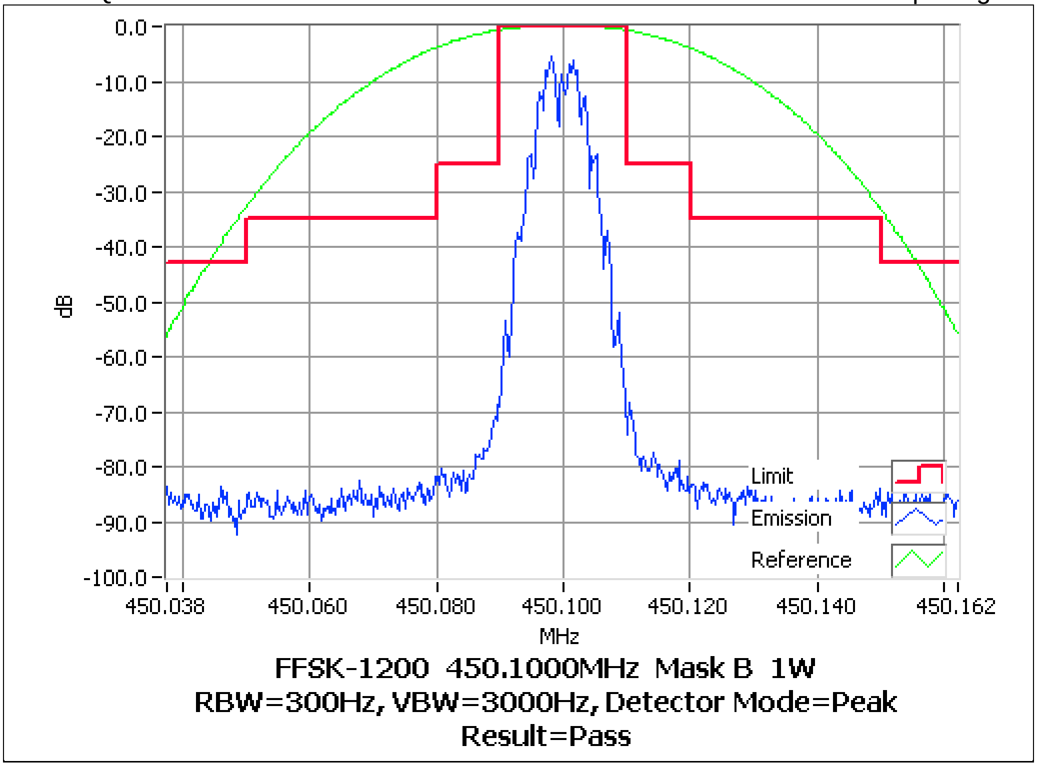
FFSK – 1200 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 25.0 kHz Channel Spacing



Tx FREQUENCY: 450.1 MHz 1 W 25.0 kHz Channel Spacing

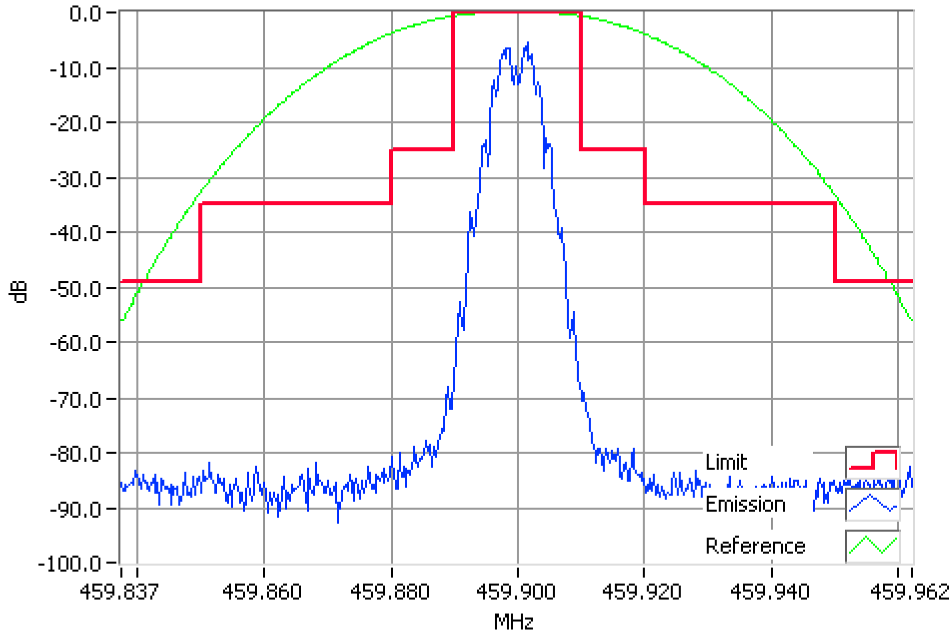


Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

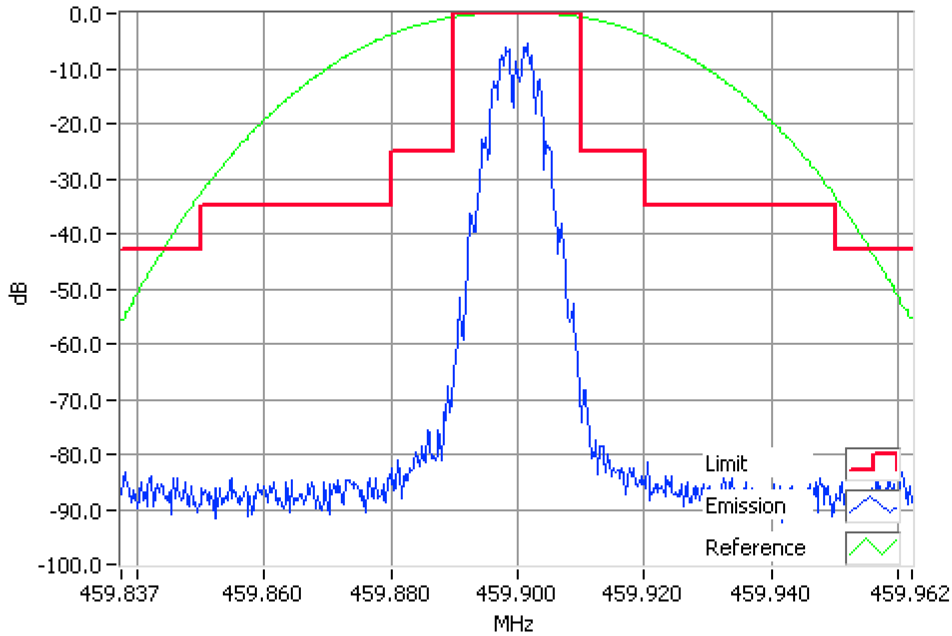
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 25.0 kHz Channel Spacing



FFSK-1200 459.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 25.0 kHz Channel Spacing



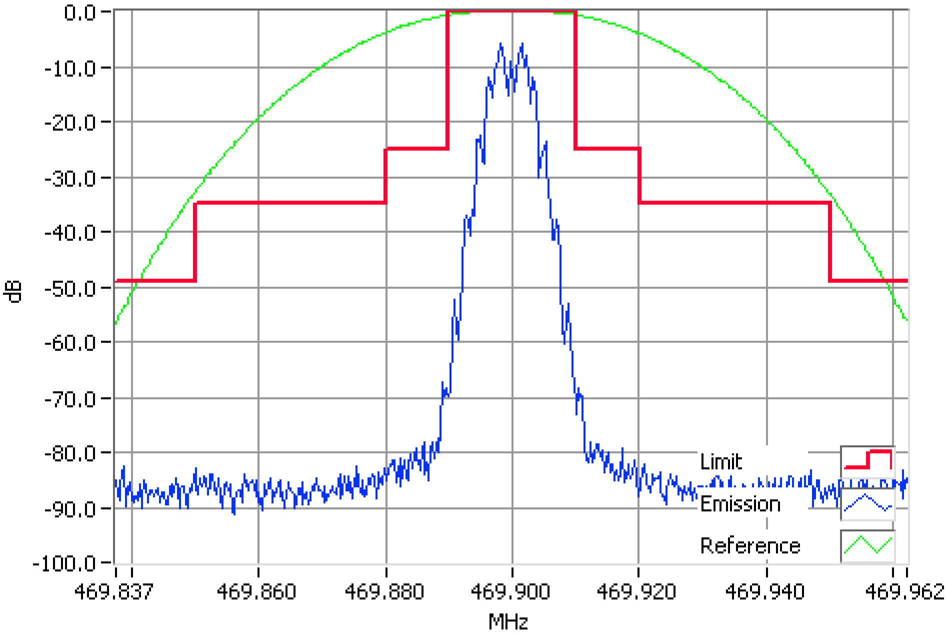
FFSK-1200 459.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 1200 bps

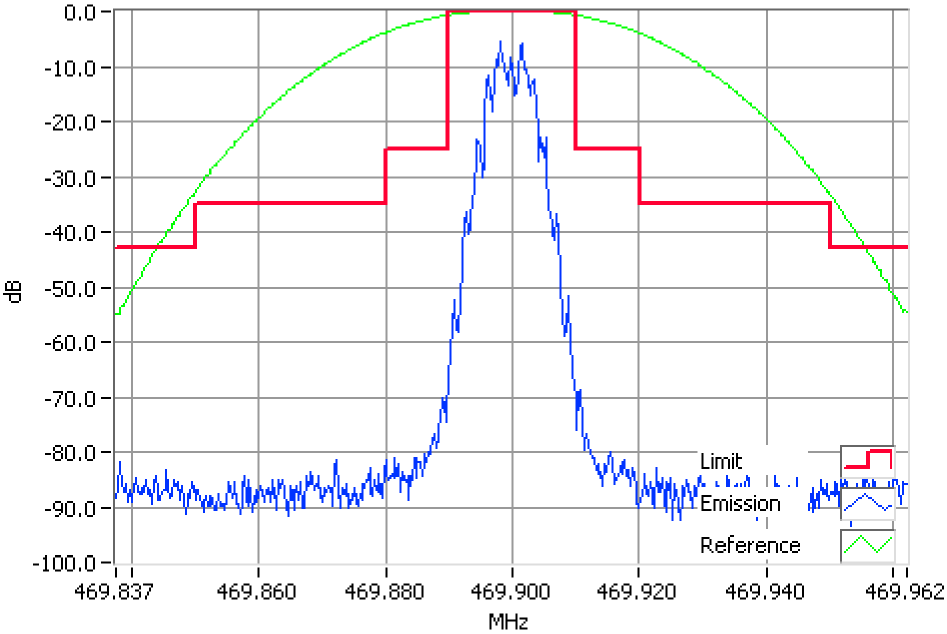
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 25.0 kHz Channel Spacing



FFSK-1200 469.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 25.0 kHz Channel Spacing



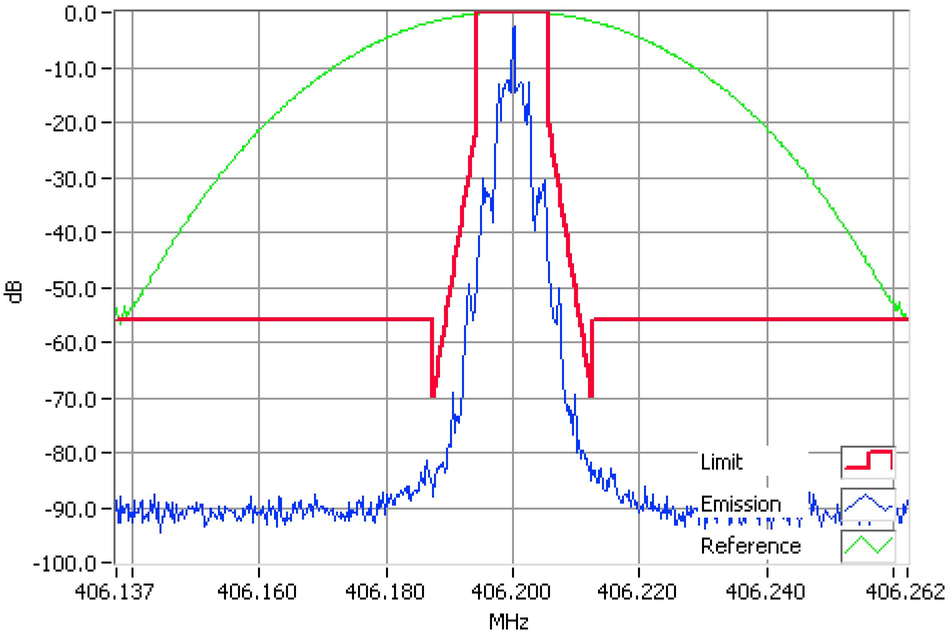
FFSK-1200 469.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

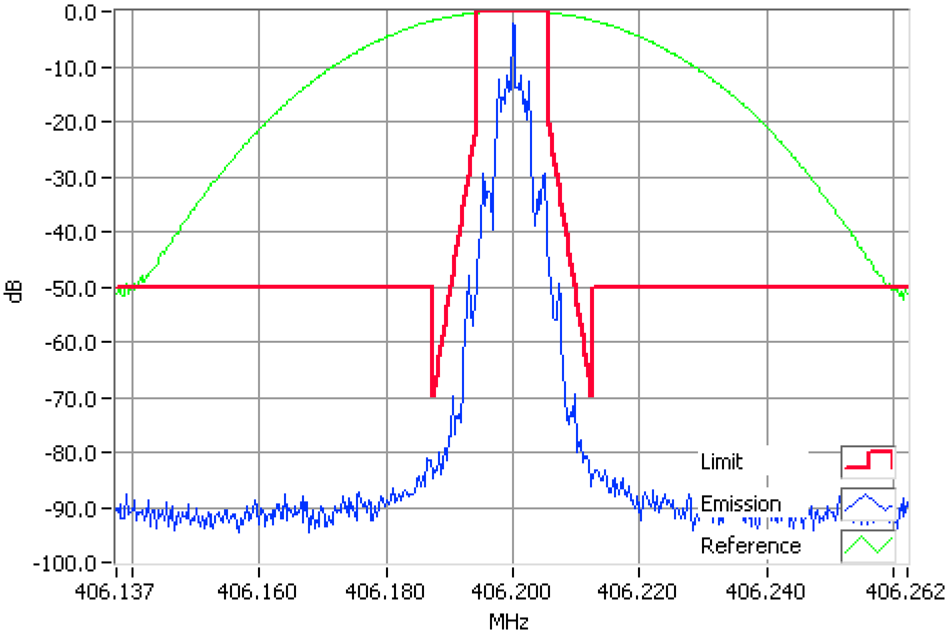
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



FFSK-2400 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



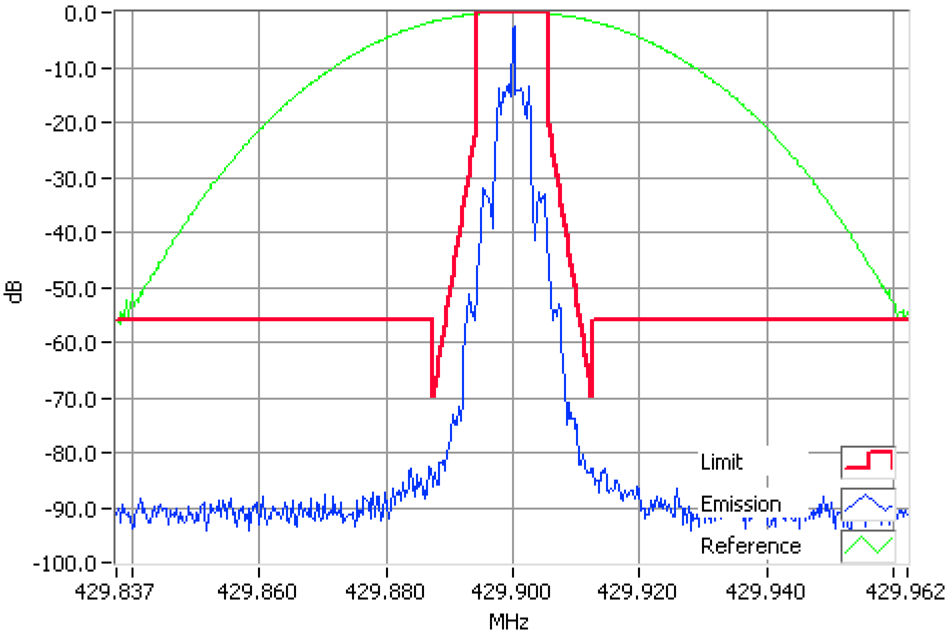
FFSK-2400 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

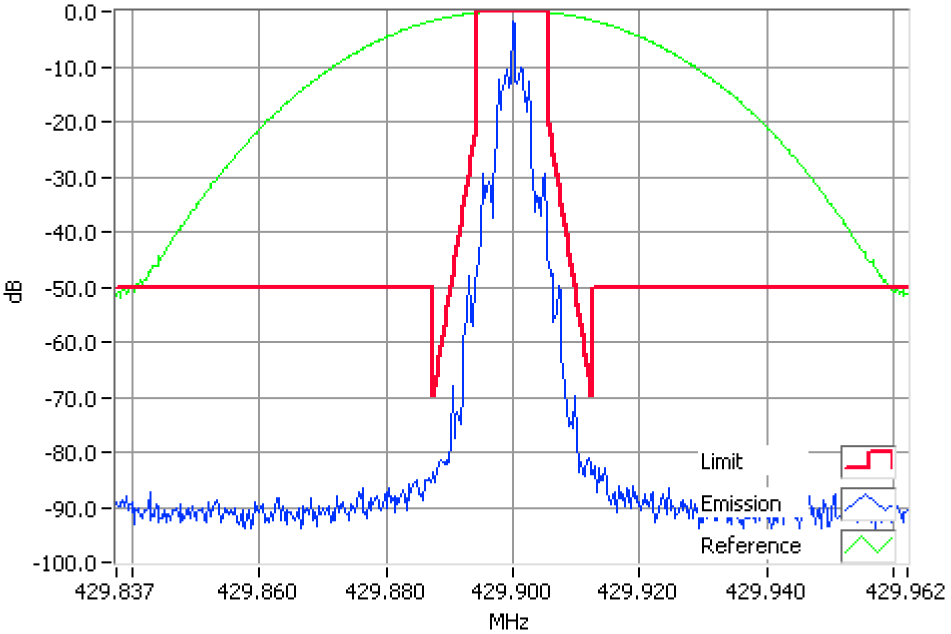
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



FFSK-2400 429.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing



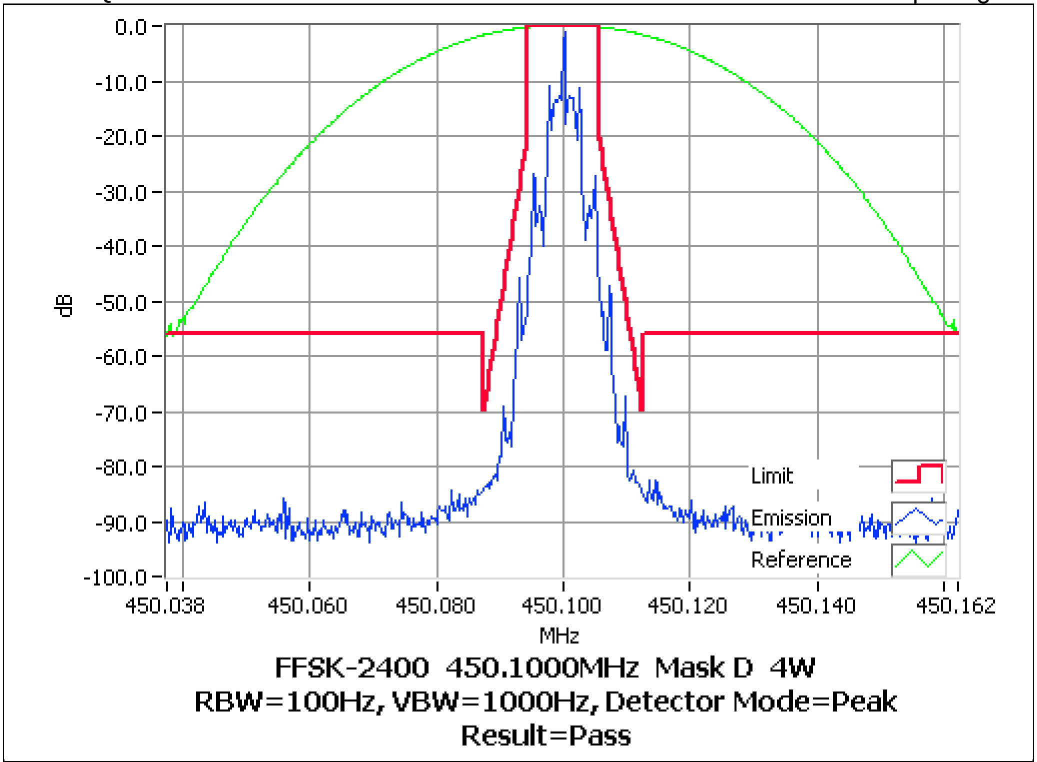
FFSK-2400 429.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

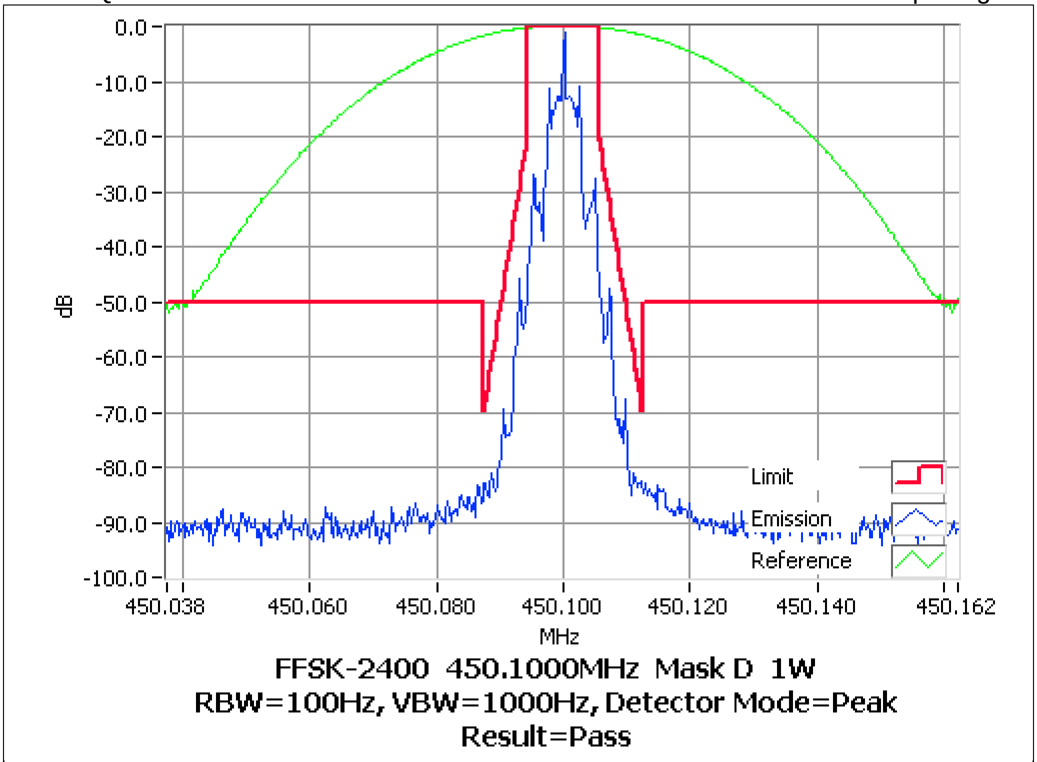
FFSK – 2400 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing

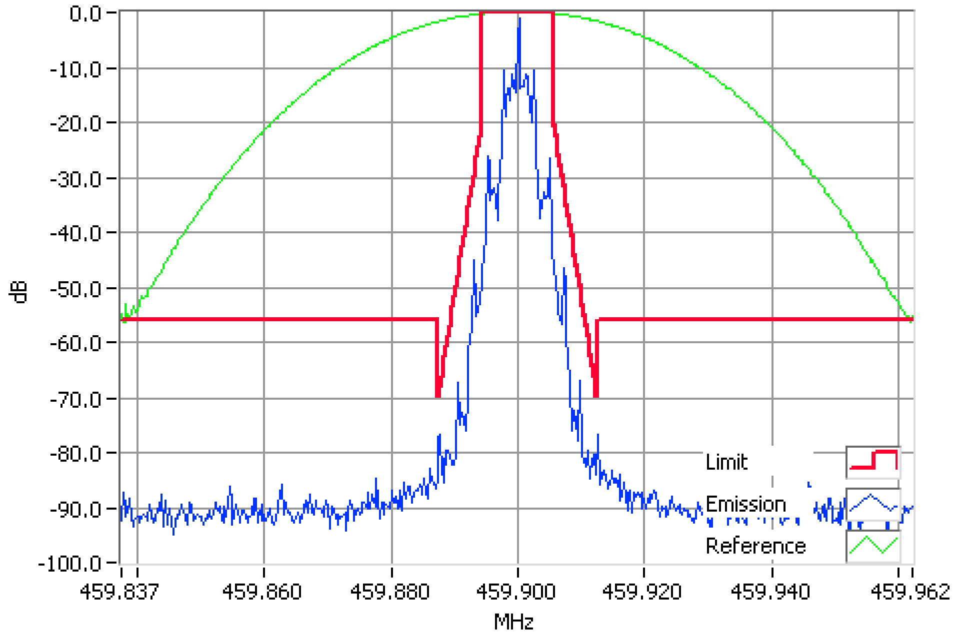


Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

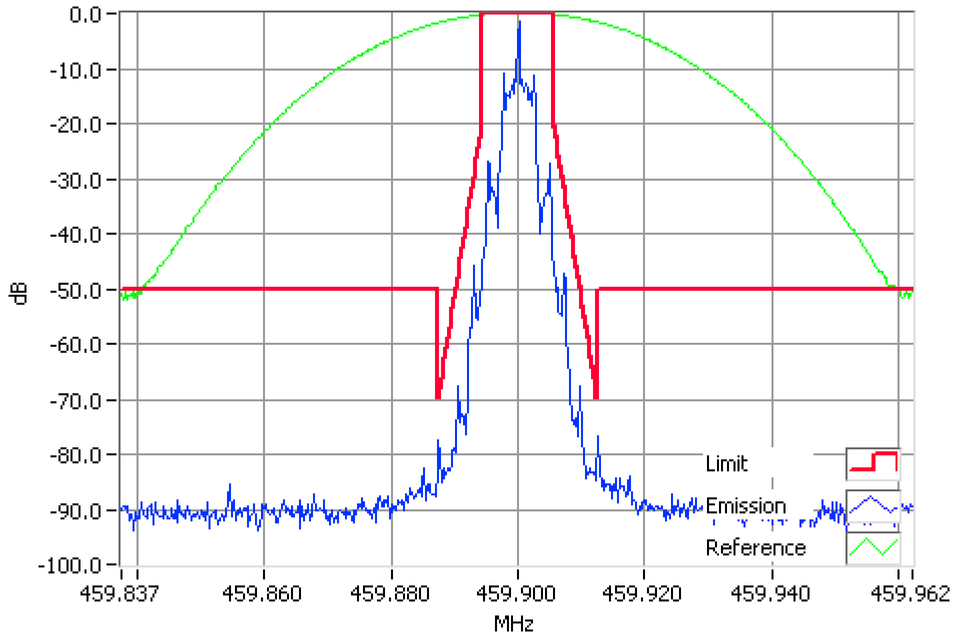
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



