REPORT NUMBER 2066 July 2004

RADIO PERFORMANCE MEASUREMENTS

On the TPAB12-H600 Portable Transceiver

FCC ID: CASTPAH6A

SN: 21000001

In accordance with

FCC 47 CFR Parts 22 and 90

PREPARED BY: Elizabeth Comery _____
Test Technician

CHECKED & APPROVED BY: Hamish Newton _____
Senior Technician

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REPORT ON :

Type Approval Testing of the TPAB12-H600 (Serial No 21000001)
in accordance with:

FCC CFR 47 Parts 22 & 90

FCC ID: CASTPAH6A

PREPARED FOR :

Tait Electronics Ltd
PO Box 1645
558 Wairakei Rd
Christchurch
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APPROVED :

H G Newton

Senior Technician

Date :

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

Copy No:

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TEST SETUP DETAILS 47

DECLARATION OF CONFORMITY

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

Equipment:	Portable Transceiver
Type:	TPAH6A
Product code:	TPAB12-H600
Serial Numbers:	21000001
Quantity:	1

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

FCC CFR 47 Parts 22 & 90

Signature:_____

S. A. Crompton
Compliance Laboratory Manager.

Date:_____

Test Conditions

All tests have been performed at the following conditions.

Temperature	15°C to 30°C
Relative Humidity	20% to 75%
Standard Test Voltage	7.5 Vdc

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.

Bn = 2M + 2DK Where: Bn = 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

M = 3kHz
D = 2.5kHz

Bn = 6 + 5 x 1
=11kHz

Emission Designator

11K0F3E

F3E represents an analogue FM voice transmission

2. Analogue Voice 25kHz Bandwidth

Necessary bandwidth

M = 3kHz
D = 5kHz

Bn = 6 + 10 x 1
=16kHz

Emission Designator

16K0F3E

F3E represents an analogue FM voice transmission

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

Necessary bandwidth

M = 0.6 (Baud rate = 1200)
D = 1.5kHz (60% of peak deviation)

Bn = 1.2 + 3 x 1.2
=4.8kHz

Emission Designator

4K80F2D

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

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

Necessary bandwidth	Emission Designator
M = 0.6 (Baud rate = 1200) D = 3kHz (60% of peak deviation)	**8K40F2D** F2D represents a FM data transmission with the use of a modulating sub carrier

Bn = 1.2 + 6 x 1.2
=8.4kHz

5. Tait High Speed Date (THSD)

THSD uses a 4 level gaussian frequency shift keying (CP-4GFSK) modulation scheme. It can be used when transferring data between two radios. Data is transmitted at a rate of 12000bps for narrow band channels, and 19200bps for wide-band channels.
Due to the difficulties in determining the value of k, the necessary bandwidth has been measured using the 99% energy rule.

12.5kHz Bandwidth

99% bandwidth	Emission Designator
7.8 kHz	**7K80F1D** F1D represents a FM data transmission without the use of a modulating sub carrier

25kHz Bandwidth

99% bandwidth	Emission Designator
12.3 kHz	**12K3F1D** F1D represents a FM data transmission without the use of a modulating sub carrier

6. Digital Voice /Data (4 – Level FSK) – CFR 47 90.212 (b)

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

a) Operating in a 12.5 kHz Bandwidth

Digital voice

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 Data

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

b) Operating in a 25 kHz Bandwidth

Digital voice

99% bandwidth	Emission Designator
10.0 kHz	**10K0F1E** F1E represents a digital FM voice transmission **10K0F7E** F7E represents two or more channels containing quantized or digital voice information

Digital Data

99% bandwidth	Emission Designator
10.0 kHz	**10K0F1D** F1D represents a digital FM data transmission **10K0F7D** F7D represents two or more channels containing quantized or digital information

7. Digital Voice Encryption (4 – Level FSK) – CFR 47 90.212 (b)

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

b) Operating in a 12.5 kHz Bandwidth

Digital voice

99% bandwidth	Emission Designator
8.1 kHz	**8K10F1E**
	F1E represents a digital FM voice transmission

c) Operating in a 25 kHz Bandwidth

Digital voice

99% bandwidth	Emission Designator
10.0 kHz	**10K0F1E**
	F1E represents a digital FM voice transmission

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 impedance of 50 Ohms.
3. The unmodulated output power was measured with a RF Power meter.