FFSK-2400 459.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing



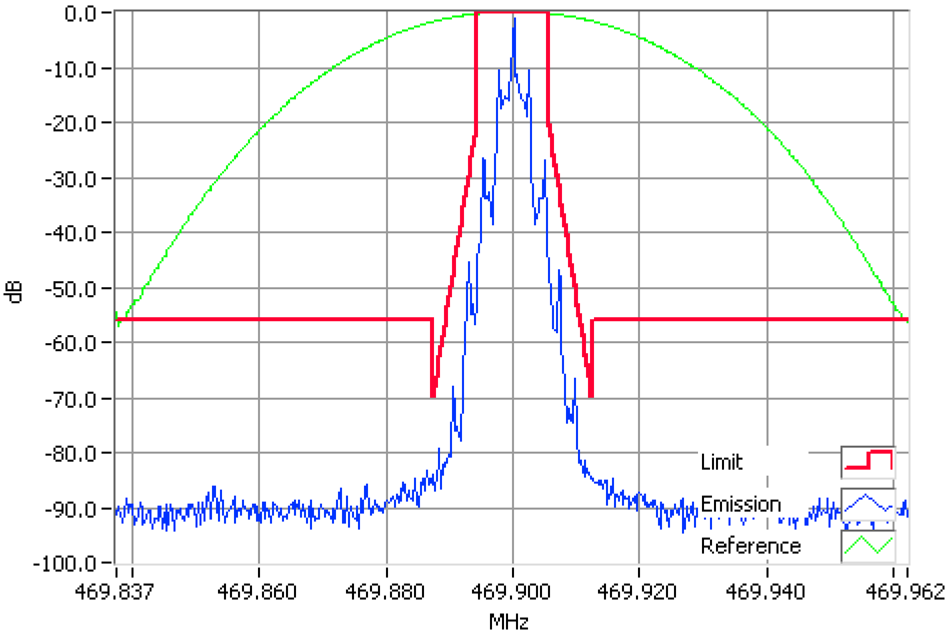
FFSK-2400 459.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

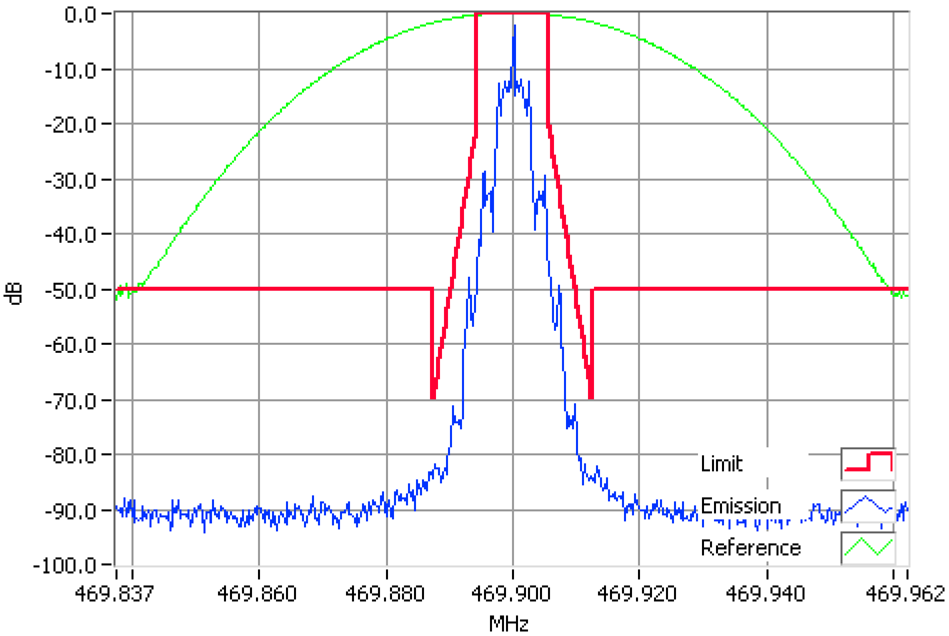
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



FFSK-2400 469.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing



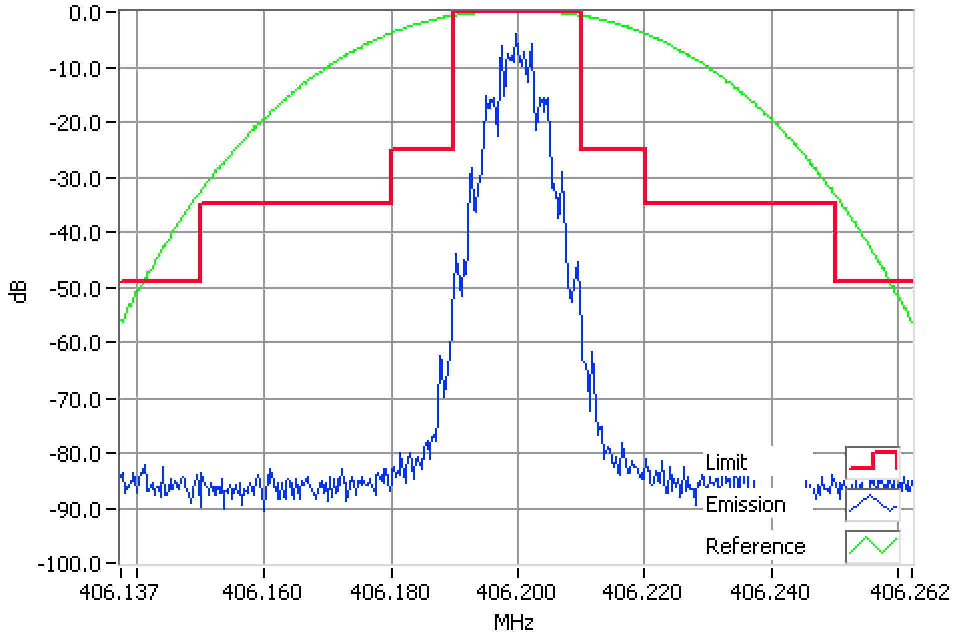
FFSK-2400 469.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

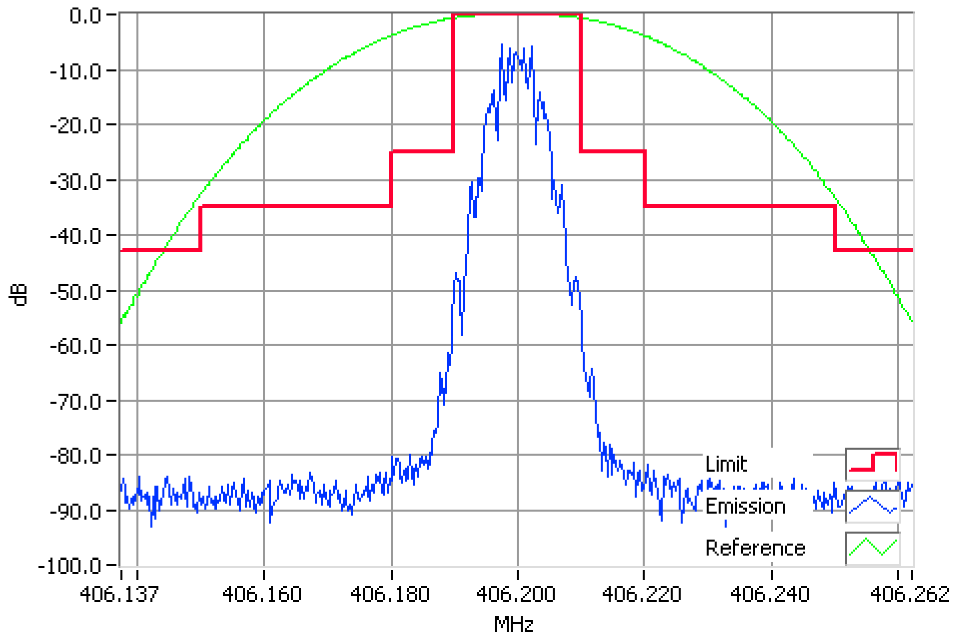
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 25.0 kHz Channel Spacing



FFSK-2400 406.2000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 25.0 kHz Channel Spacing



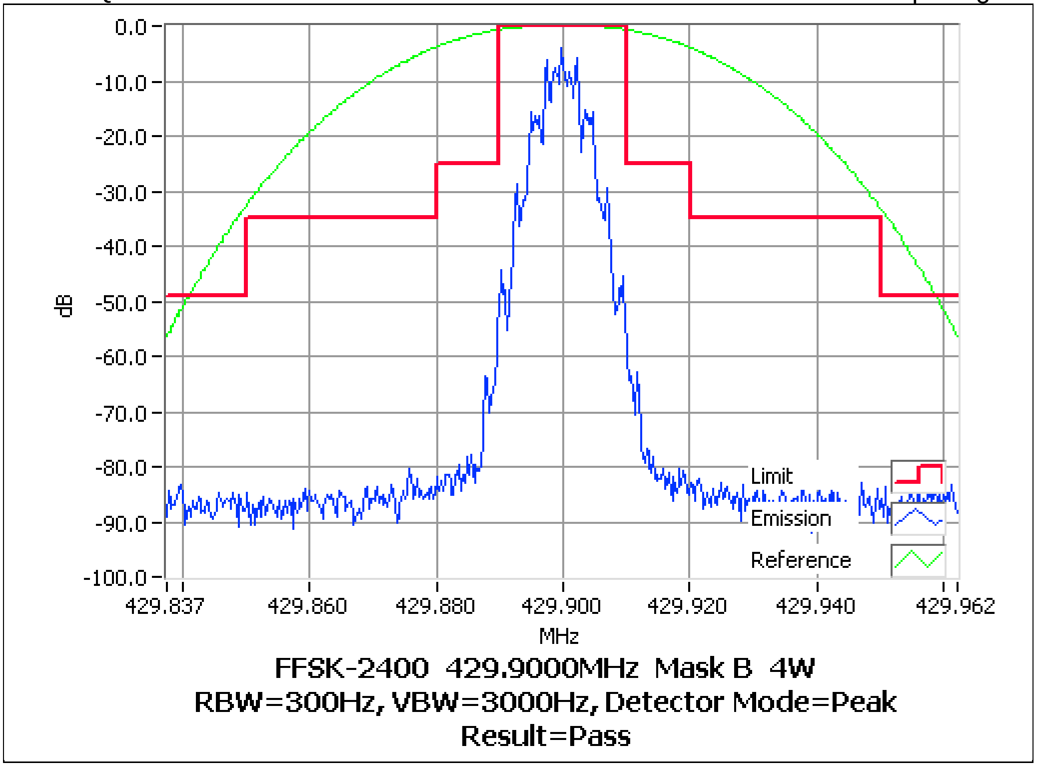
FFSK-2400 406.2000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

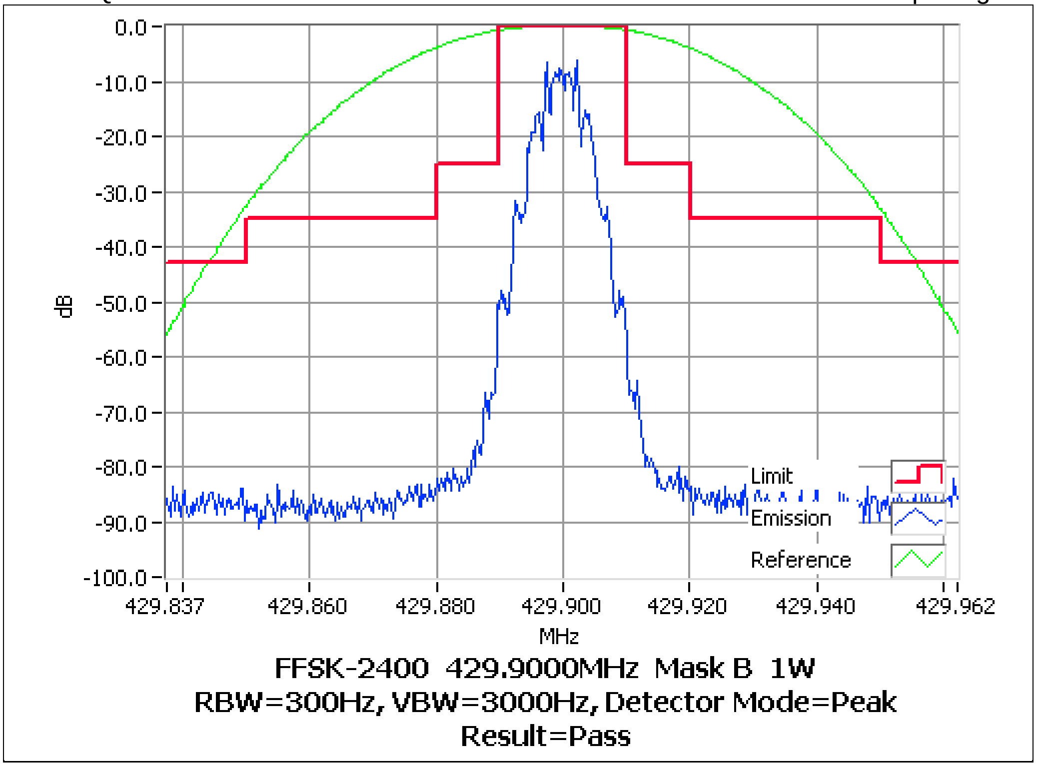
FFSK – 2400 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 25.0 kHz Channel Spacing



Tx FREQUENCY: 429.9 MHz 1 W 25.0 kHz Channel Spacing

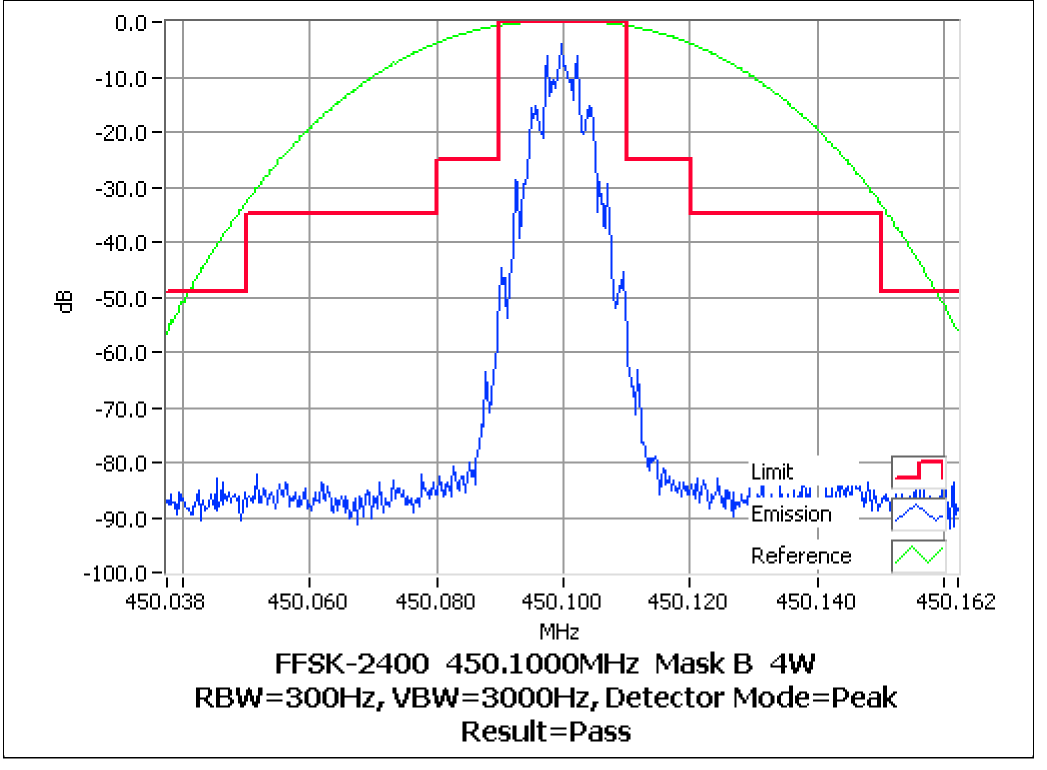


Occupied Bandwidth and Spectrum Masks

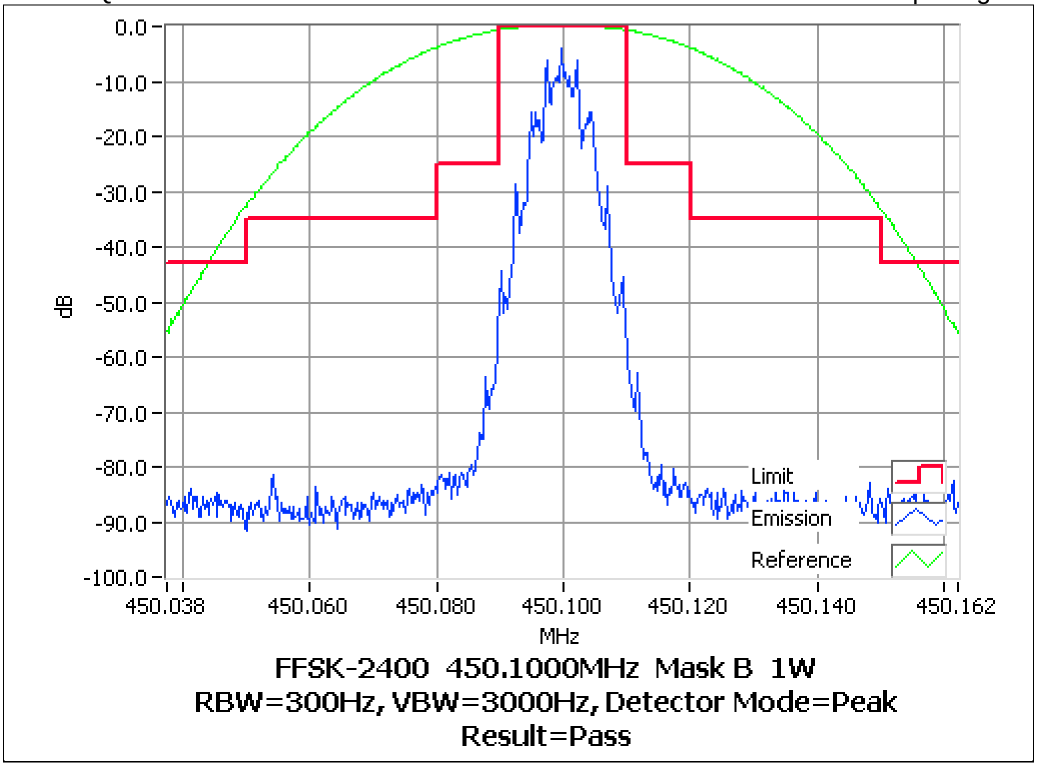
FFSK – 2400 bps

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 25.0 kHz Channel Spacing



Tx FREQUENCY: 450.1 MHz 1 W 25.0 kHz Channel Spacing

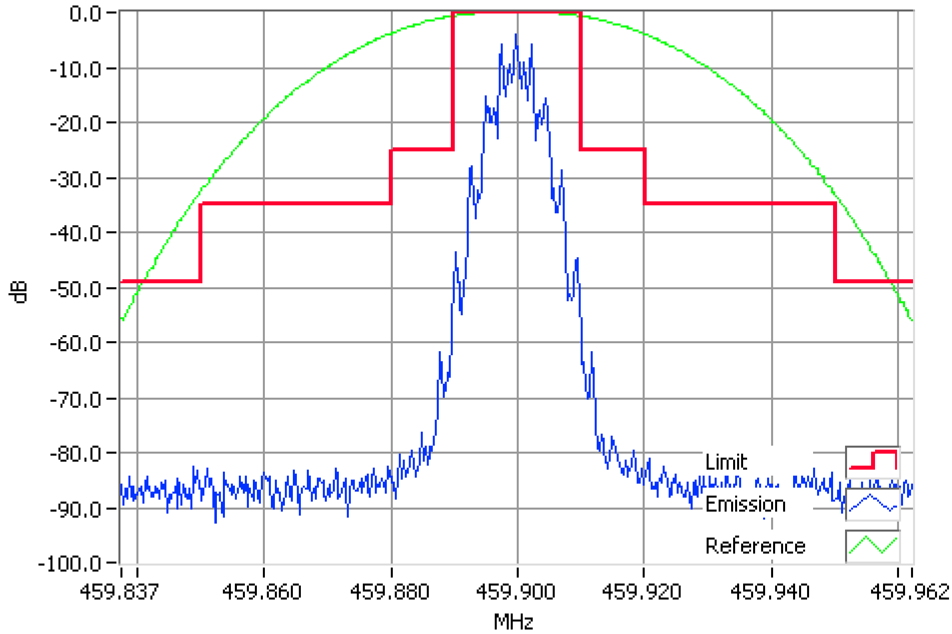


Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

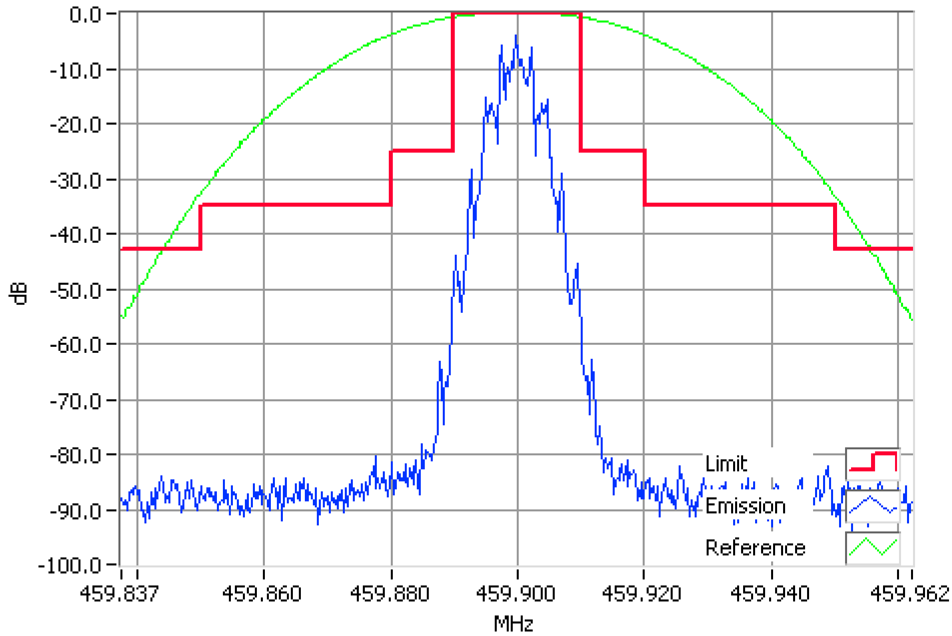
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 25.0 kHz Channel Spacing



FFSK-2400 459.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 25.0 kHz Channel Spacing



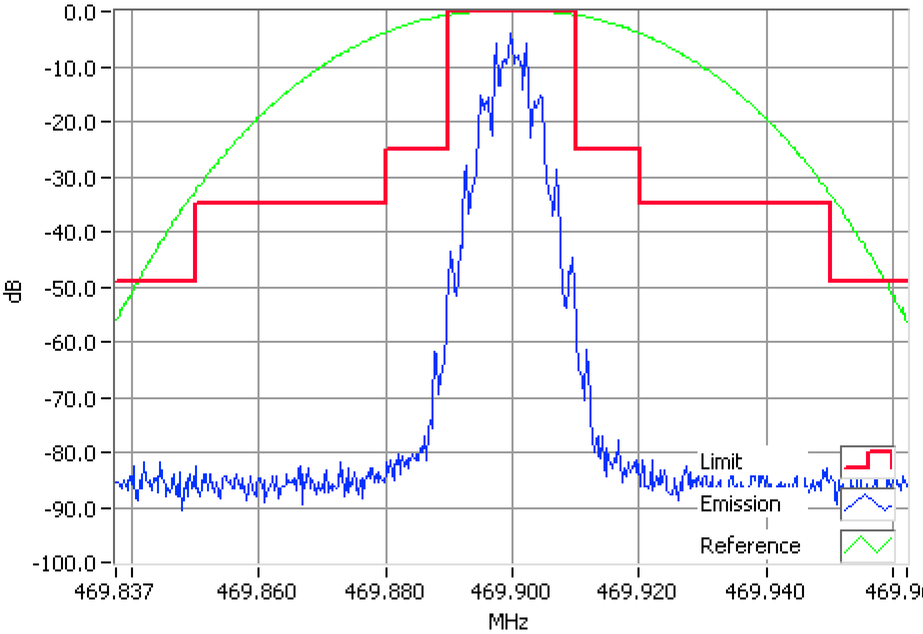
FFSK-2400 459.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

FFSK – 2400 bps

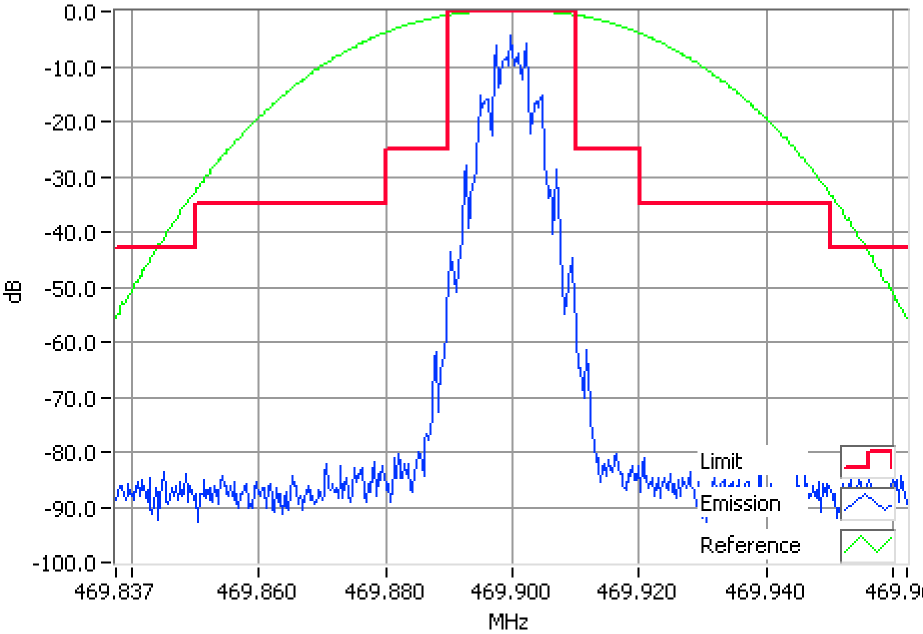
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 25.0 kHz Channel Spacing



FFSK-2400 469.9000MHz Mask B 4W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 25.0 kHz Channel Spacing



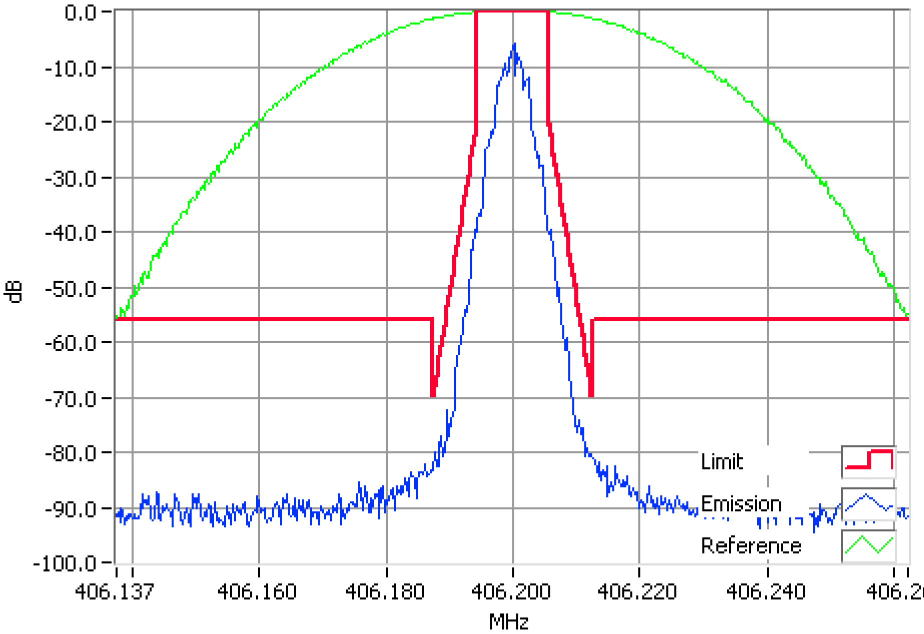
FFSK-2400 469.9000MHz Mask B 1W
RBW=300Hz, VBW=3000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

DMR

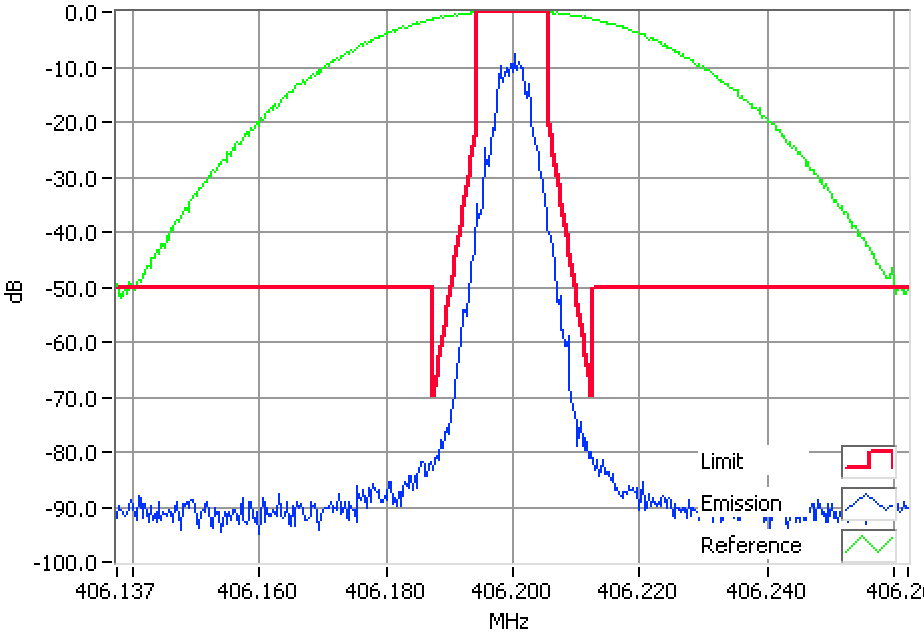
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



DMR 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



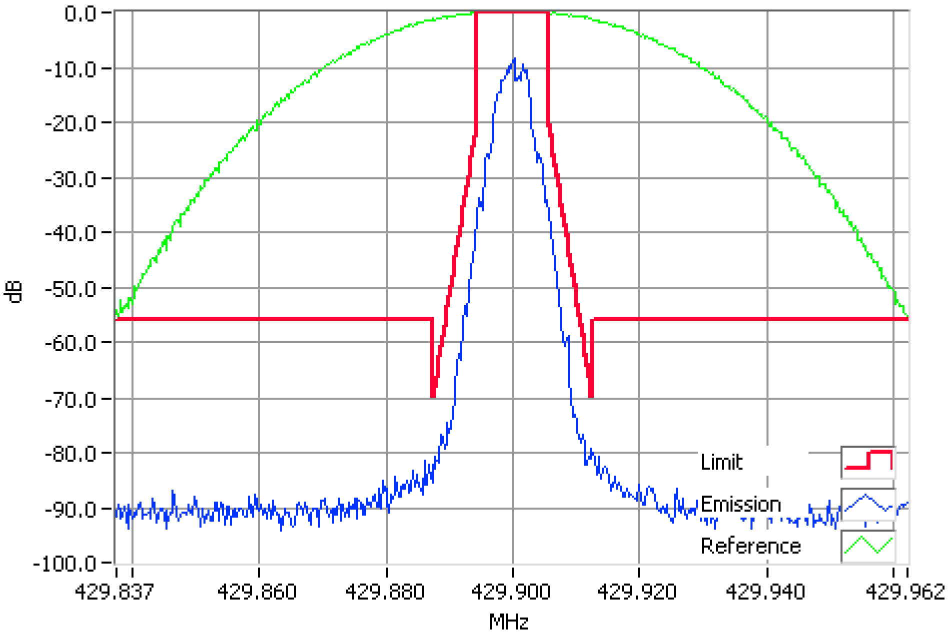
DMR 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

DMR

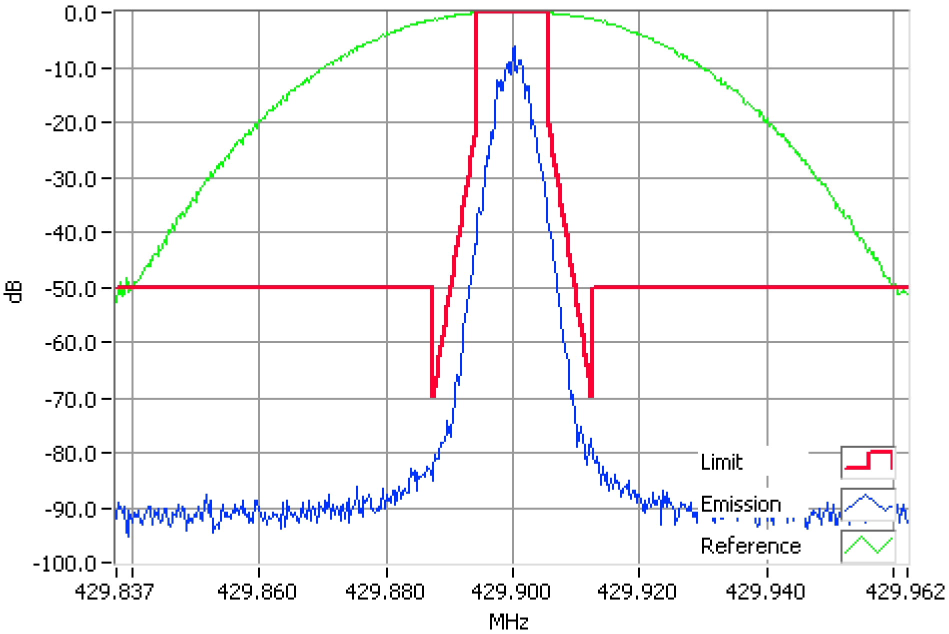
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



DMR 429.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing



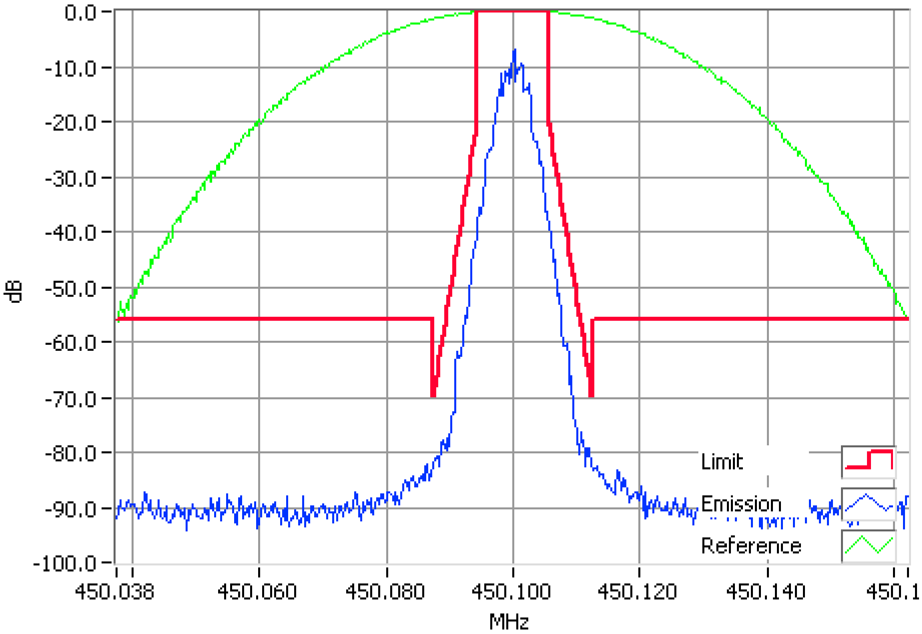
DMR 429.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

DMR

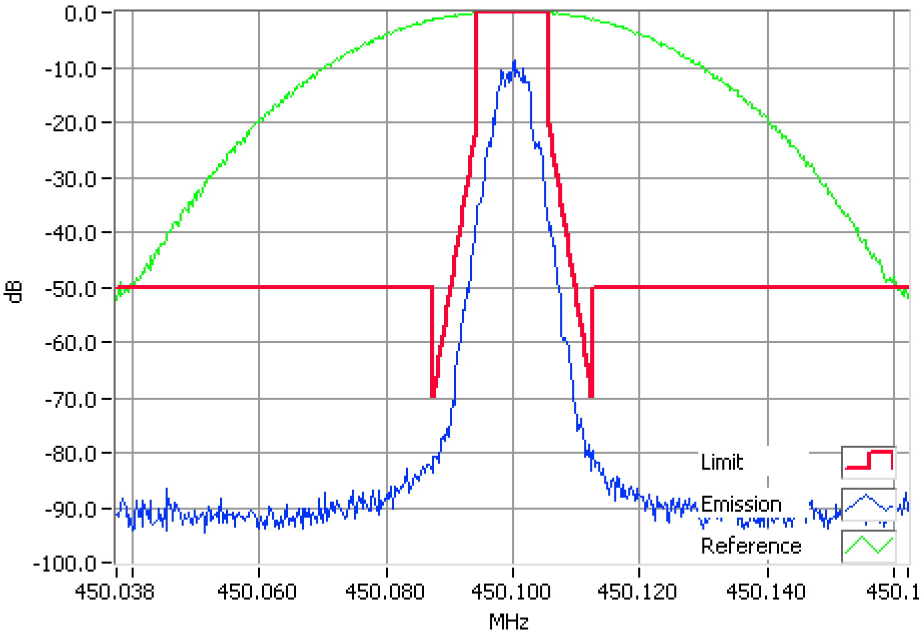
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



DMR 450.1000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing



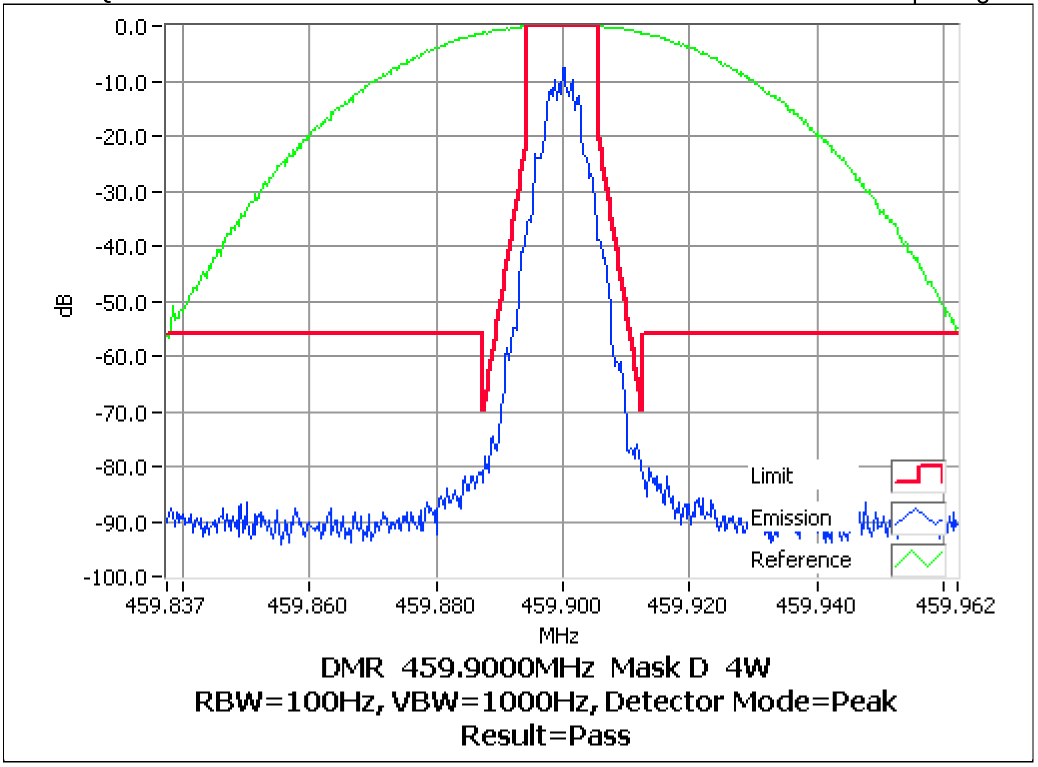
DMR 450.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

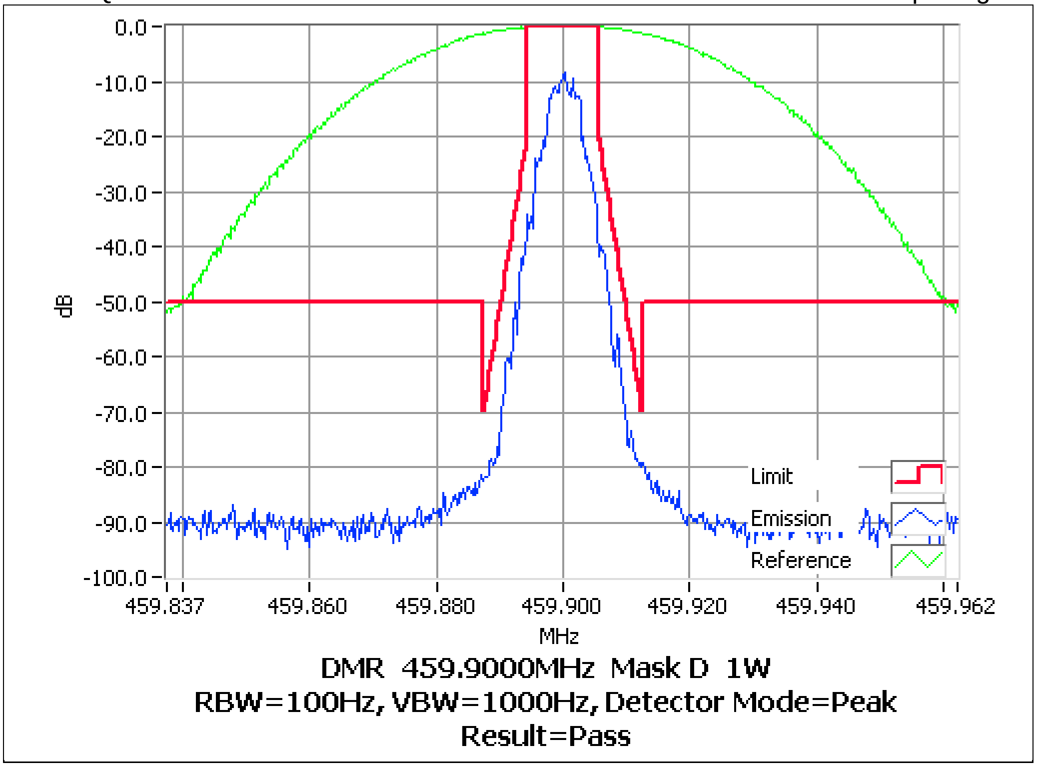
DMR

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing

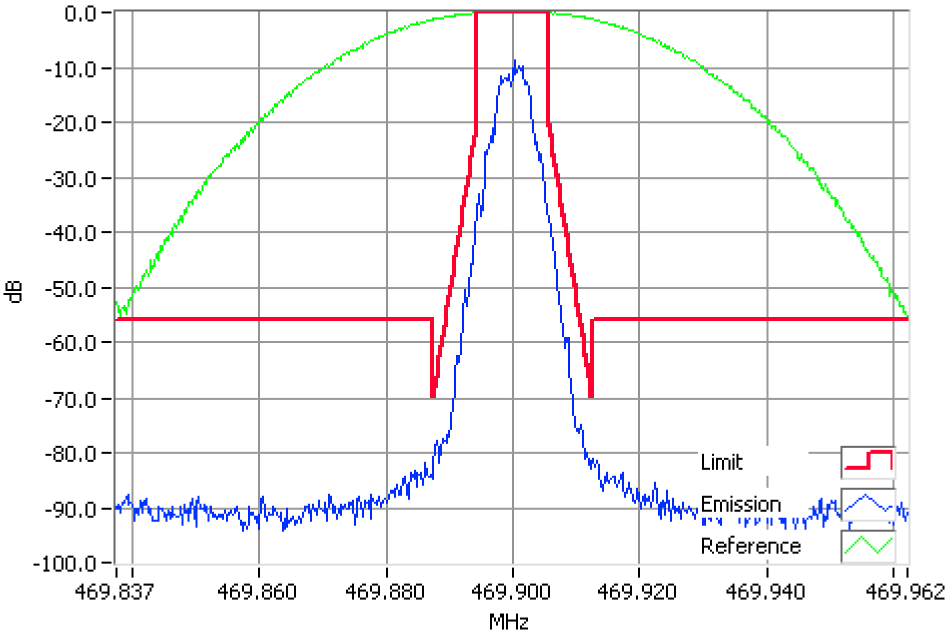


Occupied Bandwidth and Spectrum Masks

DMR

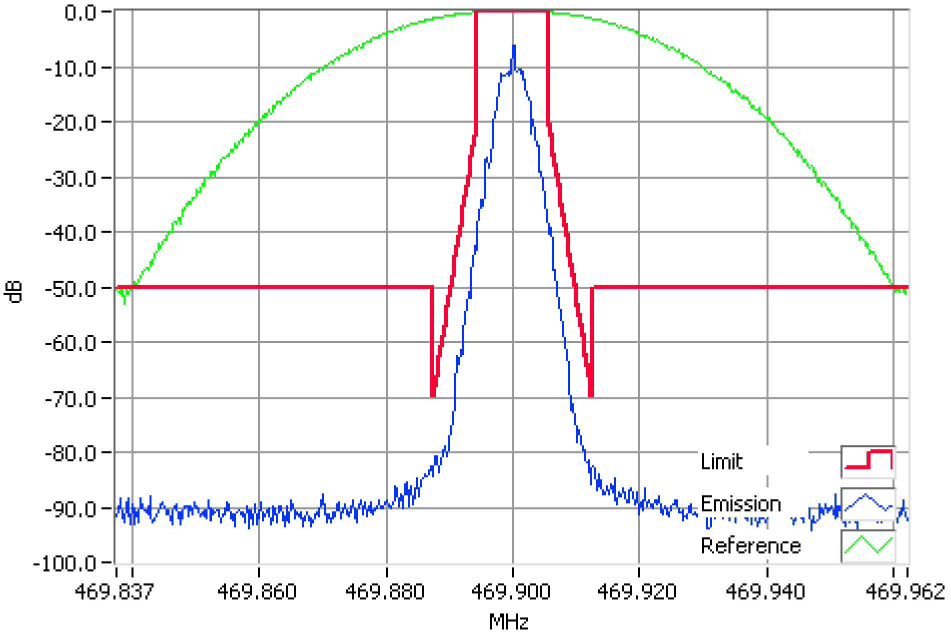
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



DMR 469.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing



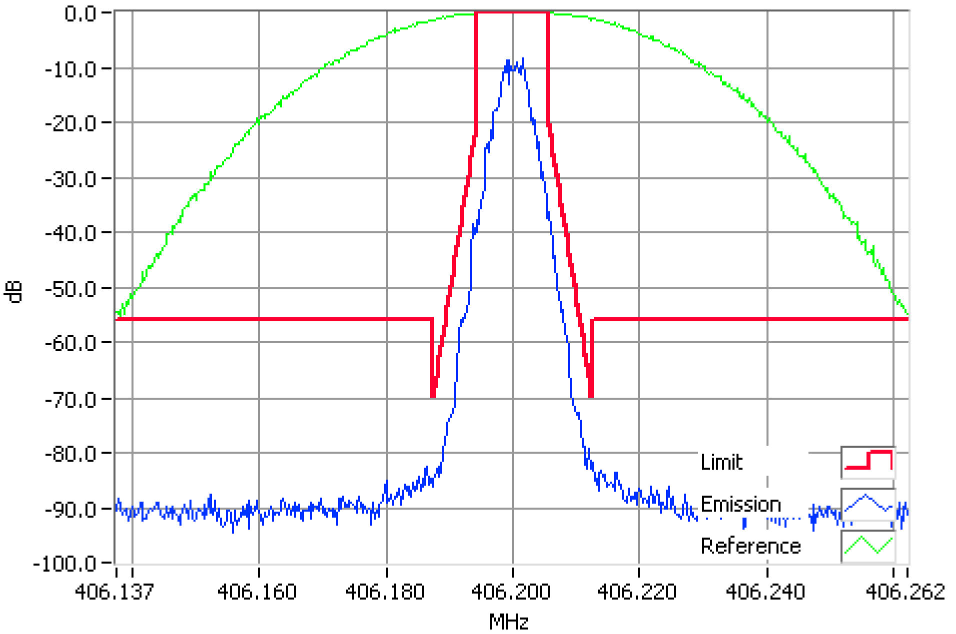
DMR 469.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-1

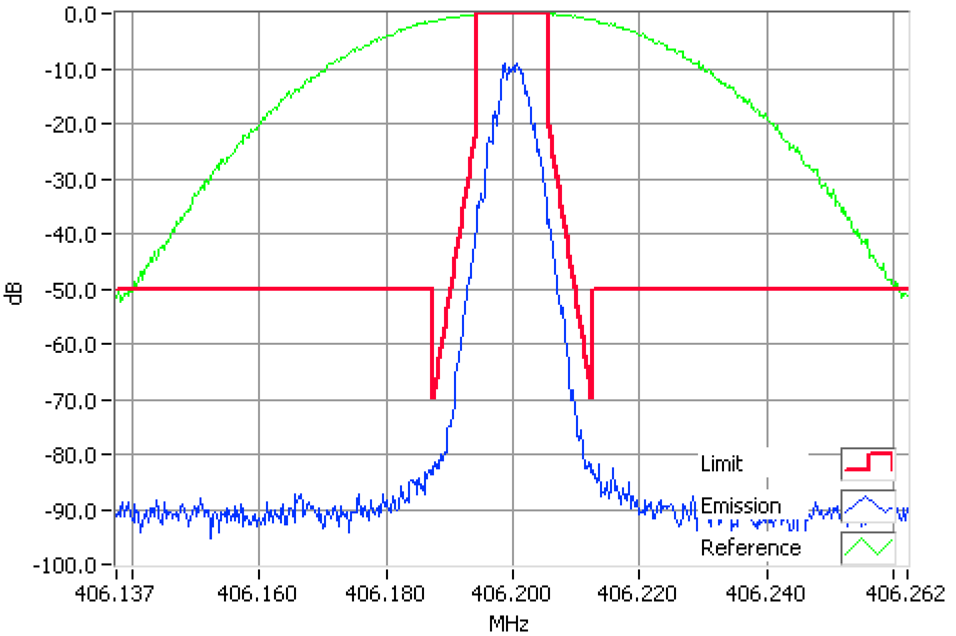
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



P25-1 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



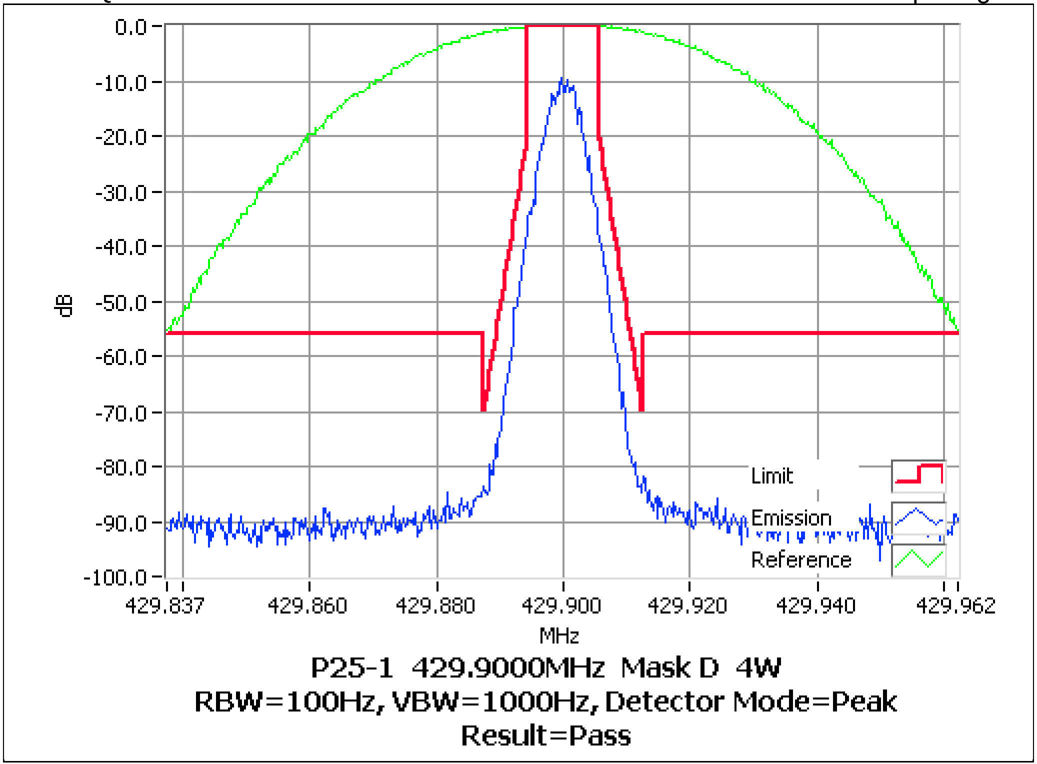
P25-1 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

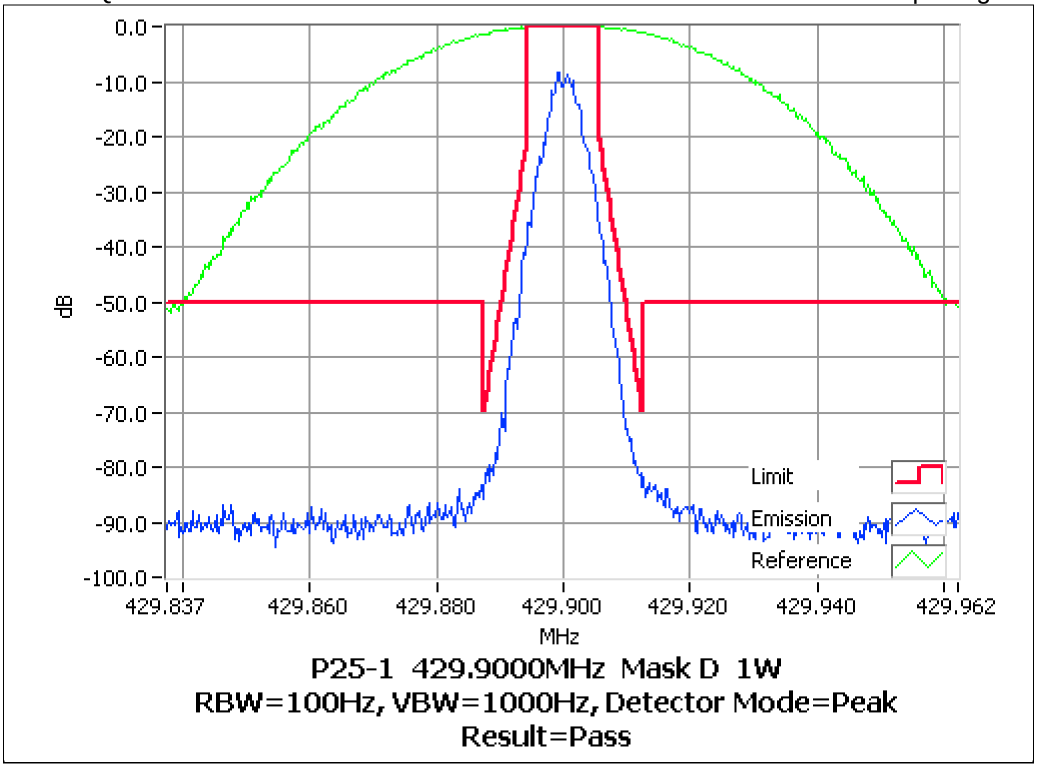
P25 Phase-1

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing

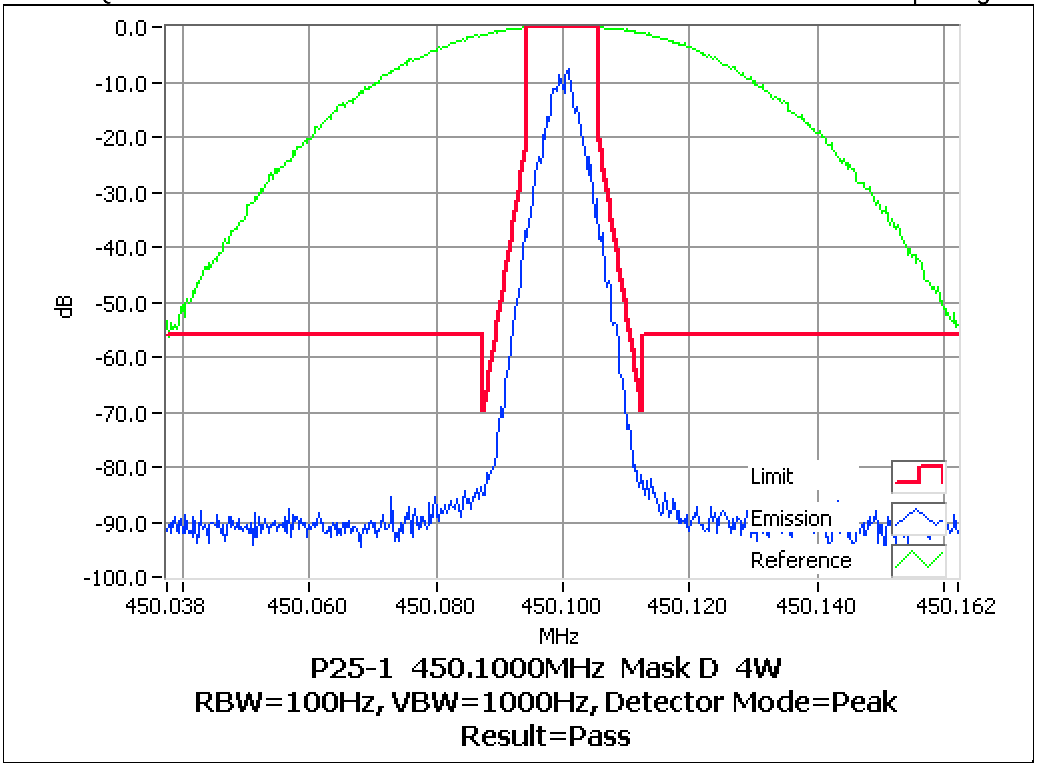


Occupied Bandwidth and Spectrum Masks

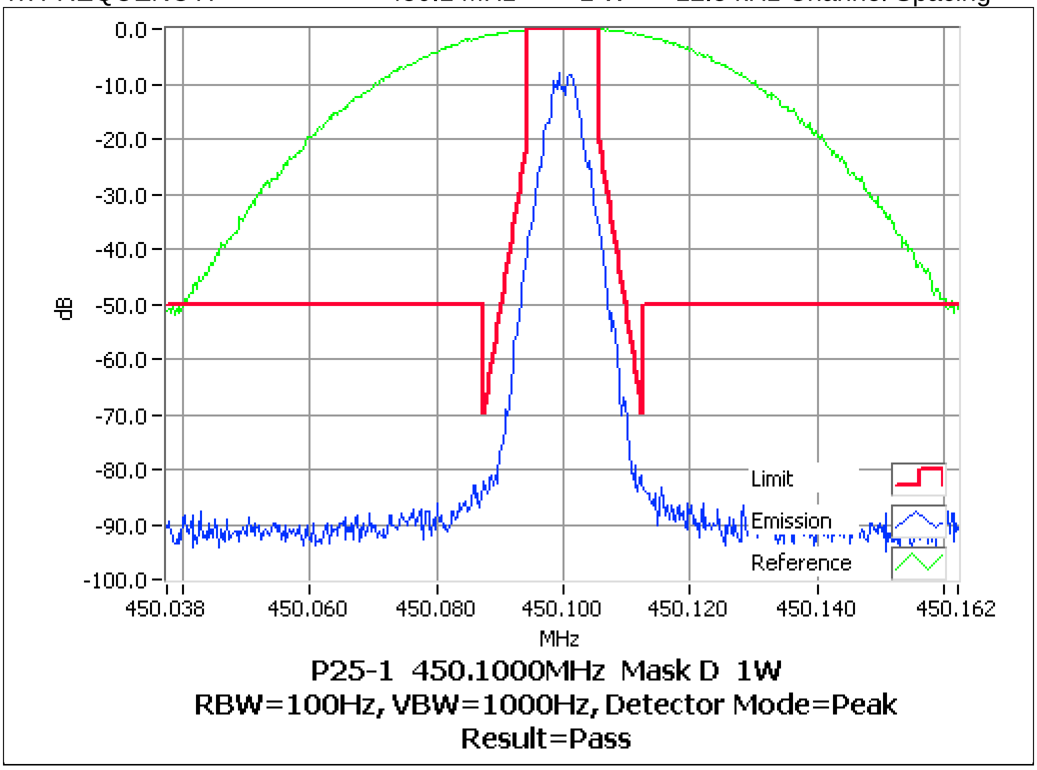
P25 Phase-1

SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing

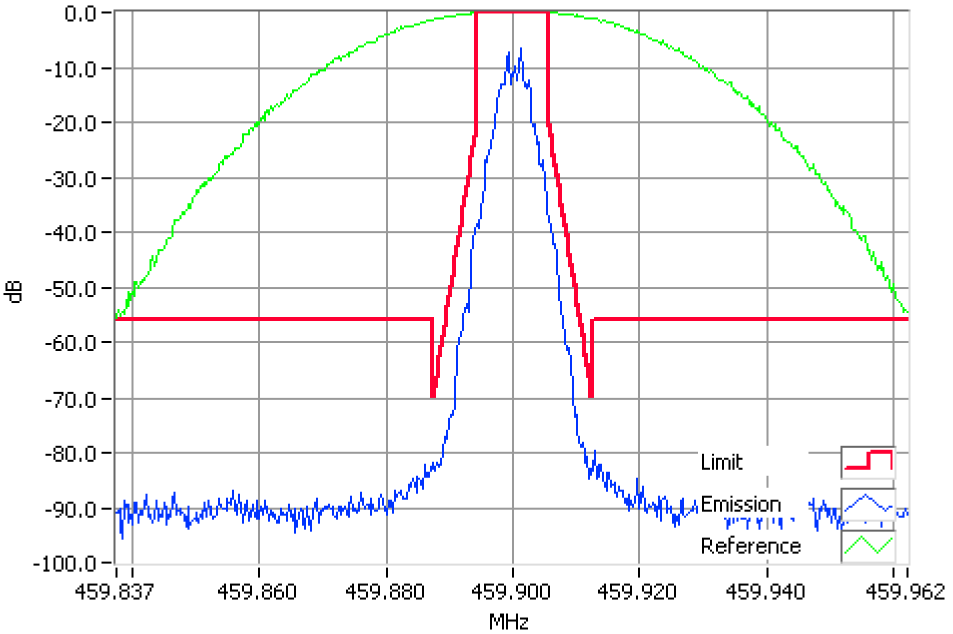


Occupied Bandwidth and Spectrum Masks

P25 Phase-1

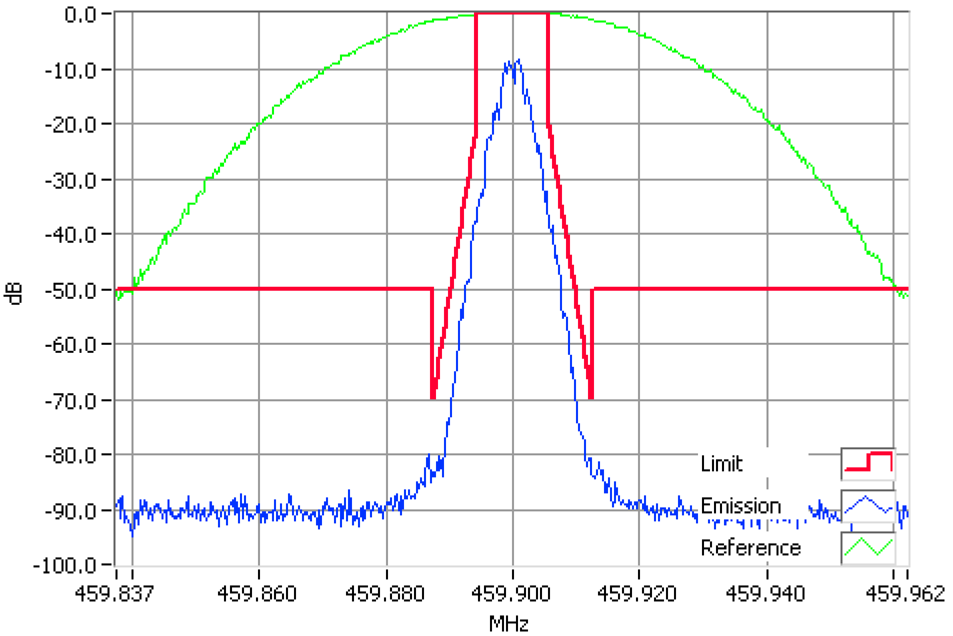
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



P25-1 459.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing



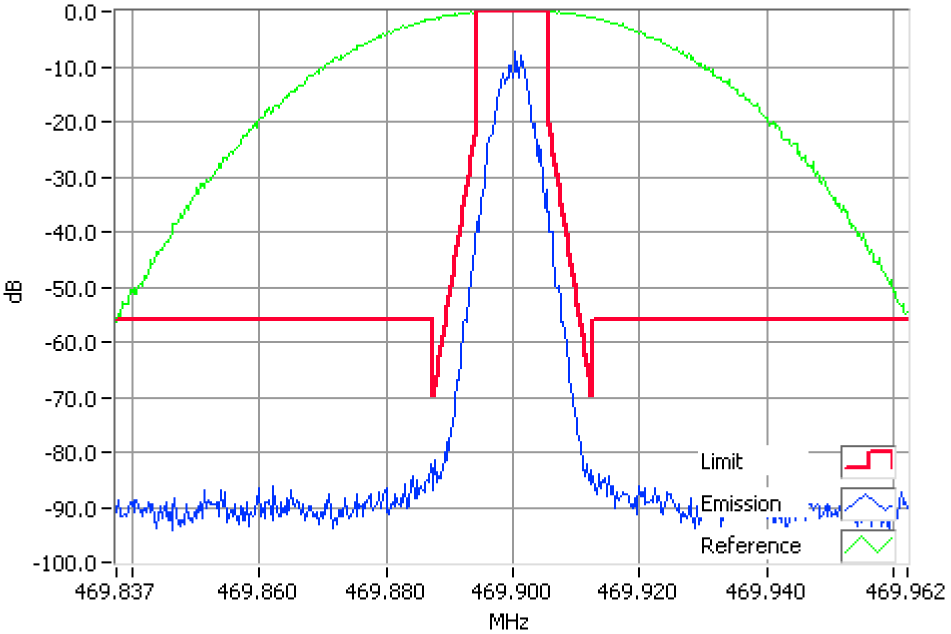
P25-1 459.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-1

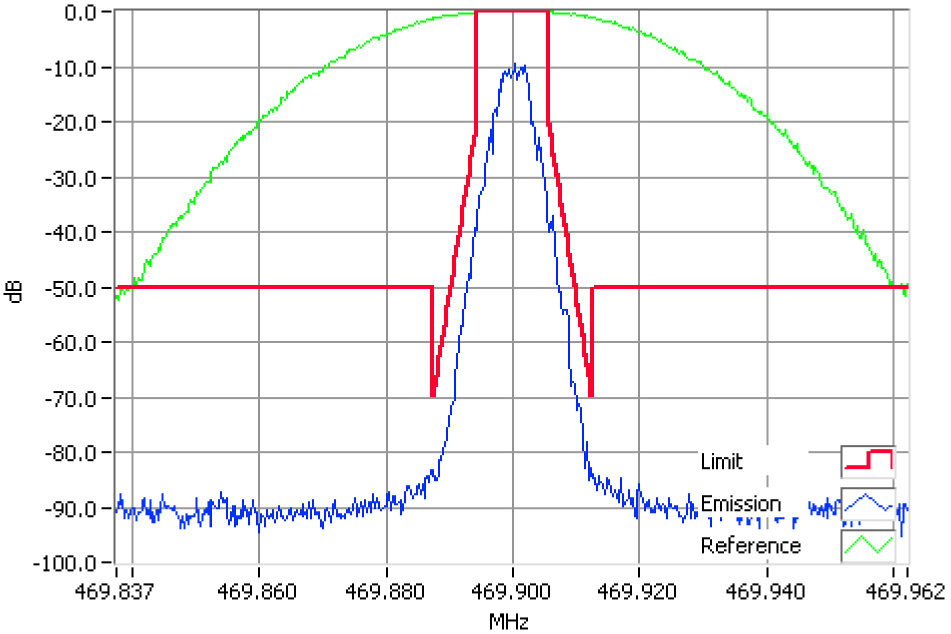
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



P25-1 469.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing



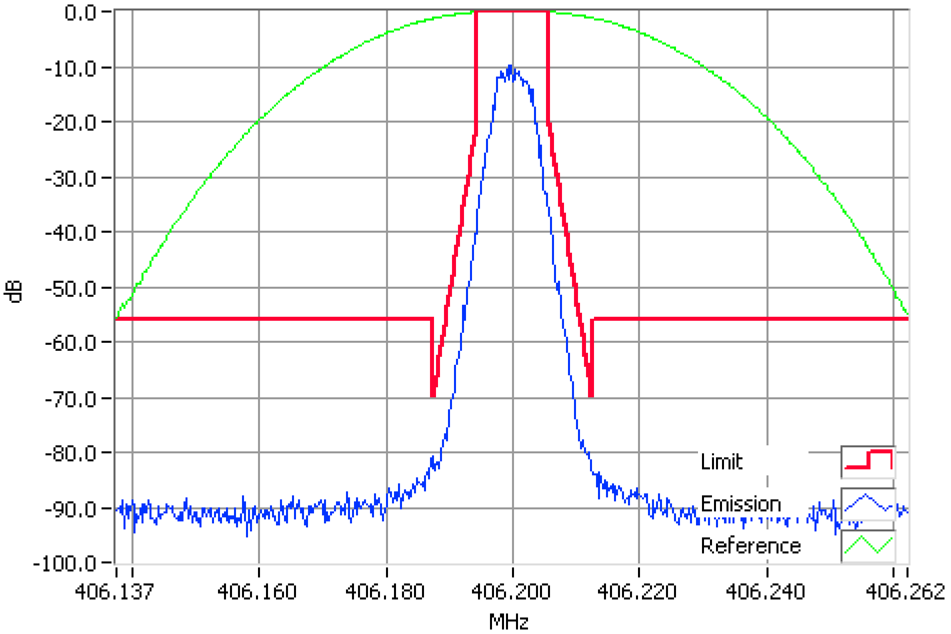
P25-1 469.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-2

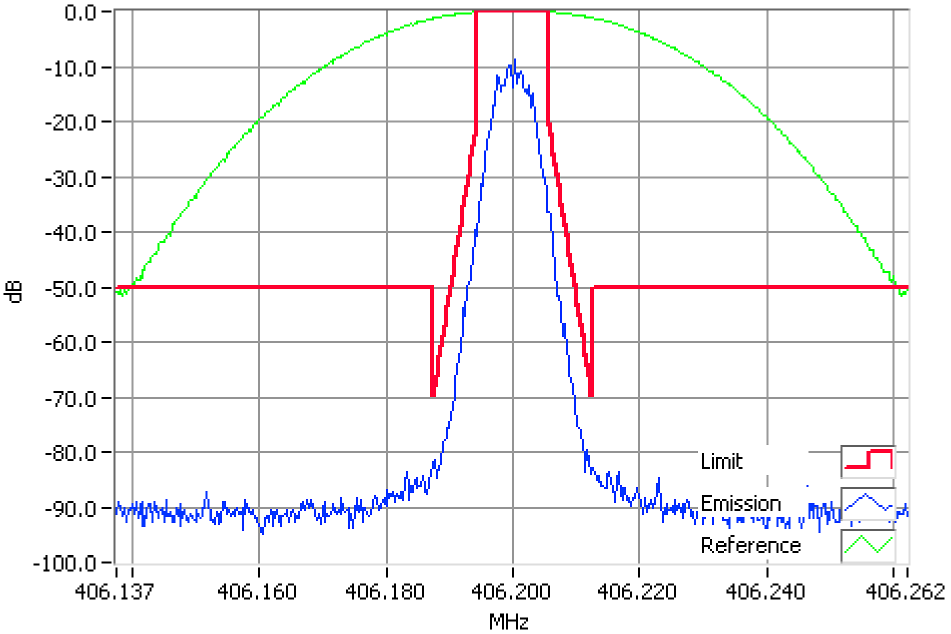
SPECIFICATION:	FCC CFR 2.1049 (c)	RSS-119	5.5

Tx FREQUENCY: 406.2 MHz 4 W 12.5 kHz Channel Spacing



P25-2 406.2000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 406.2 MHz 1 W 12.5 kHz Channel Spacing



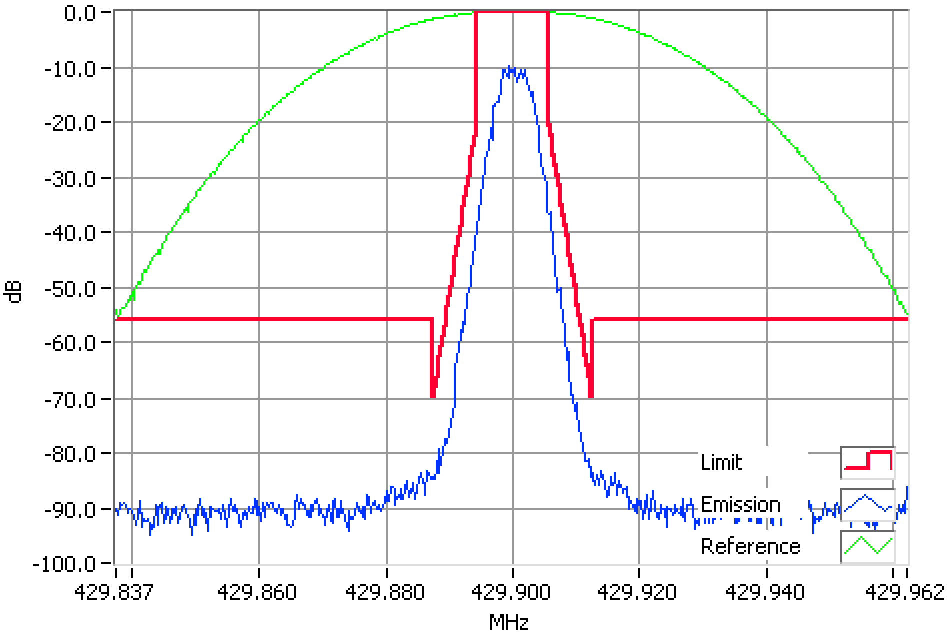
P25-2 406.2000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-2

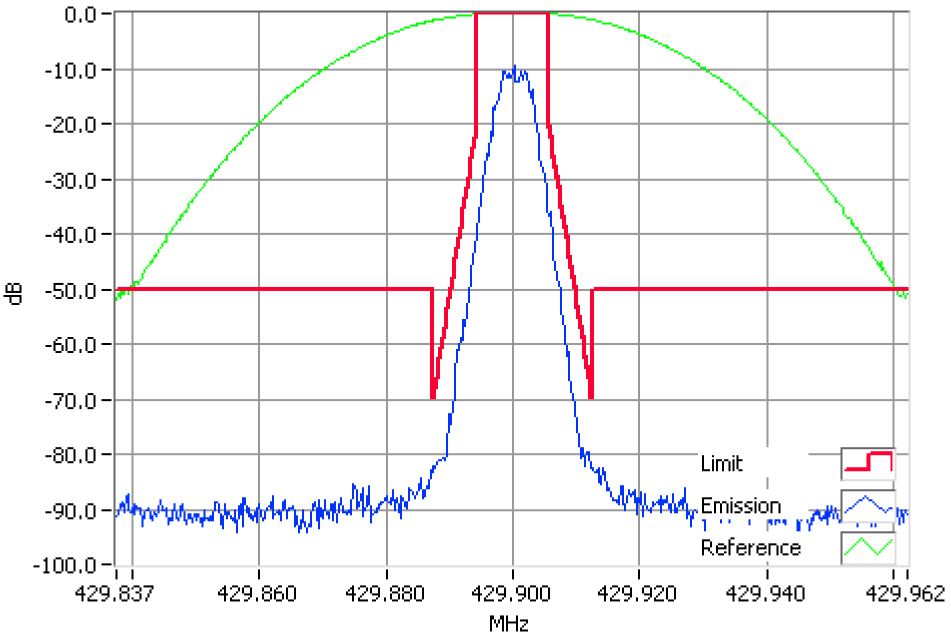
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing



P25-2 429.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 429.9 MHz 1 W 12.5 kHz Channel Spacing



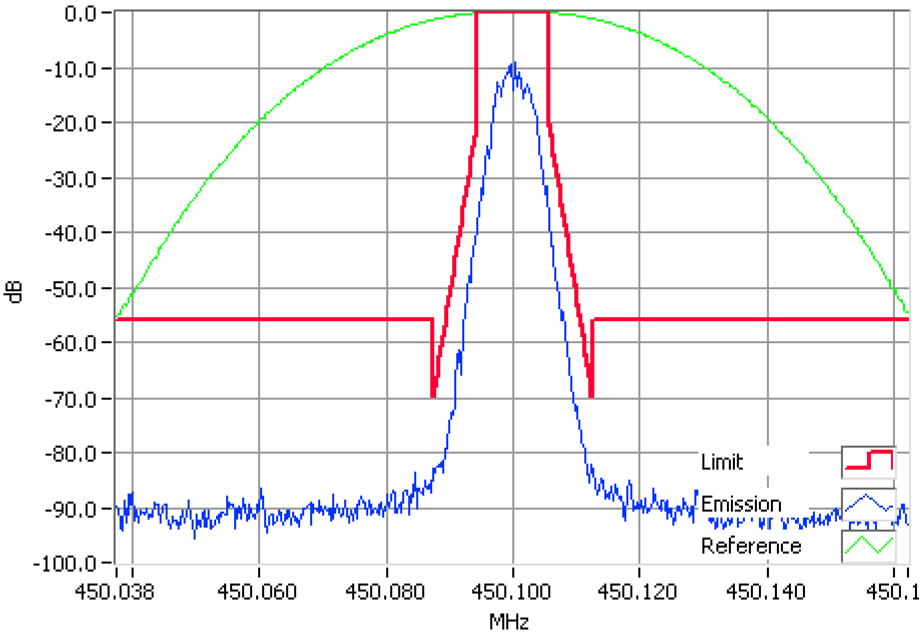
P25-2 429.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-2

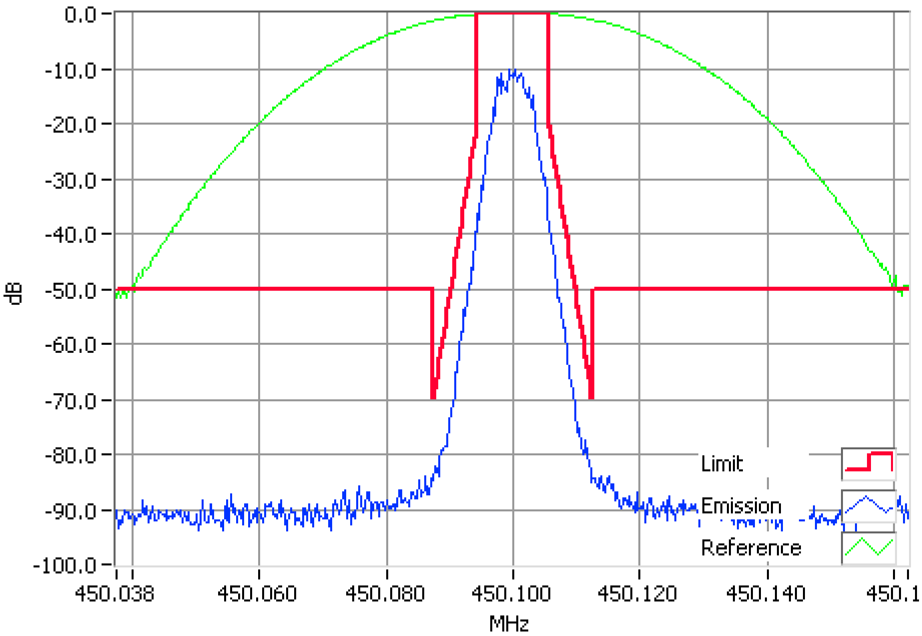
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 450.1 MHz 4 W 12.5 kHz Channel Spacing



P25-2 450.1000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 450.1 MHz 1 W 12.5 kHz Channel Spacing



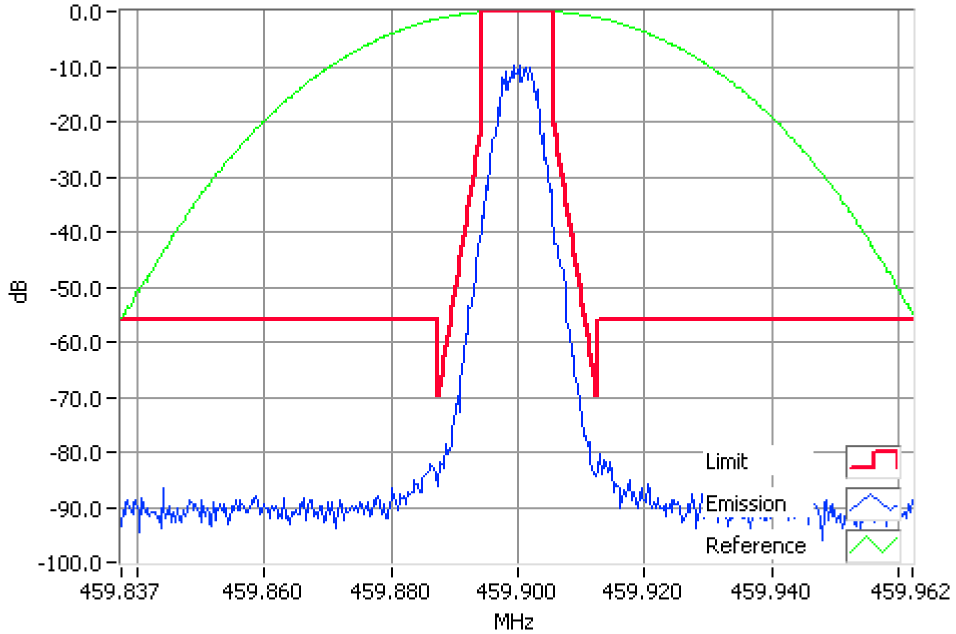
P25-2 450.1000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-2

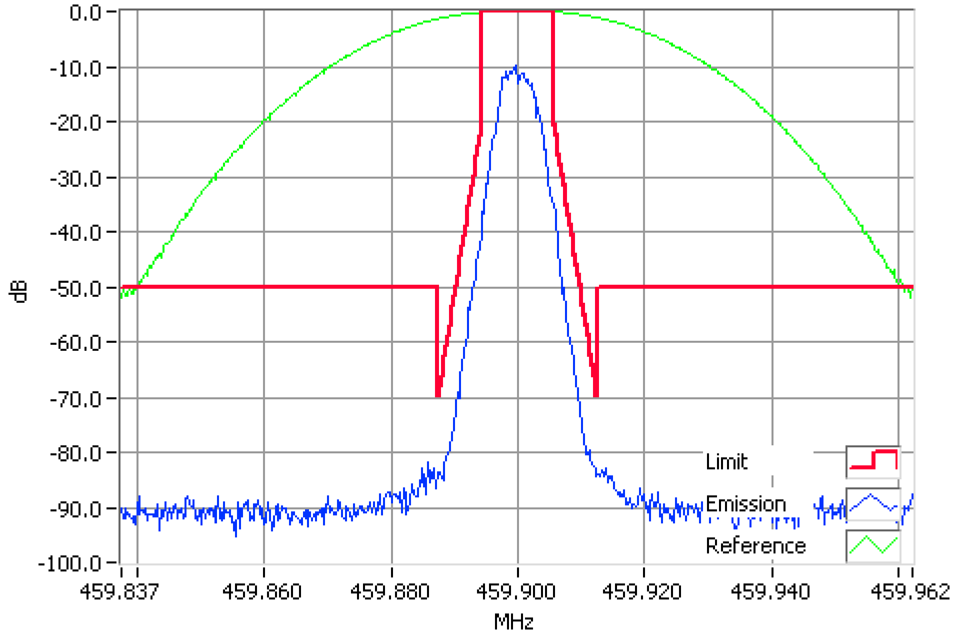
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 459.9 MHz 4 W 12.5 kHz Channel Spacing



P25-2 459.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 459.9 MHz 1 W 12.5 kHz Channel Spacing



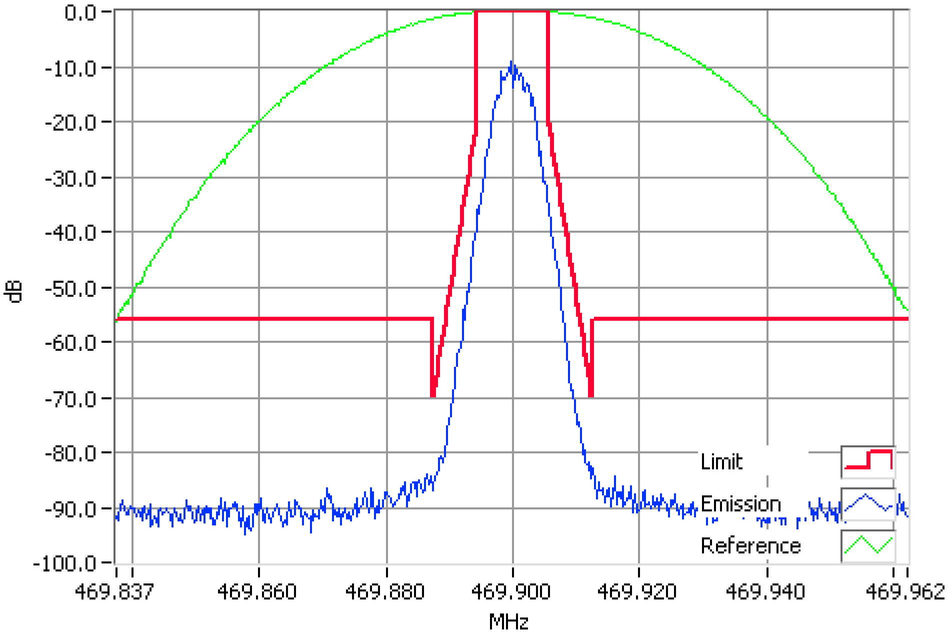
P25-2 459.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Occupied Bandwidth and Spectrum Masks

P25 Phase-2

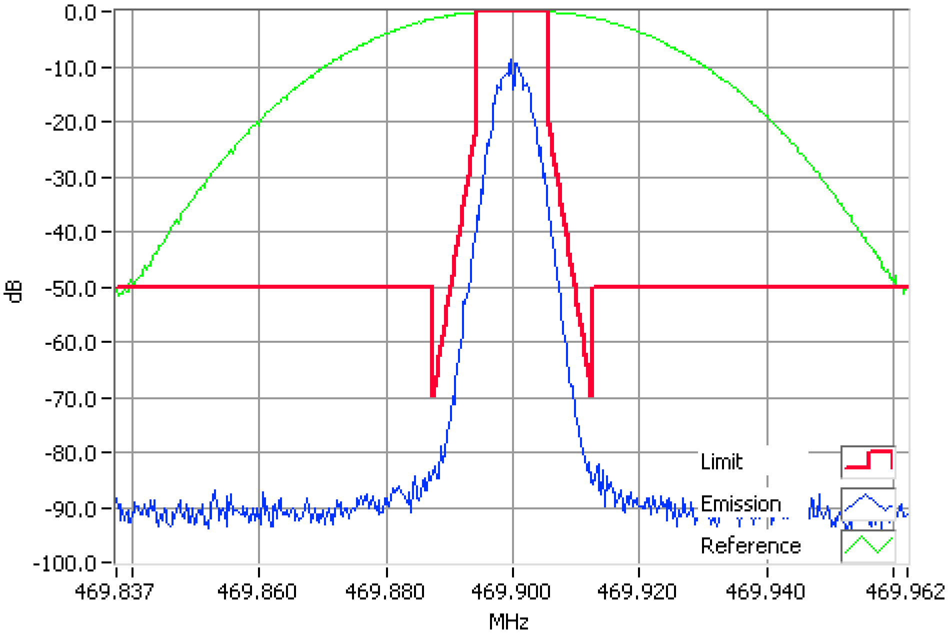
SPECIFICATION: FCC CFR 2.1049 (c) RSS-119 5.5

Tx FREQUENCY: 469.9 MHz 4 W 12.5 kHz Channel Spacing



P25-2 469.9000MHz Mask D 4W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

Tx FREQUENCY: 469.9 MHz 1 W 12.5 kHz Channel Spacing



P25-2 469.9000MHz Mask D 1W
RBW=100Hz, VBW=1000Hz, Detector Mode=Peak
Result=Pass

SPURIOUS EMISSIONS (Tx CONDUCTED)

SPECIFICATIONS: FCC 47 CFR 2.1051 RSS-119 5.8

GUIDE: TIA/EIA-603D 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 10th 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.

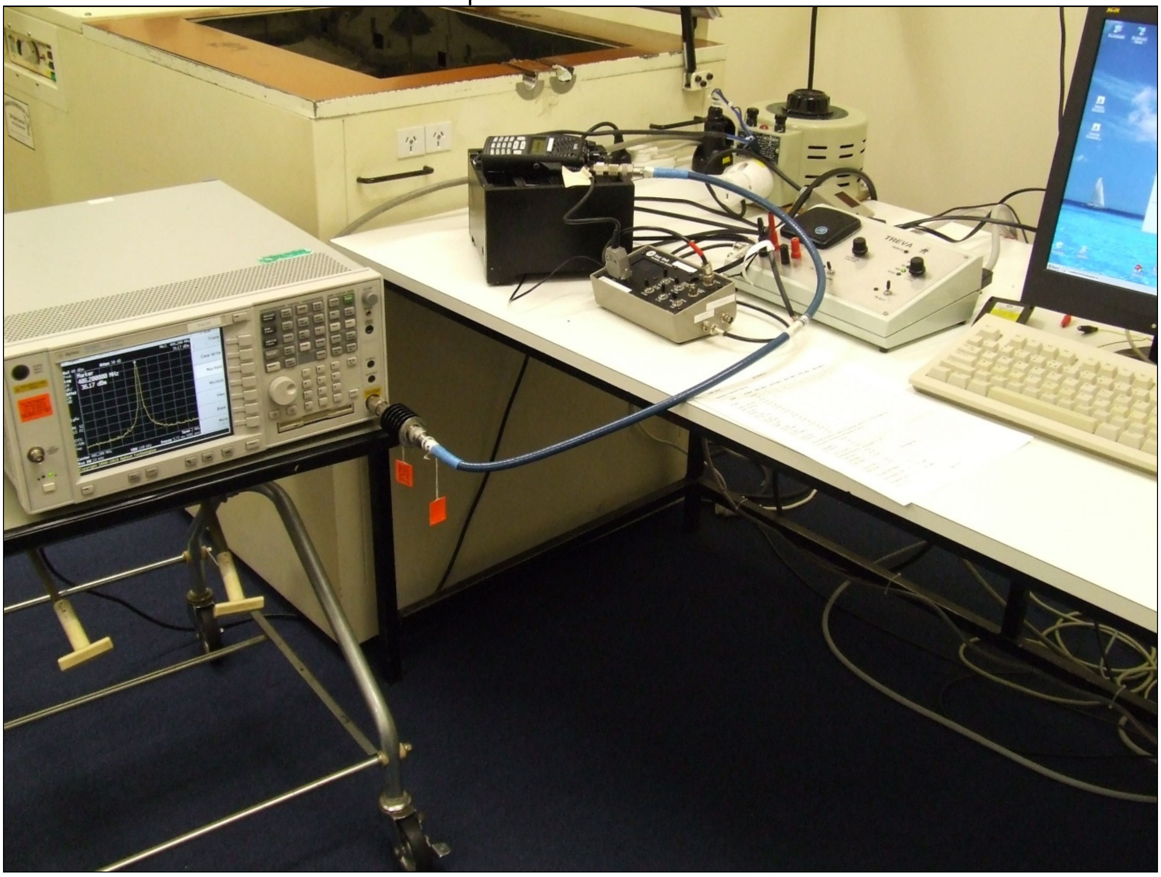
Spurious emissions which were attenuated by more than 20 dB below the limit were not recorded.

MEASUREMENT RESULTS:
See the tables and plots on the following pages for 12.5 kHz channel spacing.

A photograph of the test set-up is included below.

LIMIT CLAUSES: FCC 47 CFR 90.210 RSS-119 5.8

Photo: Conducted Emissions Test Setup

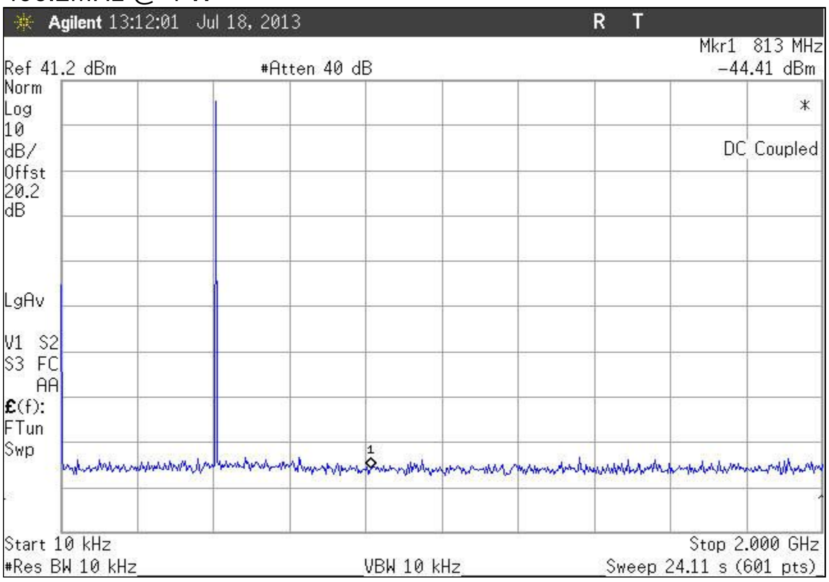


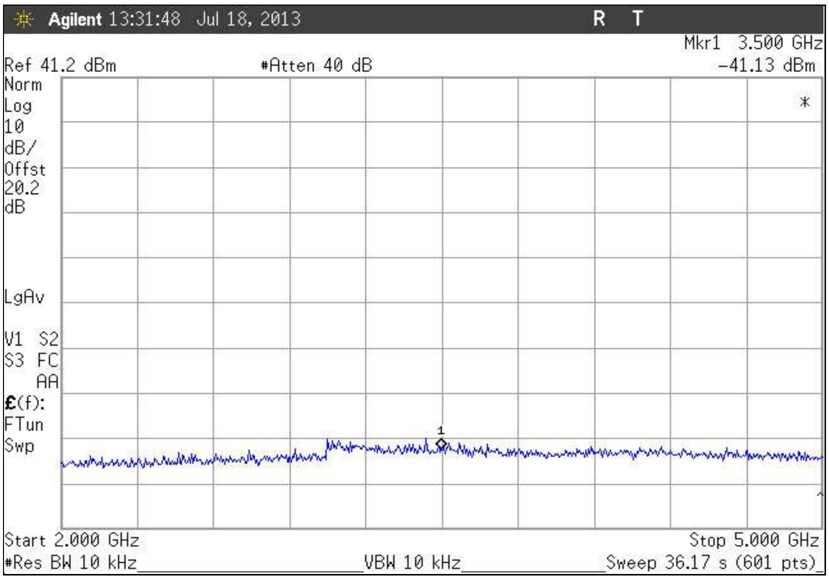
Tx Conducted Emissions - Continued

SPECIFICATION: FCC CFR 2.1051 RSS-119 5.8

12.5 kHz Channel Spacing	406.2MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	406.2MHz @ 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.		

406.2MHz @ 4 W

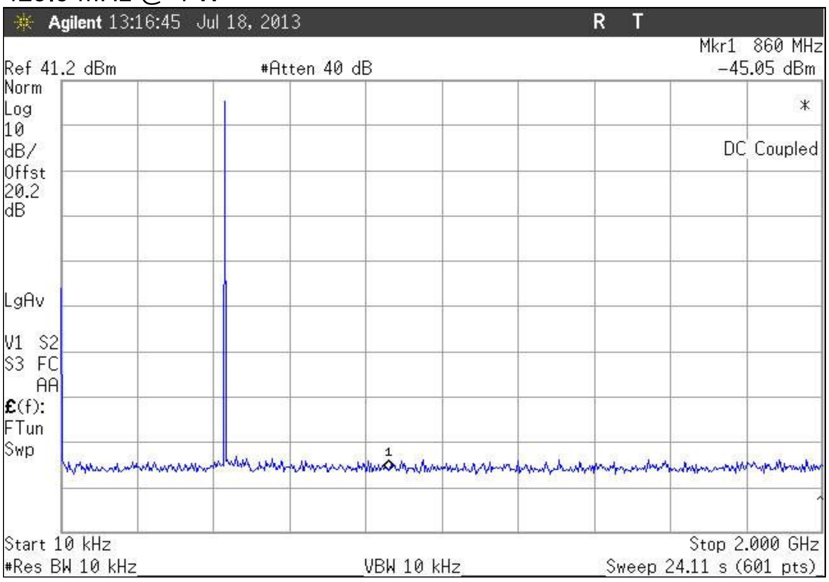


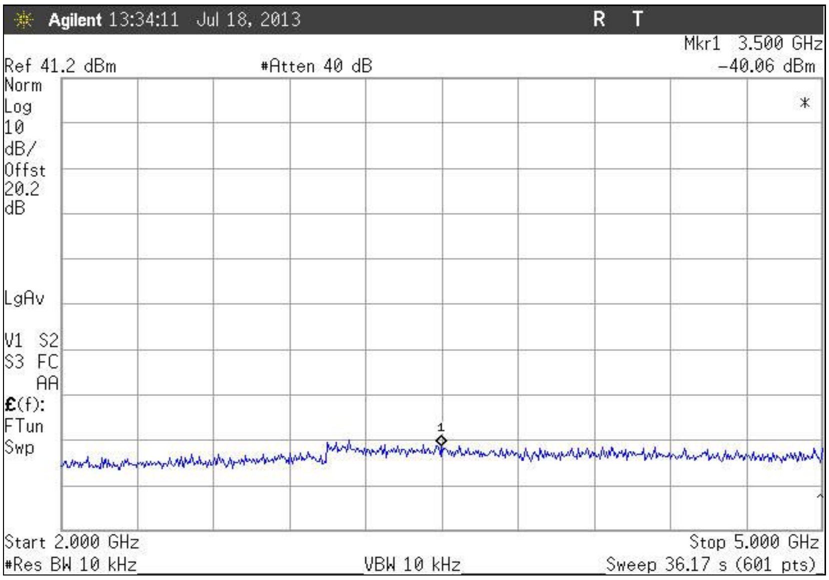


Tx Conducted Emissions - Continued

12.5 kHz Channel Spacing	429.9 MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	429.9 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.		

429.9 MHz @ 4 W

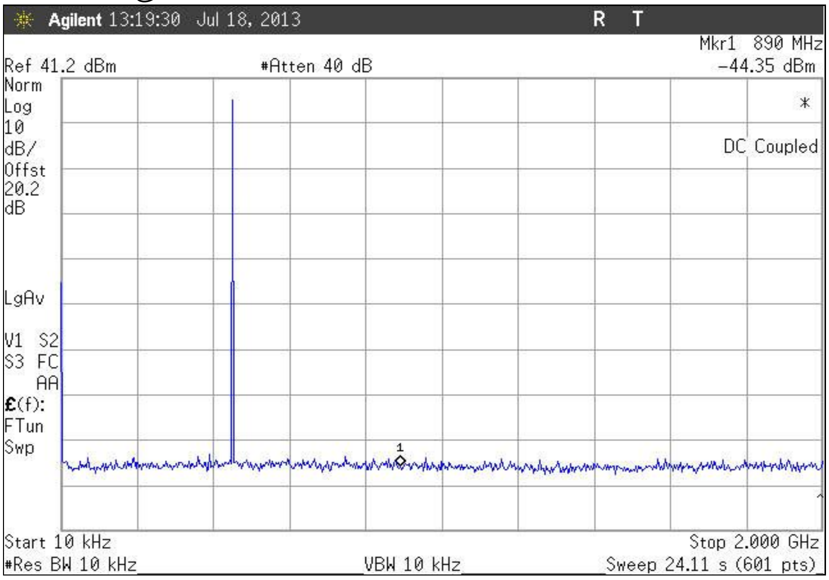


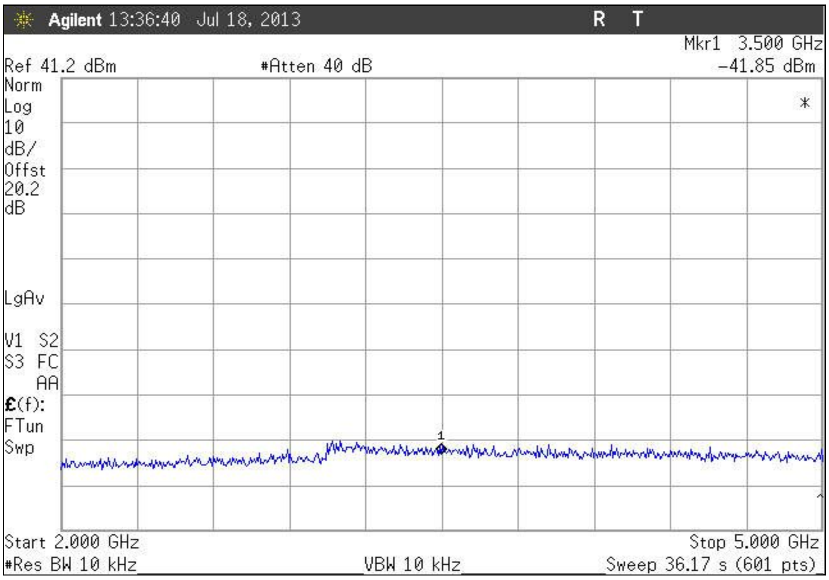


Tx Conducted Emissions - Continued

12.5 kHz Channel Spacing	450.1MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	450.1MHz @ 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.		

450.1MHz @ 4 W

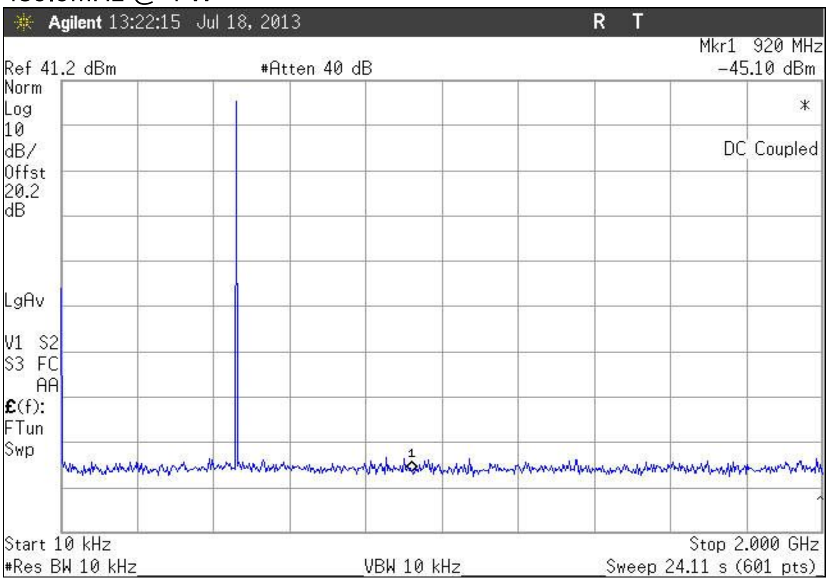


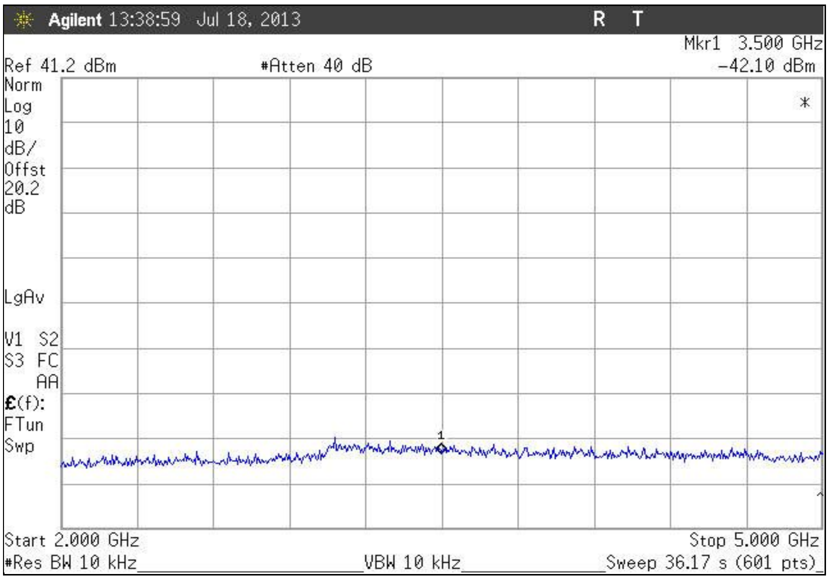


Tx Conducted Emissions - Continued

12.5 kHz Channel Spacing	459.9MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	459.9MHz @ 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.		

459.9MHz @ 4 W

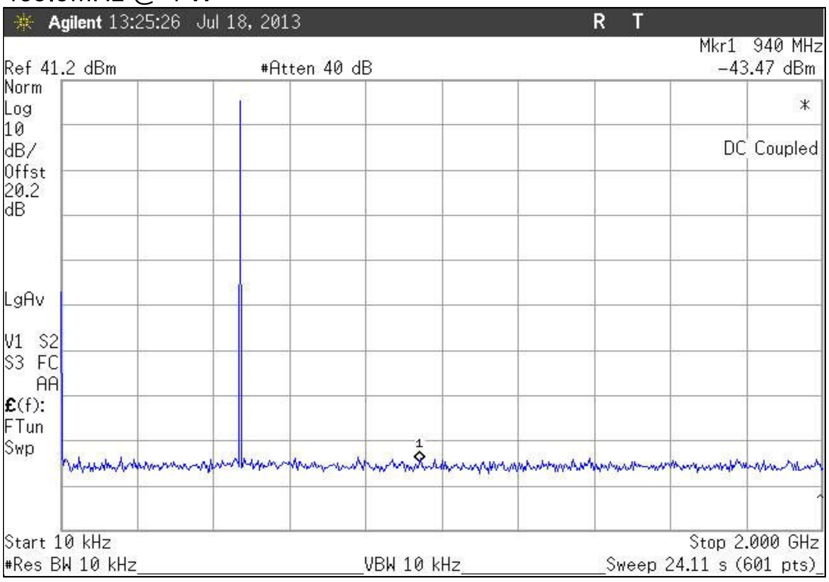


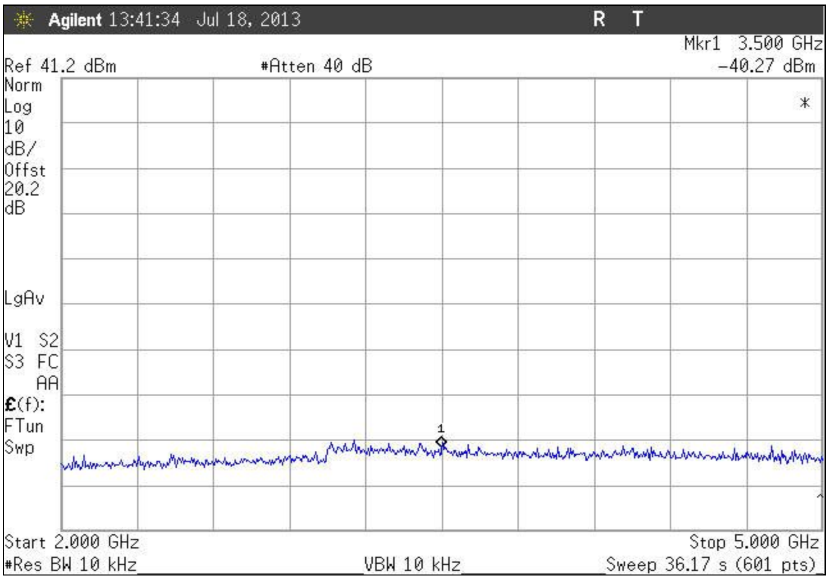


Tx Conducted Emissions - Continued

12.5 kHz Channel Spacing	469.9MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	469.9MHz @ 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.		

469.9MHz @ 4 W





Tx Conducted Emissions – Continued

LIMITS: FCC 47 CFR 90.210 RSS-119 5.8

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing 50 + 10 Log_{10} (P_{Watts})	
4 W	-20 dBm	-56 dBc
1 W	-20 dBm	-50 dBc

SPURIOUS EMISSIONS (Tx RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603D 2.2.12

MEASUREMENT PROCEDURE:
Initial Scan:

1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 1000 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS along with measurements from 1000 MHz to the 10^{th} harmonic of the fundamental frequency.
2. The EUT is placed in the reverberation chamber and emissions are measured from 1000 MHz to the upper frequency required. Any emission within 20 dB of the limit is then re-tested on the OATS.
3. The harmonics emissions up to the 6^{th} harmonic of the fundamental frequency are measured on the OATS

OATS Measurement:

1. The EUT is placed on a wooden turntable at a distance of three meters 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^{o} 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

Tx Radiated Emissions - Continued

12.5 kHz Channel Spacing	406.2MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	406.2MHz @ 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	429.9 MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	429.9 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.		

12.5 kHz Channel Spacing	450.1MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	450.1MHz @ 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.		

Tx Radiated Emissions - Continued

12.5 kHz Channel Spacing	459.9MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	459.9MHz @ 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	469.9MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	469.9MHz @ 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: FCC CFR 2.1053

Carrier Output Power Watts	Emission Mask D 12.5 kHz Channel Spacing $50 + 10\ Log_{10}\ (P_{Watts})$	
4 W	-20 dBm	-56 dBc
1 W	-20 dBm	-50 dBc

Tx Radiated Emissions - Continued

Open Area Test Site Results		
12.5 kHz Channel Spacing	459.9 MHz @ 4 W	Emission Mask D
Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
919.8	-55.0	-91.0
1379.7	-61.5	-97.5
1839.6	-56.9	-92.9
2299.5	-61.1	-97.1
2759.4	-56.2	-92.2
3219.3	-47.7	-83.7

Photo: OATS Setup

TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

GUIDE: TIA/EIA-603D 2.2.19

MEASUREMENT PROCEDURE:
1. Refer Annex A for equipment set up.
2. Measurements and plots were made following the TIA/EIA procedure.

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

LIMIT CLAUSES: FCC 47 CFR 90.214 RSS-119 5.9

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 406.2MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	406.2MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-0.6	N/A
t2	0.7	N/A
t3	N/A	0.9
t2 → t3 ppm	1.6	
ERROR LIMIT (t2 → t3) ppm	2.5	

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

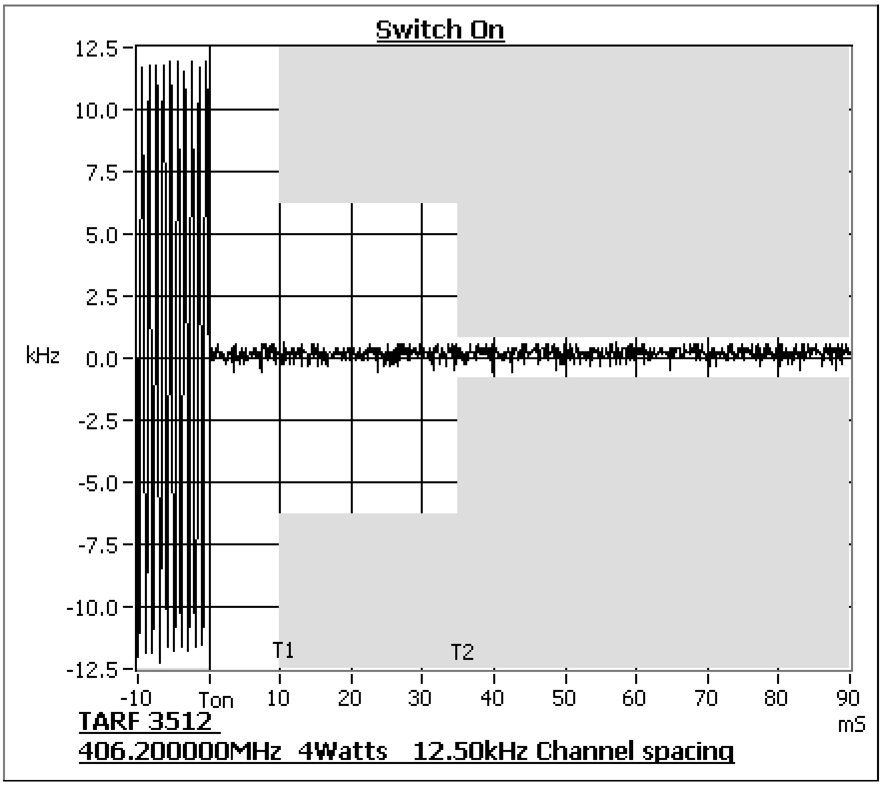
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

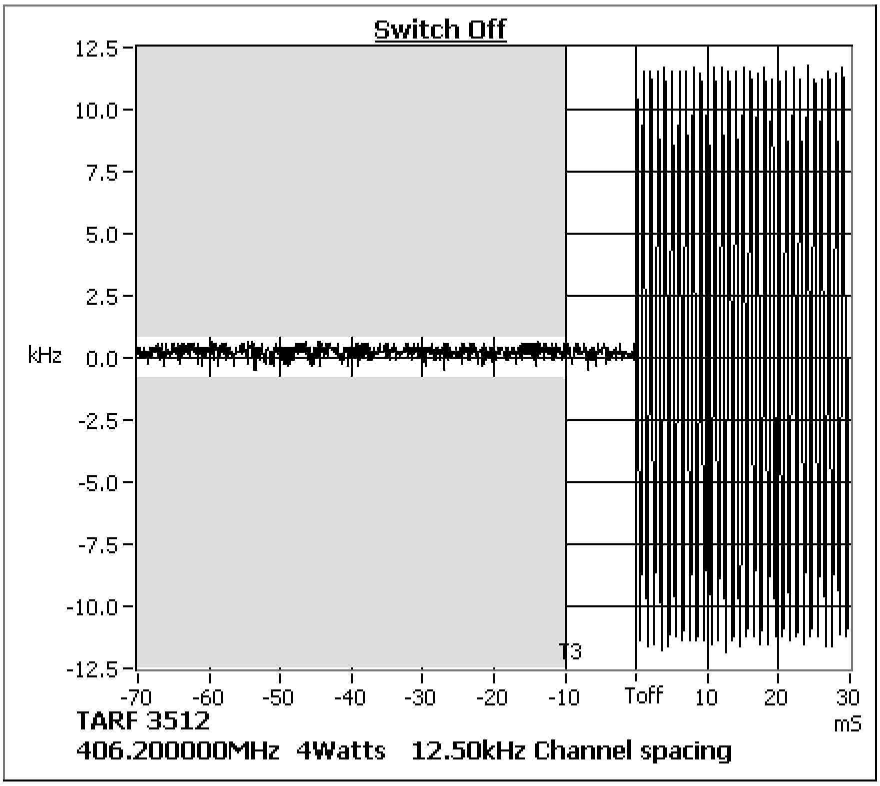
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 406.2MHz 4 W 12.5 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	429.9 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	-0.6	N/A
t_2	-0.7	N/A
t_3	N/A	0.6
$t_2 \rightarrow t_3$ ppm	1.6	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	2.5	

Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	YES	NO
	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	YES	NO
	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

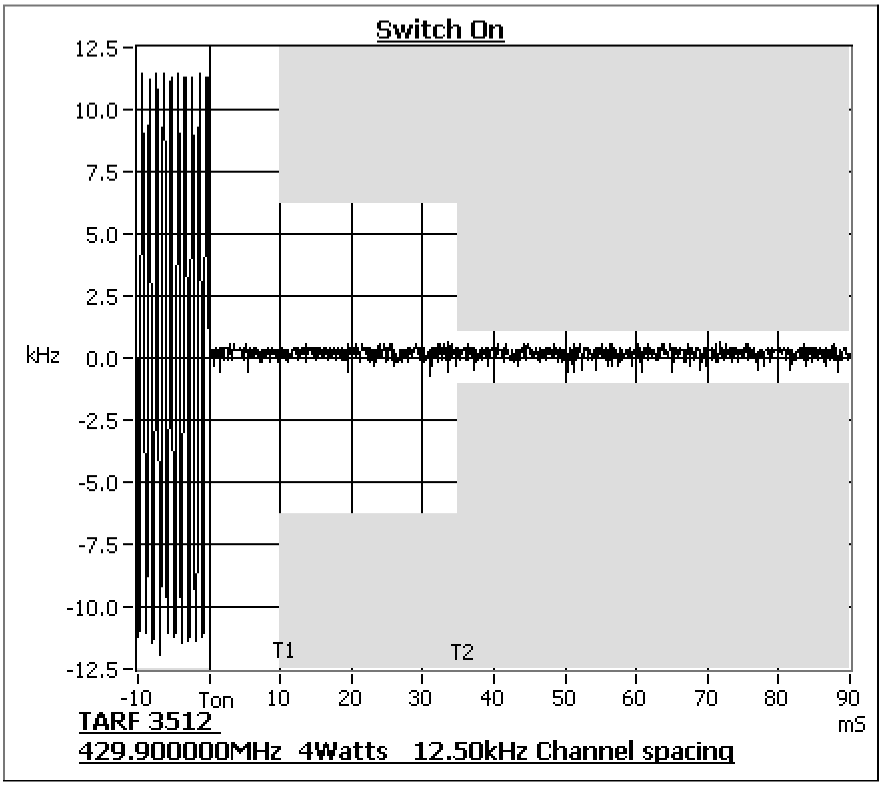
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t_1 (ms)	± 12.5 kHz	5 ms	10 ms
t_2 (ms)	± 6.25 kHz	20 ms	25 ms
t_3 (ms)	± 12.5 kHz	5 ms	10 ms

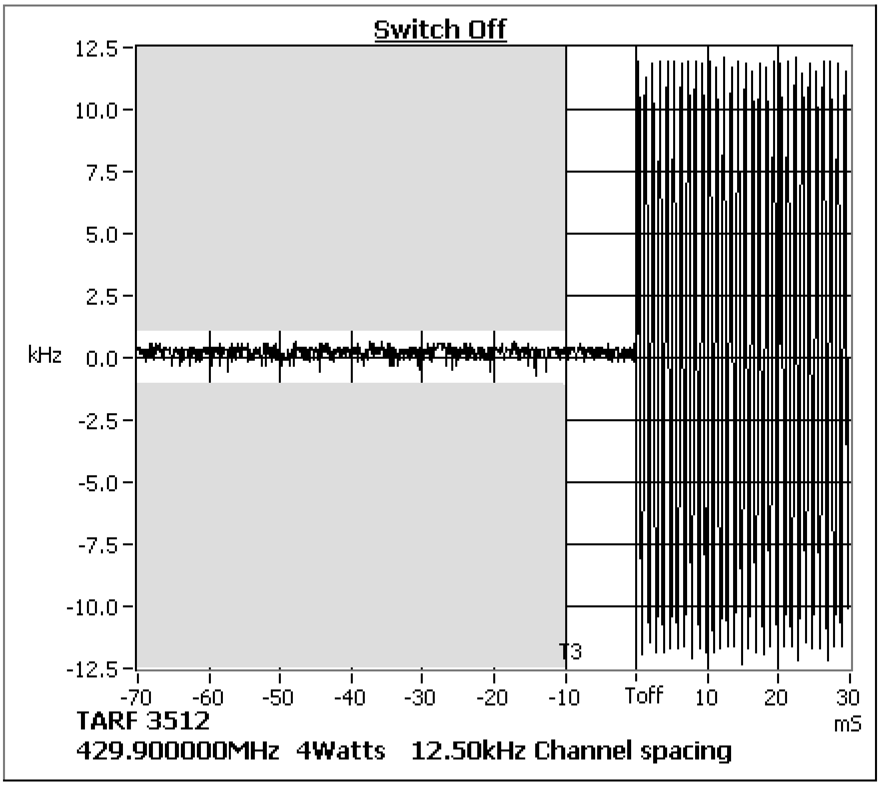
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 429.9 MHz 4 W 12.5 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 450.1MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	450.1MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	1.1	N/A
t2	0.6	N/A
t3	N/A	0.6
t2 → t3 ppm	1.5	
ERROR LIMIT (t2 → t3) ppm	2.5	

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

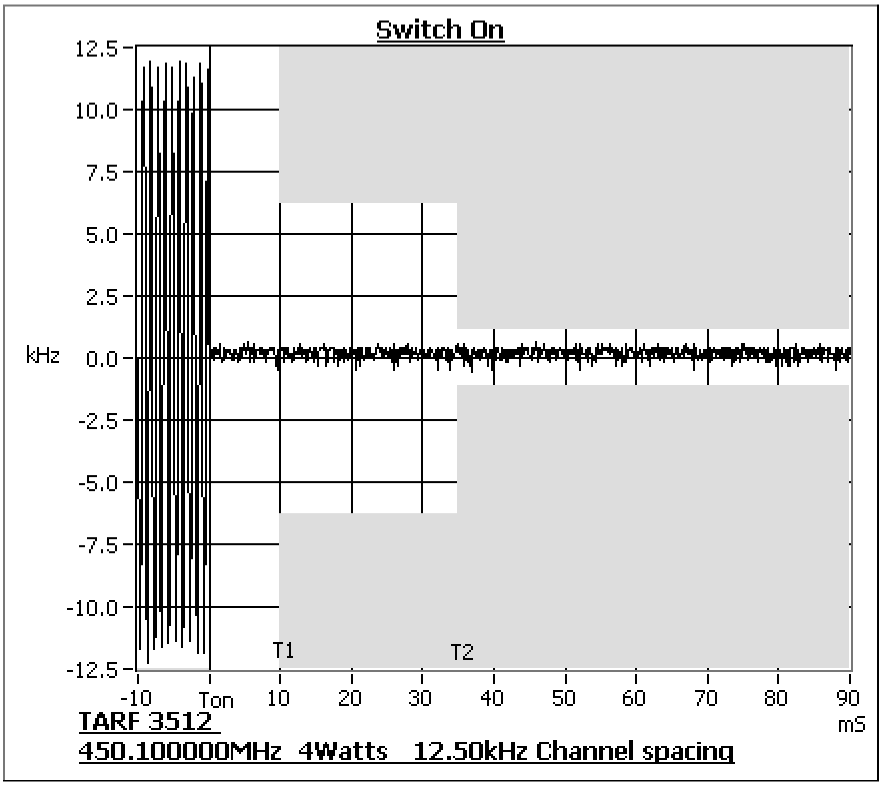
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

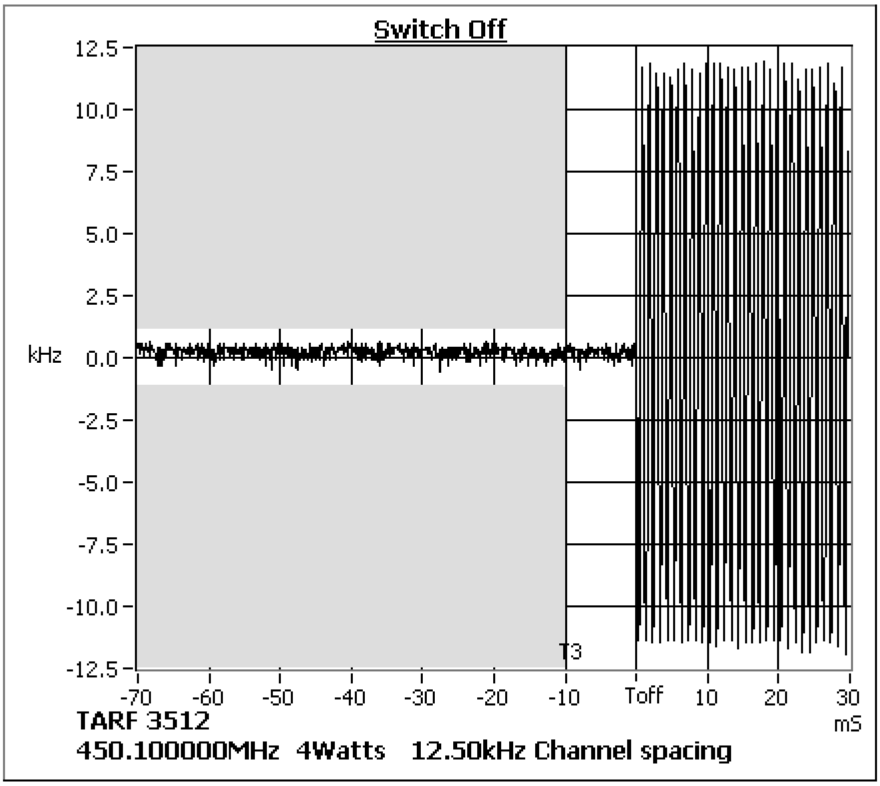
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 450.1MHz 4 W 12.5 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 459.9MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	459.9MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	0.6	N/A
t_2	0.8	N/A
t_3	N/A	0.6
$t_2 \rightarrow t_3$ ppm	1.7	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	2.5	

	YES	NO
Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

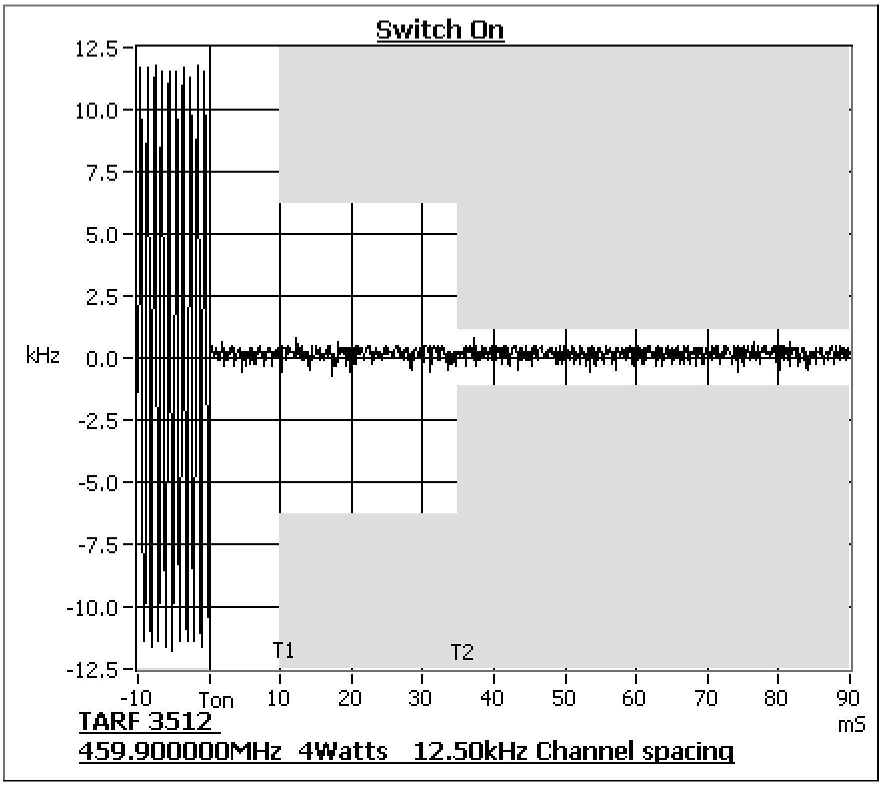
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t_1 (ms)	± 12.5 kHz	5 ms	10 ms
t_2 (ms)	± 6.25 kHz	20 ms	25 ms
t_3 (ms)	± 12.5 kHz	5 ms	10 ms

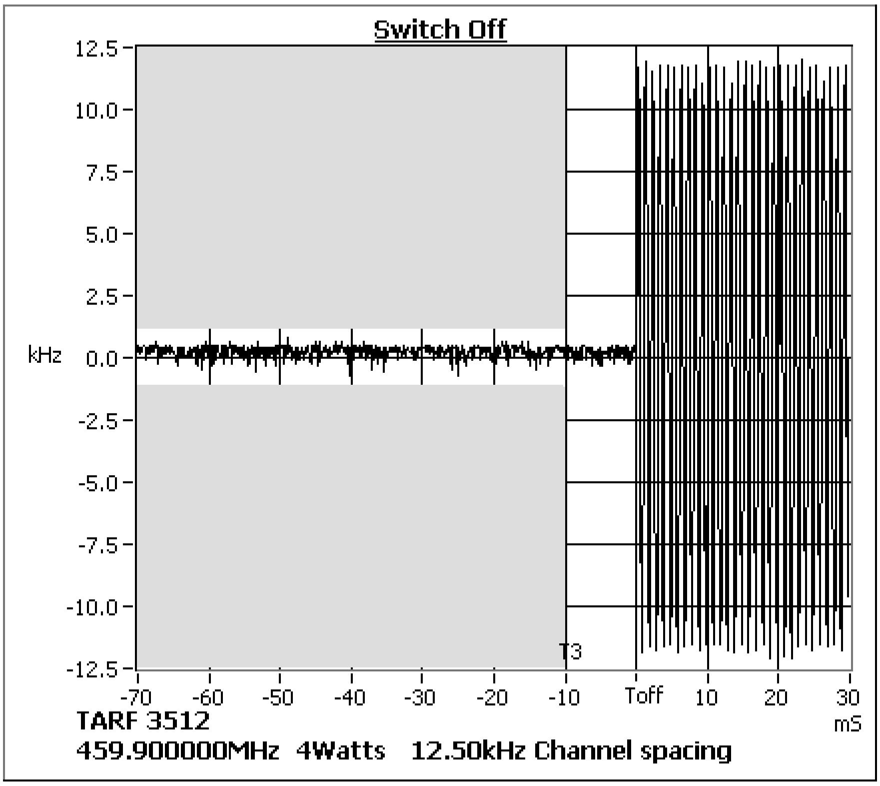
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 459.9MHz 4 W 12.5 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 469.9MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	469.9MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	0.6	N/A
t2	-0.7	N/A
t3	N/A	-0.8
t2 → t3 ppm	1.2	
ERROR LIMIT (t2 → t3) ppm	2.5	

	YES	NO
Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

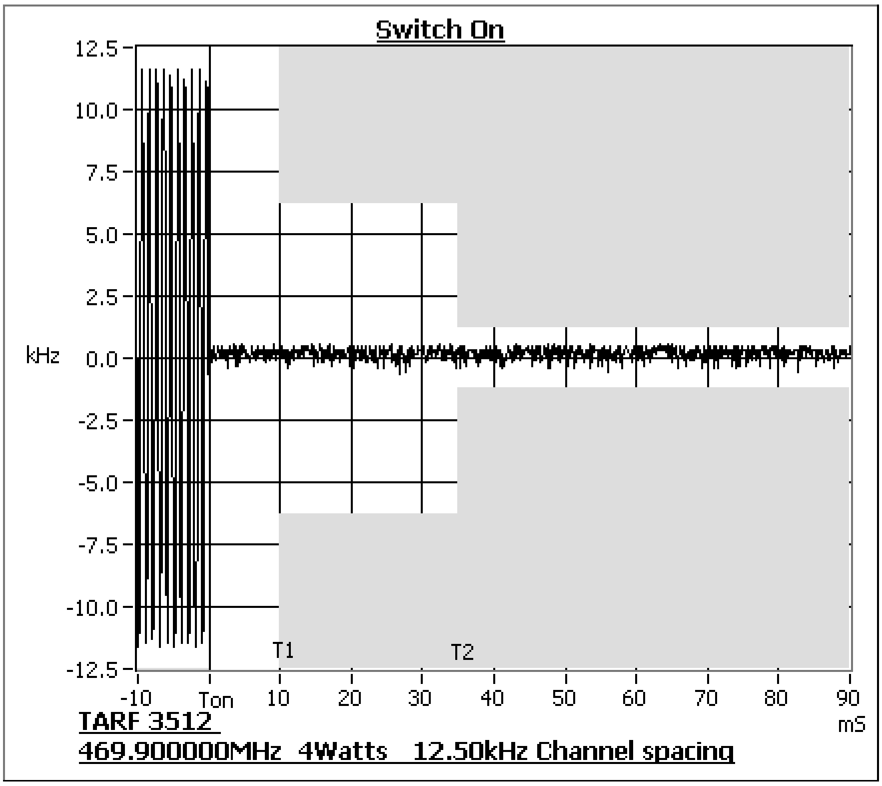
LIMIT: RSS-119 5.9

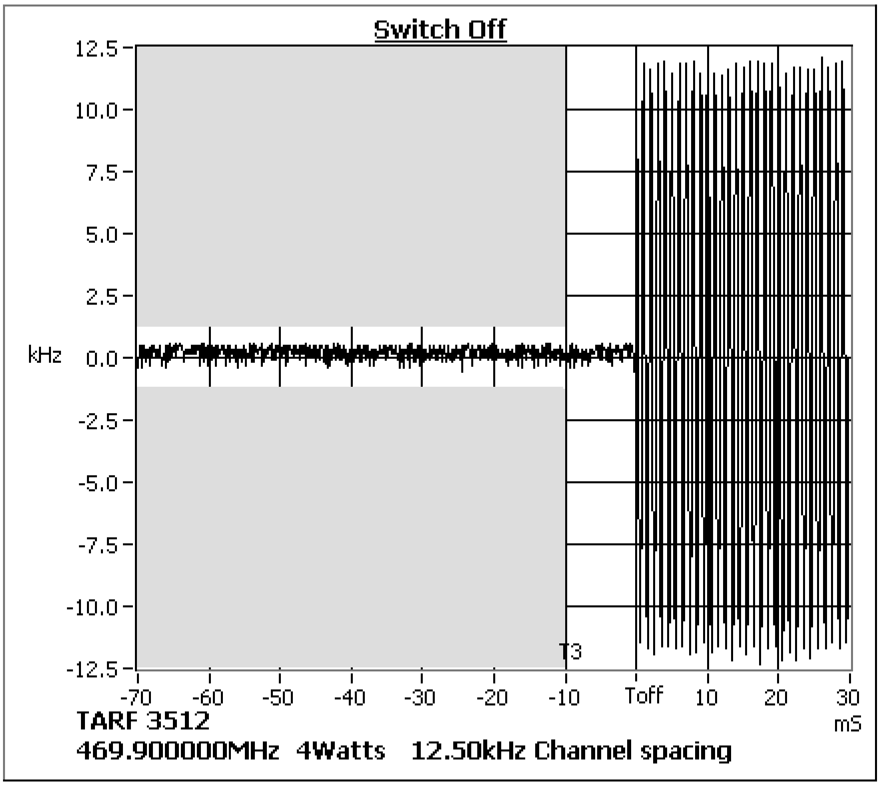
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION:	FCC 47 CFR 90.214	RSS-119	5.9
Tx FREQUENCY:	469.9MHz 4 W	12.5 kHz Channel Spacing	





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 406.2 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	406.2 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.0	N/A
t2	-1.0	N/A
t3	N/A	-0.8
t2 → t3 ppm	-2.5	
ERROR LIMIT (t2 → t3) ppm	5.0	

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	Y	
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	Y	
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

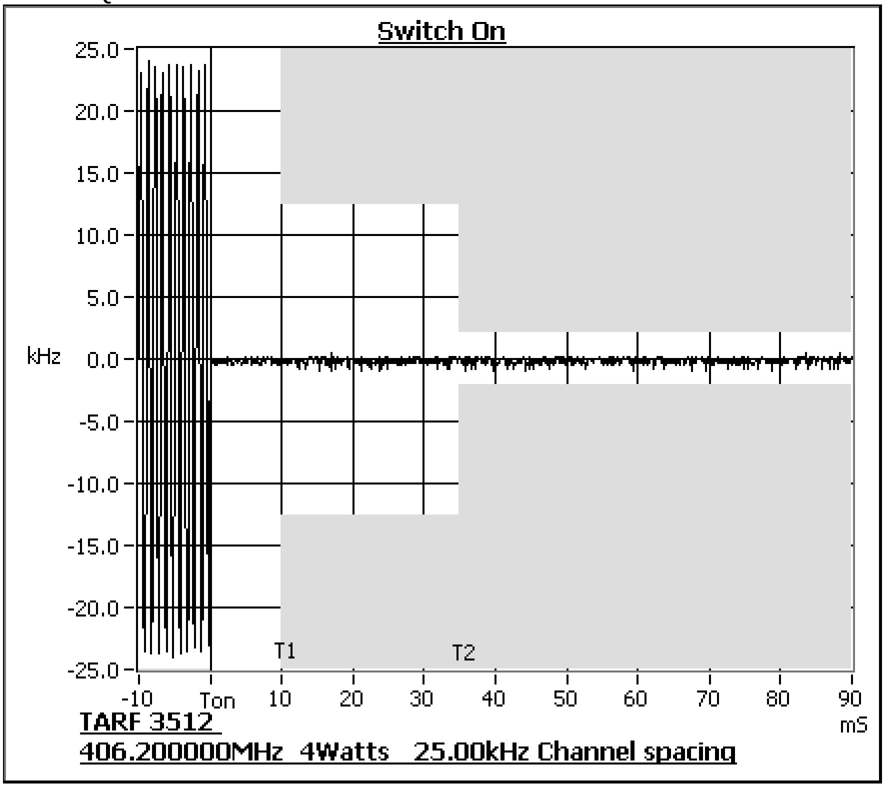
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

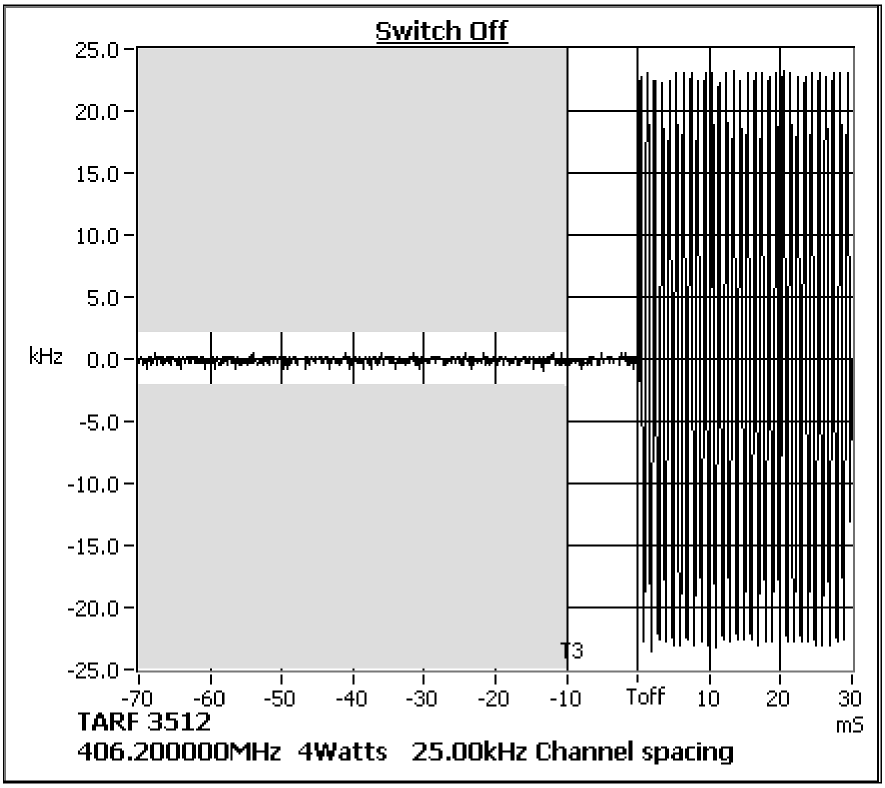
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 406.2 MHz 4 W 25.0 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 429.9 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	429.9 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t1	-1.2	N/A
t2	-1.2	N/A
t3	N/A	-0.7
t2 → t3 ppm	-2.7	
ERROR LIMIT (t2 → t3) ppm	5.0	

Confirm that during periods t1 and t3 the frequency difference does not exceed the value of one channel separation.	YES	NO
	Y	
Confirm that during the period t2 the frequency difference does not exceed half a channel separation.	YES	NO
	Y	
Confirm that during the period t2 to t3 the frequency difference does not exceed the frequency error limit.	YES	NO
	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t1 (ms)	5 ms	10 ms
t2 (ms)	20 ms	25 ms
t3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

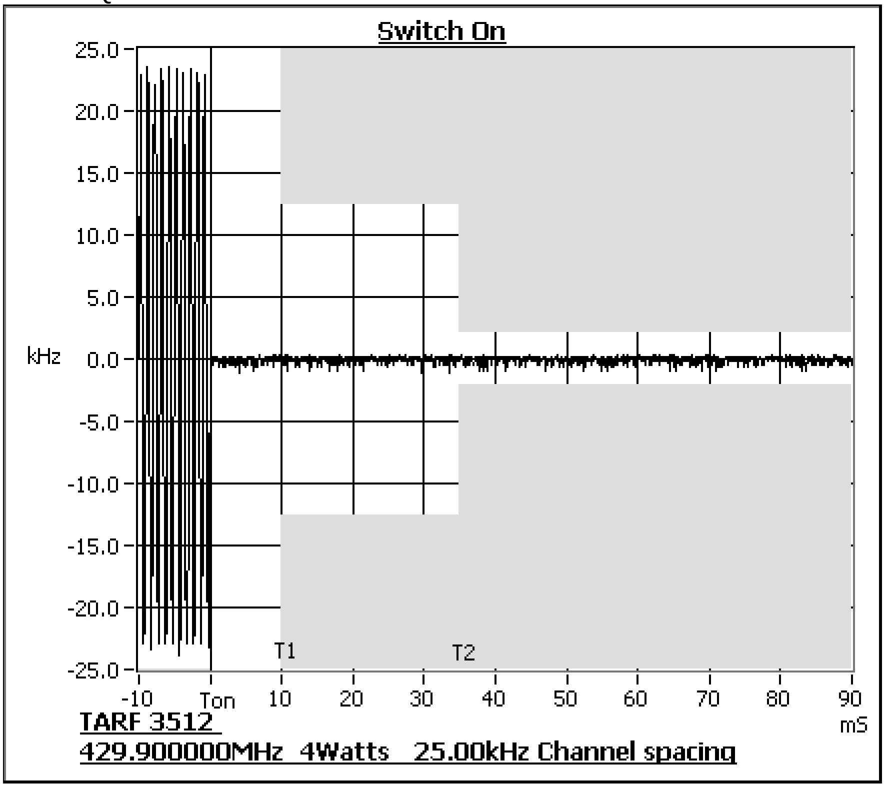
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t1 (ms)	± 12.5 kHz	5 ms	10 ms
t2 (ms)	± 6.25 kHz	20 ms	25 ms
t3 (ms)	± 12.5 kHz	5 ms	10 ms

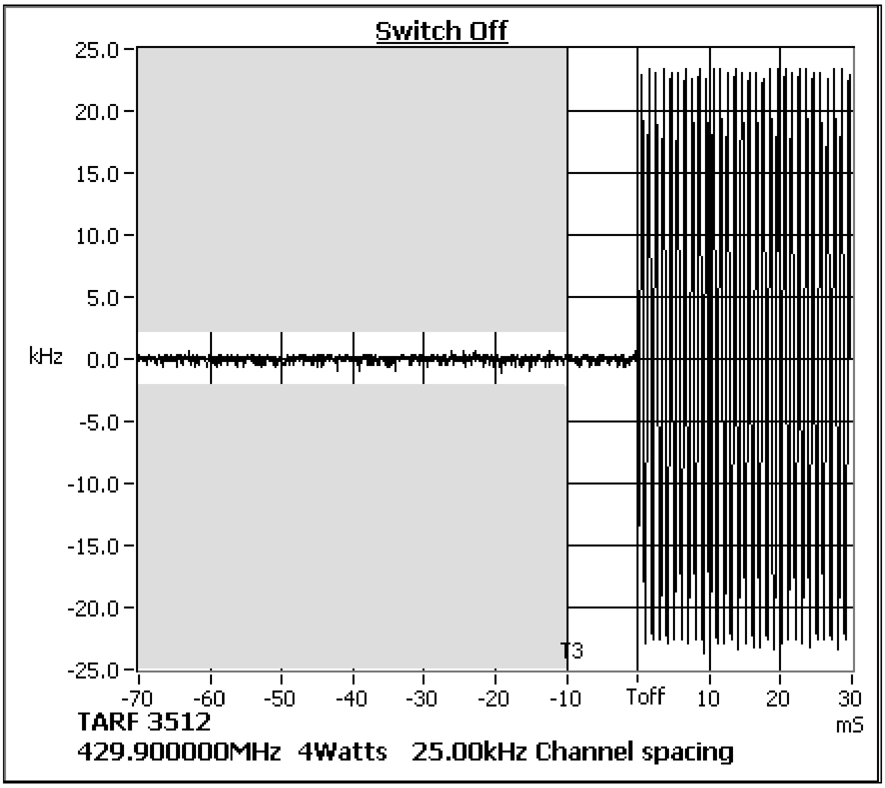
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t1 and t3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 429.9 MHz 4 W 25.0 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 450.1 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	450.1 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	-1.4	N/A
t_2	-0.9	N/A
t_3	N/A	-0.9
$t_2 \rightarrow t_3$ ppm	-2.6	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	5.0	

	YES	NO
Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

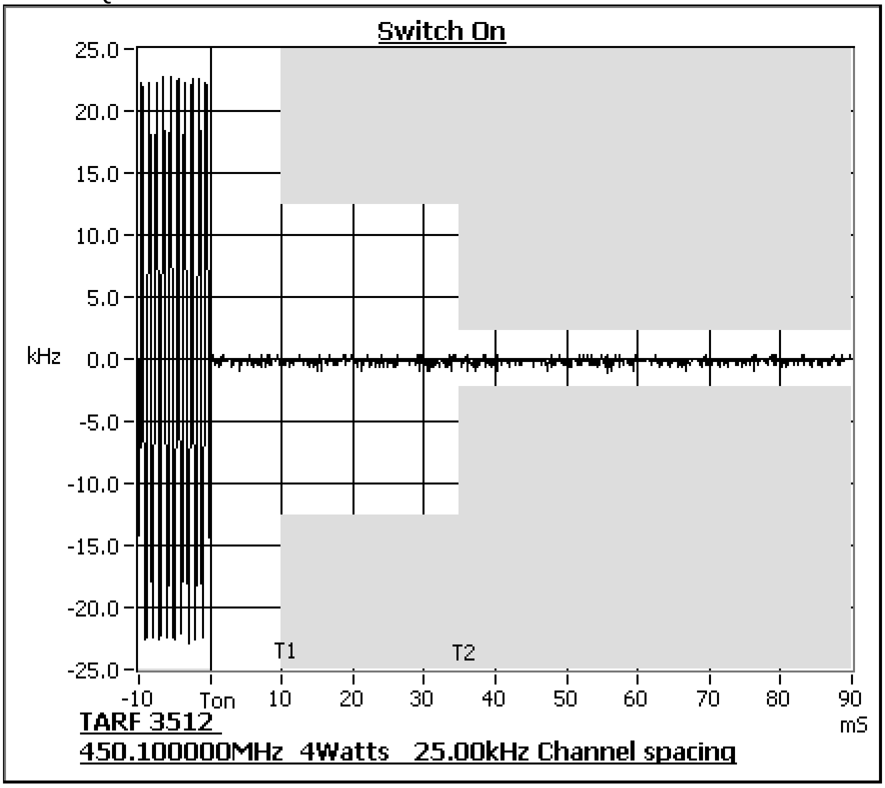
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t_1 (ms)	± 12.5 kHz	5 ms	10 ms
t_2 (ms)	± 6.25 kHz	20 ms	25 ms
t_3 (ms)	± 12.5 kHz	5 ms	10 ms

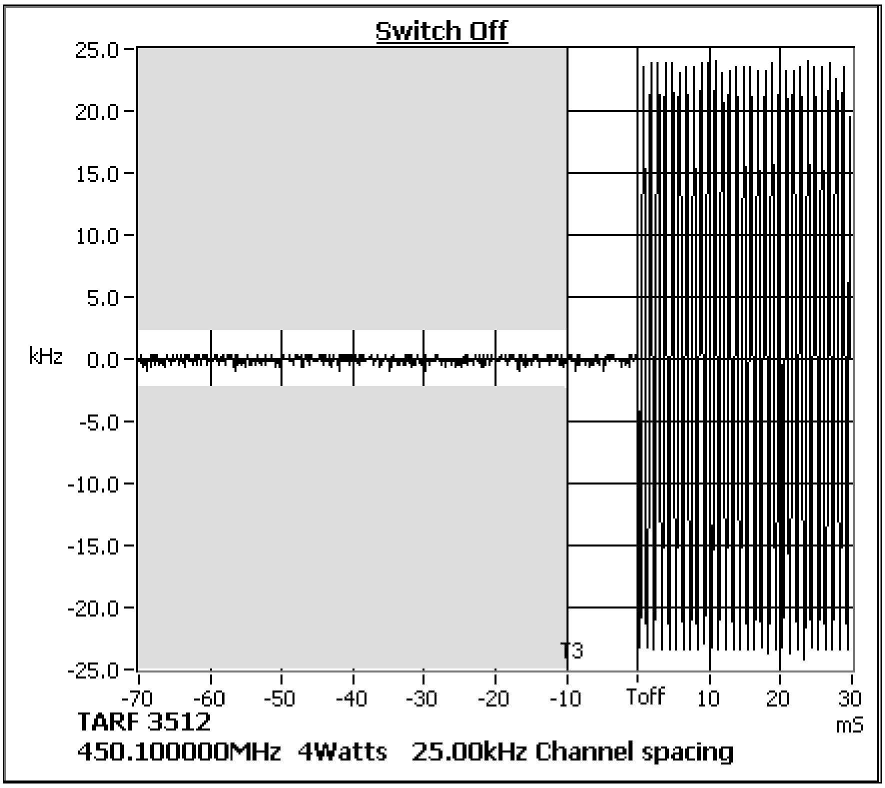
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 450.1 MHz 4 W 25.0 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 459.9 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	459.9 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	-1.1	N/A
t_2	-1.3	N/A
t_3	N/A	-0.8
$t_2 \rightarrow t_3$ ppm	-2.3	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	5.0	

	YES	NO
Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

LIMIT: RSS-119 5.9

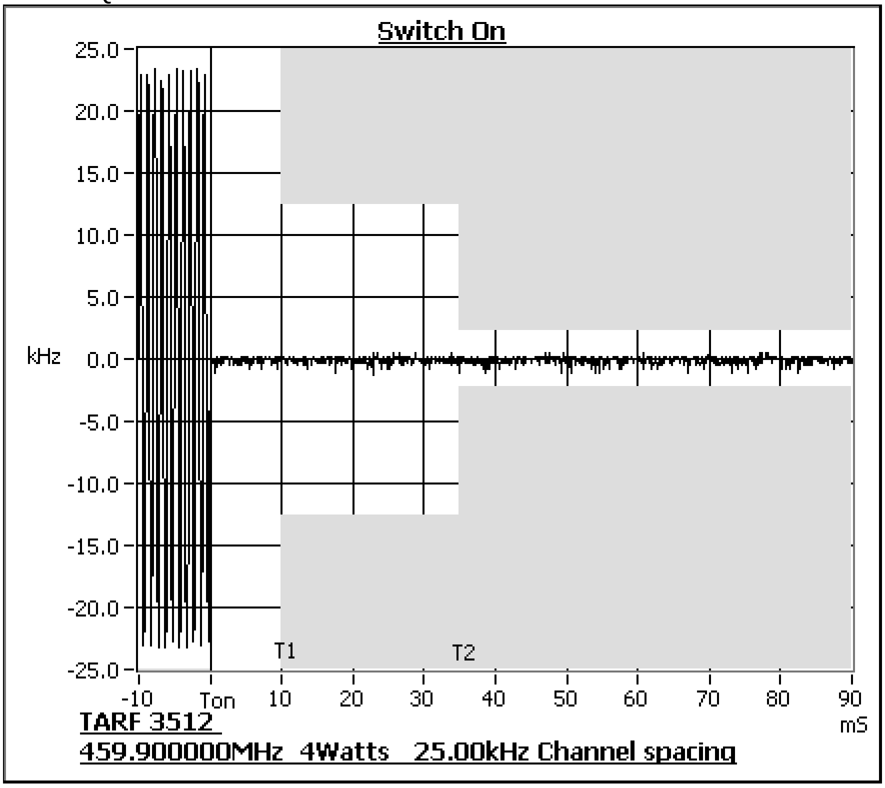
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t_1 (ms)	± 12.5 kHz	5 ms	10 ms
t_2 (ms)	± 6.25 kHz	20 ms	25 ms
t_3 (ms)	± 12.5 kHz	5 ms	10 ms

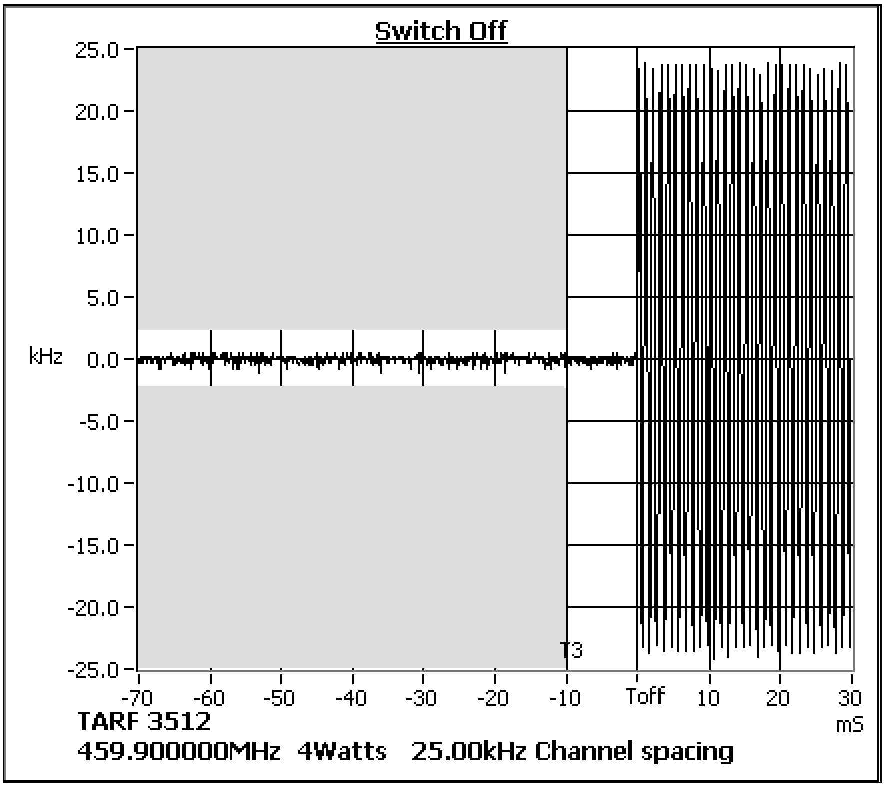
Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION:	FCC 47 CFR 90.214	RSS-119	5.9

Tx FREQUENCY: 459.9 MHz 4 W 25.0 kHz Channel Spacing





Transient Frequency Behavior

SPECIFICATION: FCC 47 CFR 90.214 RSS-119 5.9

Tx FREQUENCY: 469.9 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	469.9 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	-1.0	N/A
t_2	-1.0	N/A
t_3	N/A	-1.0
$t_2 \rightarrow t_3$ ppm	-2.6	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	5.0	

	YES	NO
Confirm that during periods t_1 and t_3 the frequency difference does not exceed the value of one channel separation.	Y	
Confirm that during the period t_2 the frequency difference does not exceed half a channel separation.	Y	
Confirm that during the period t_2 to t_3 the frequency difference does not exceed the frequency error limit.	Y	

LIMIT: FCC 47 CFR 90.214

TRANSIENT PERIODS	FREQUENCY RANGE 150 – 174 MHz	FREQUENCY RANGE 421 – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

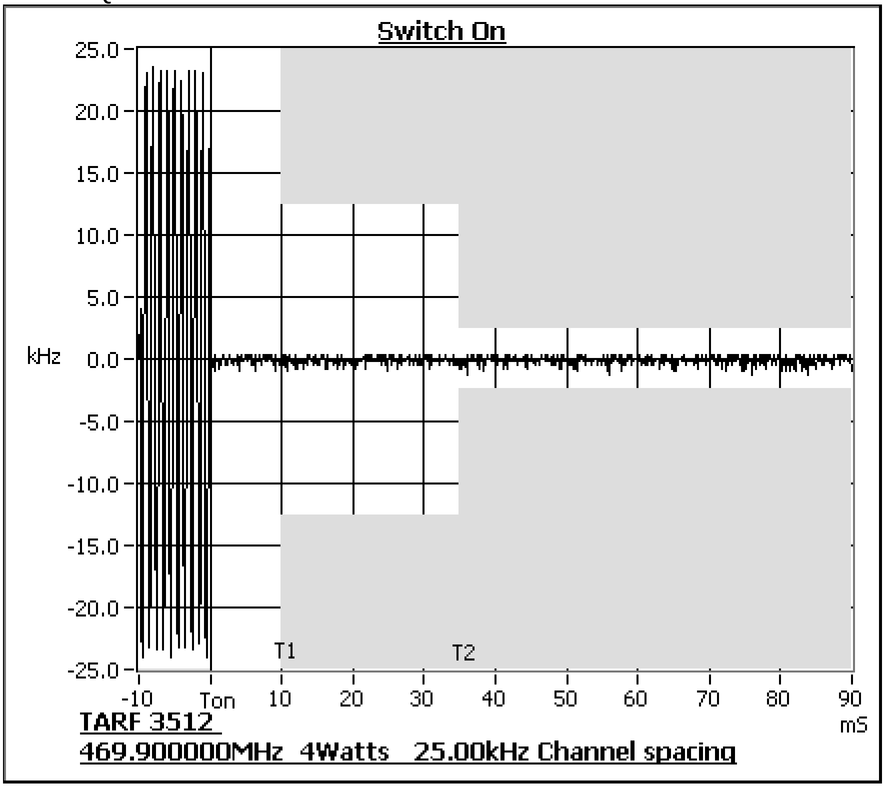
LIMIT: RSS-119 5.9

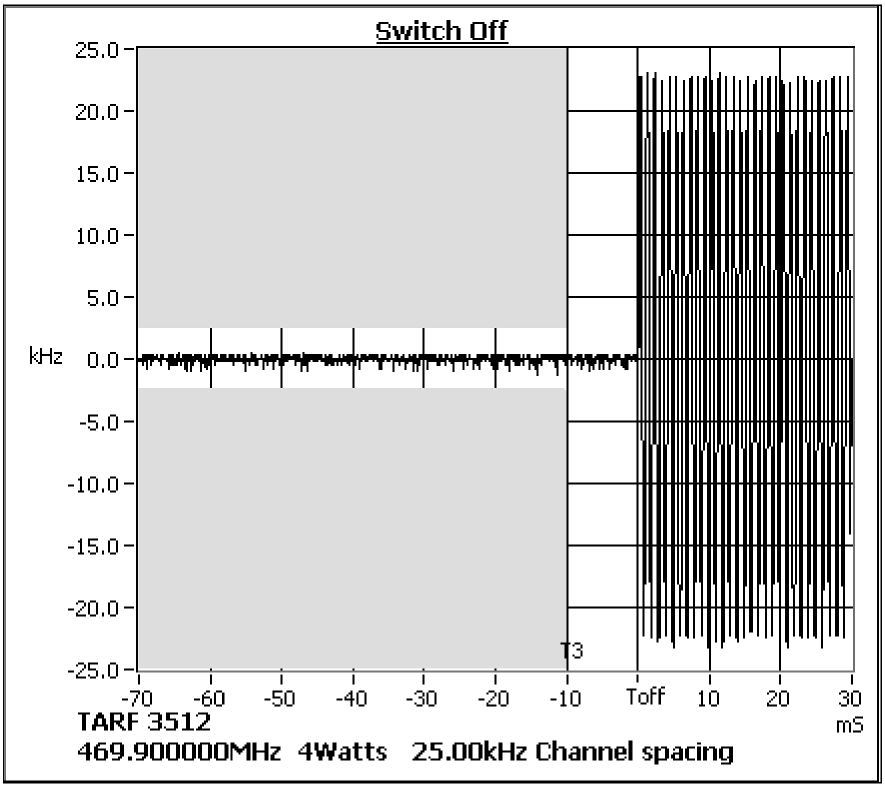
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
TRANSIENT PERIODS	Maximum Frequency Difference	FREQUENCY RANGE	
		138 – 174 MHz	406.1 – 470 MHz
t_1 (ms)	± 12.5 kHz	5 ms	10 ms
t_2 (ms)	± 6.25 kHz	20 ms	25 ms
t_3 (ms)	± 12.5 kHz	5 ms	10 ms

Note: RSS-119 5.9 - If the transmitter carrier output power rating is 6 Watts or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods,

Transient Frequency Behavior

SPECIFICATION:	FCC 47 CFR 90.214	RSS-119	5.9
Tx FREQUENCY:	469.9 MHz 4 W	25.0 kHz Channel Spacing	





TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1) RSS-119 5.3

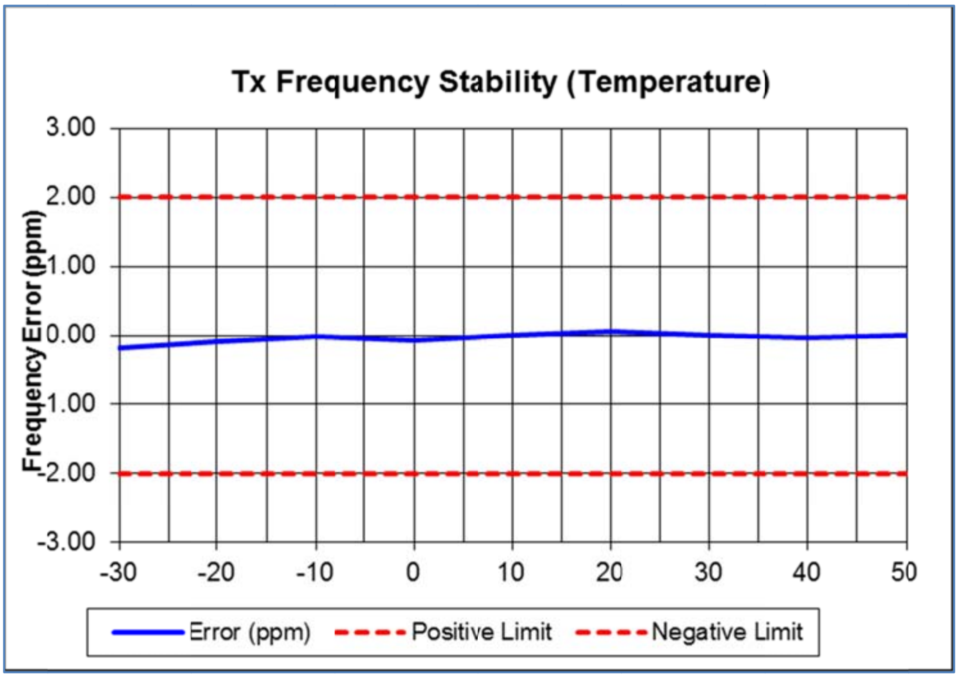
GUIDE: TIA/EIA-603D 2.2.2

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

MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz channel spacing.

406.2MHz

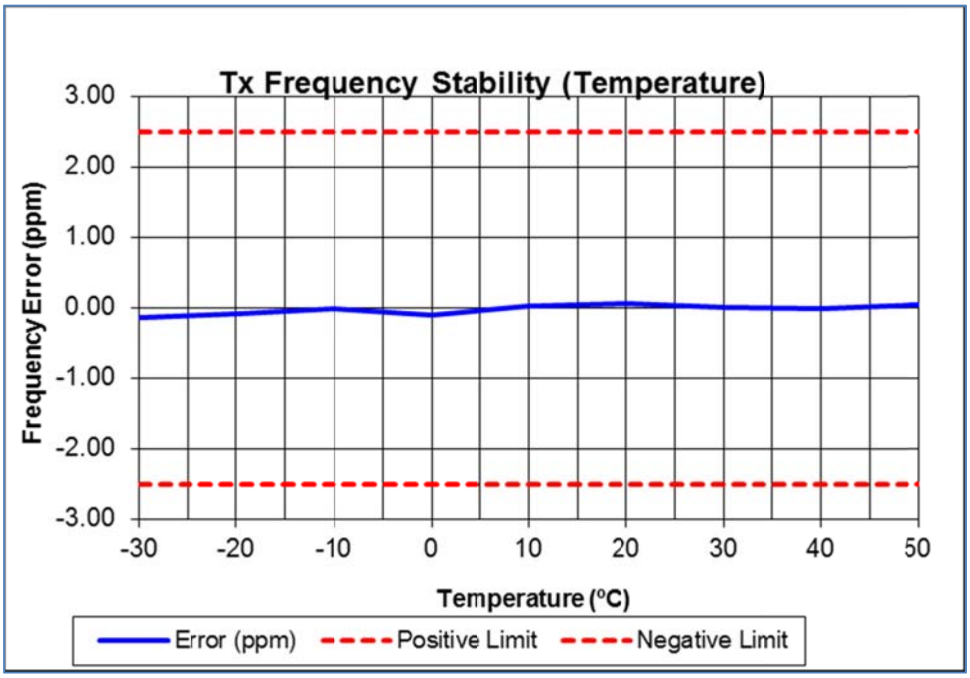
Temperature (ºC)	Frequency (MHz)	Error (ppm)
50	406.200003	0.01
40	406.199984	-0.04
30	406.200002	0.00
20	406.200021	0.05
10	406.200000	0.00
0	406.199968	-0.08
-10	406.199989	-0.03
-20	406.199962	-0.09
-30	406.199925	-0.18



Transmitter Frequency Stability - Temperature

429.9 MHz

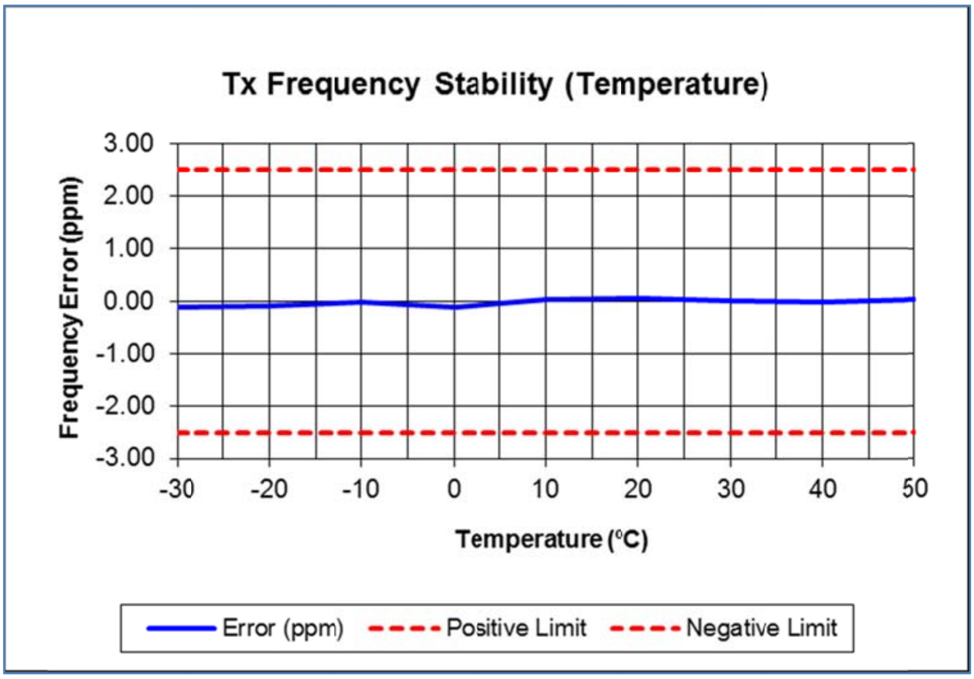
Temperature (ºC)	Frequency (MHz)	Error (ppm)
50	429.900013	0.03
40	429.899990	-0.02
30	429.900003	0.01
20	429.900027	0.06
10	429.900008	0.02
0	429.899958	-0.10
-10	429.899994	-0.01
-20	429.899959	-0.10
-30	429.899942	-0.13



Transmitter Frequency Stability - Temperature

450.1MHz

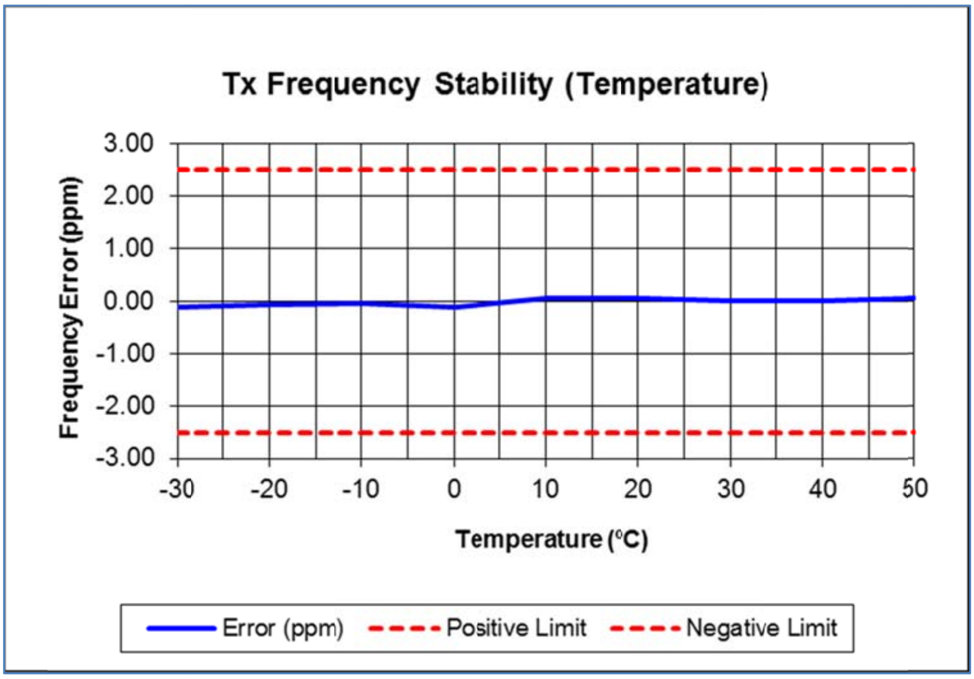
Temperature (ºC)	Frequency (MHz)	Error (ppm)
50	450.100020	0.04
40	450.099995	-0.01
30	450.100003	0.01
20	450.100029	0.06
10	450.100020	0.04
0	450.099952	-0.11
-10	450.099995	-0.01
-20	450.099961	-0.09
-30	450.099945	-0.12



Transmitter Frequency Stability - Temperature

459.9MHz

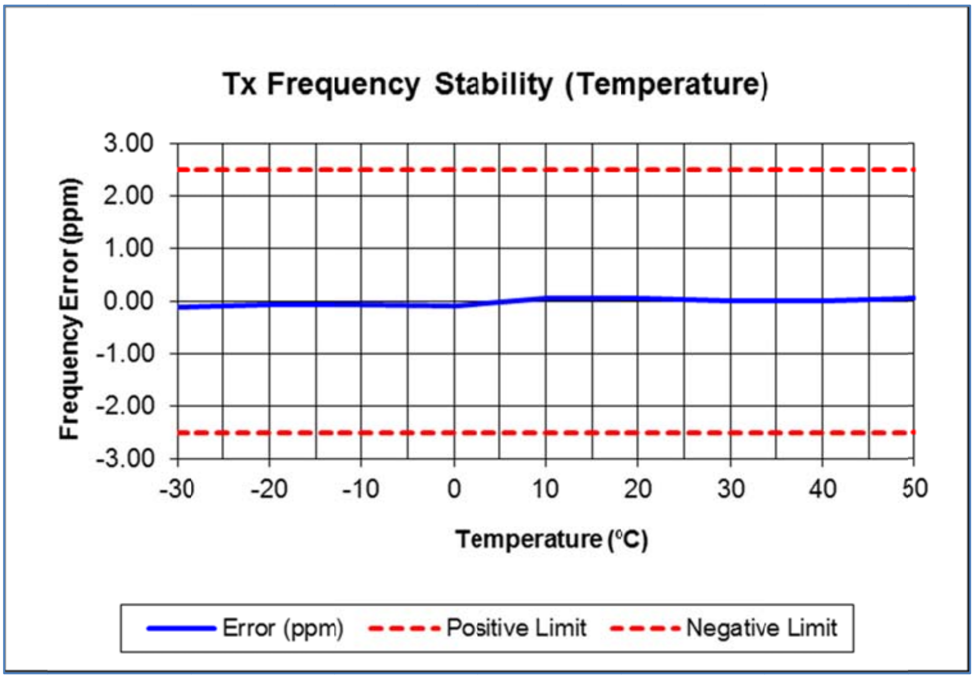
Temperature (ºC)	Frequency (MHz)	Error (ppm)
50	459.900023	0.05
40	459.900001	0.00
30	459.900003	0.01
20	459.900029	0.06
10	459.900026	0.06
0	459.899950	-0.11
-10	459.899987	-0.03
-20	459.899969	-0.07
-30	459.899952	-0.10



Transmitter Frequency Stability - Temperature

469.9MHz

Temperature (ºC)	Frequency (MHz)	Error (ppm)
50	469.900024	0.05
40	469.900006	0.01
30	469.900000	0.00
20	469.900027	0.06
10	469.900030	0.06
0	469.899954	-0.10
-10	469.899976	-0.05
-20	469.899976	-0.05
-30	469.899948	-0.11



LIMIT: FCC 47 CFR 90.213 RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)				
12.5	406.2 MHz	429.9 MHz	450.1 MHz	459.9 MHz	469.9 MHz
	2.0	2.5	2.5	2.5	2.5
25.0	406.2 MHz	429.9 MHz	450.1 MHz	459.9 MHz	469.9 MHz
	5.0	5.0	5.0	5.0	5.0

TRANSMITTER FREQUENCY STABILITY - VOLTAGE

SPECIFICATION: FCC 47 CFR 2.1055 (d) (1) RSS-119 5.3

GUIDE: TIA/EIA-603D 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 nominal and battery endpoint.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

Voltage	FREQUENCY ERROR (ppm) for 12.5 kHz				
	406.2 MHz	429.9 MHz	450.1 MHz	459.9 MHz	469.9 MHz
7.5 V_{DC}	-0.08	-0.05	-0.06	-0.06	-0.05
6.375 V_{DC}	-0.07	-0.05	-0.05	-0.05	-0.05

LIMIT CLAUSES: FCC 47 CFR 90.213 RSS-119 5.3

Channel Spacing (kHz)	Frequency Error (ppm)				
12.5	406.2 MHz	429.9 MHz	450.1 MHz	459.9 MHz	469.9 MHz
	2.0	2.5	2.5	2.5	2.5
25.0	406.2 MHz	429.9 MHz	450.1 MHz	459.9 MHz	469.9 MHz
	5.0	5.0	5.0	5.0	5.0

SPURIOUS EMISSIONS – Rx CONDUCTED

SPECIFICATION: RSS-119 5.11

GUIDE: TIA/EIA-603D 2.1.2

MEASUREMENT PROCEDURE:
1. Refer Annex A for Equipment set up diagram.
2. The frequency range examined was from 30 MHz to 3 times highest tunable frequency.
3. Spurious emissions which were attenuated more than 20dB below the limit were not recorded.

406.2MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
429.9 MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
450.1MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
459.9MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
469.9MHz Receive		
Emission Frequency (MHz)	Level (nW)	Level (dBm)
~	~	~
No emissions were detected within 20 dB of Limit.		

LIMIT CLAUSE: RSS-Gen 6(b)

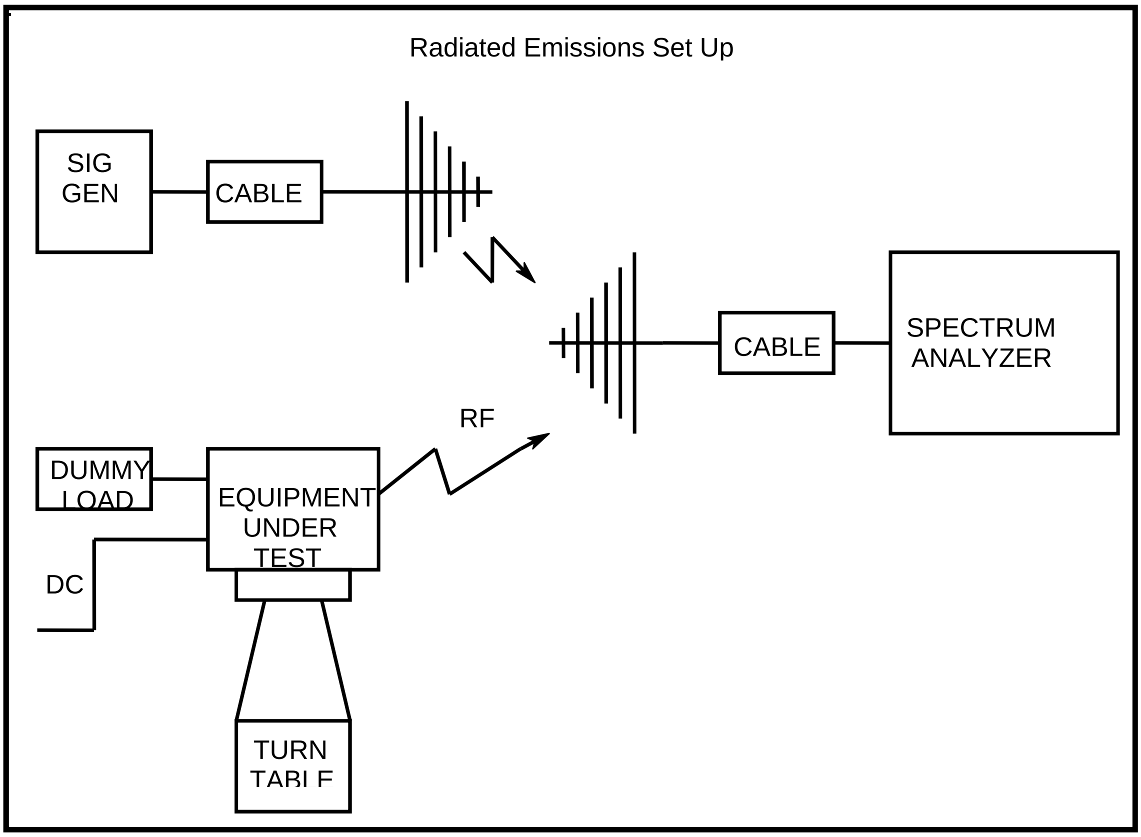
LIMIT	30 → 1000 MHz	2 nW	- 57 dBm
	> 1000 MHz	5 nW	- 53 dBm

TEST EQUIPMENT LIST

No#	Equipment Type	Information	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
3	Signal Generator	Analog 4GHz	Agilent	E4422B	GB40050320	E3788	8-May-14
16	Oscilloscope	100MHz Digital	Tektronics	TDS340	B013611	E3585	10-Oct-13
18	Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	2-Aug-15
19	Environ. Chamber	Chest	Contherm	Chest	E3397	E3397	2-Aug-13
28	Power Supply	TREVA2 60V/25A	Agilent	N5767A	US09F4901H	E4656	8-Oct-13
31	Antenna	18GHz DRG	Emco	DRG3115	9512-4638	E3560	6-Mar-16
32	Antenna	18GHz DRG	Emco	DRG3115	2084	E3076	6-Mar-16
33	Spectrum Analyser	26.5GHz	Agilent	PXA N9030A	MY49432161	E4907	30-Mar-14
35	RF Chamber	S-LINE TEM CELL	Rohde & Schwarz	1089.9296.02	338232/003	E3636	31-Aug-15
38	RF Amplifier	+21.7 dB 1GHz	Tait	ZFL-1000LN	E3660	E3360	18-Dec-13
50	RF Attenuator	20dB 25W	Weinschel	33-20-33	BD5871	E3673	13-Oct-13
51	RF Attenuator	TREVA2 20dB 150W	Weinschel	40-20-33	CJ405	E3733	12-Oct-13
60	Coax Cable	1m Blue	Suhner	Sucoflex 104A	44610/4A	E4619	12-Oct-13
65	Audio Analyser	TREVA2	Hewlett Packard	HP8903B	2818A04275	E3710	12-Oct-13
66	Spectrum Analyser	13.2GHz	Hewlett Packard	HP8562E	3821A00779	E3715	17-Oct-13
90	Modulation Analyser	TREVA2	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	12-Oct-13
93	Signal Generator	TREVA2 Analog 3.3GHz	Rohde & Schwarz	SML03 1090.3000.13	100597	E4050	17-Oct-13
97	RF Attenuator	TREVA2 3dB	Weinschel	Model 1	BL9950	E4080	
101	RF Combiner	TREVA2	Minicircuits	ZFSC-4-1	-	E4084	
103	Spectrum Analyser	13.2GHz	Agilent	E4445A	MY42510072	E4139	21-Nov-14
107	Coax Cable	OATS Tower Cable	Intelcom	RG214	OATS1	E4621	15-Oct-13
108	Coax Cable	OATS Turntable Cable	Intelcom	RG215	OATS2	E4622	15-Oct-13
109	OATS	Antenna Tower	Electrometrics	EM-4720-2	112	E4447	
110	OATS	Controller	Electrometrics	EM-4700	119	E4445	
111	OATS	Turntable	Electrometrics	EM-4704A	105	E4446	
117	Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack5	E4850	13-Oct-13
118	Coax Cable	2m Black	Suhner	RG214HF/Nm/Nm/2000	TeltestBlack6	E4849	13-Oct-13
127	Power Meter	TREVA2 Power Head for HP8901	Hewlett Packard	HP11722A	2716A02037	1575	15-Oct-13
128	Antenna	Log Periodic	Schwarzbeck	VUSLP	9111-219	E4147	
133	TREVA 2		Teltest	-	2	-	24-Sep-13
134	Coax Cable	Reverb - 4.5m Multiflex 141	TeltestBlue6	MF 141	TeltestBlue6	E4843	13-Oct-13
135	Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue5	MF 141	TeltestBlue5	E4844	13-Oct-13
136	Coax Cable	Reverb - 2m Multiflex 141	TeltestBlue4	MF 141	TeltestBlue4	E4845	13-Oct-13
137	Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue3	MF 141	TeltestBlue3	E4846	13-Oct-13
138	Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue2	MF 141	TeltestBlue2	E4847	13-Oct-13
139	Coax Cable	Reverb - 1m Multiflex 141	TeltestBlue1	MF 141	TeltestBlue1	E4848	13-Oct-13
145	RF Chamber	Reverb - Stirrer controller for reverb chamber	Teseq	Stirrer Controller	29765.1	E4854	
146	RF Chamber	Reverb - 0.5 - 18GHz Reverberation Chamber	Teseq	RVC XS	29765	E4855	
148	Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-885	E4857	
149	Antenna	Reverb - 1-18GHz DRG	Schwarzbeck	BBHA 9120 D	9120D-884	E4858	
150	RF Amplifier	Pre-amplifier	Agilent	87405C	MY47010688	E4941	16-Oct-15

Note:
Items 97, 101 are part of item 133
Items 109, 110, 111, 128, 145, 146, 148, 149 are calibrated prior to use.

ANNEX A – TEST SETUP DETAILS



All other testing is performed using the **T**eltest **R**adio **EVA**luation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.