MEASUREMENT RESULTS:

Manufacturer's Rated Output Power: Switchable: 1 W and 4 W

460.1MHz	1 W nominal	4 W nominal
POWER (W)	1.07	4.20
Variation from Nominal (%)	7.0	5.0
Measurement Uncertainty (dB)	+0.63 -0.68	

LIMIT CLAUSE: FCC 47 CFR 90.205

Radio Type: Mobile Transceiver
Frequency Band: 421MHz~512MHz

(o) The output power shall not exceed by more than 20% the manufacturer's rated output power for the particular transmitter.

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603B 2.2.6

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

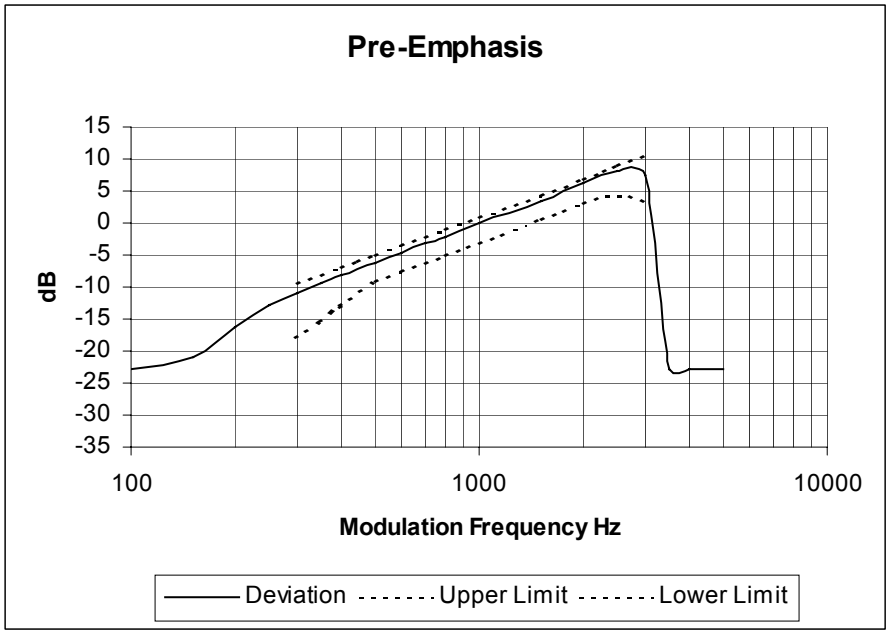
MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603B 3.2.6

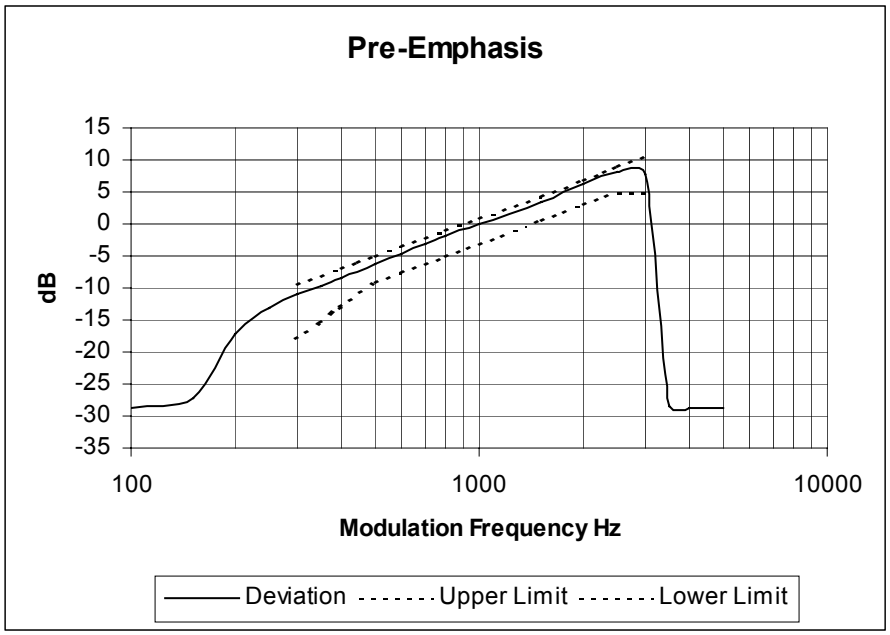
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 460.1MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 460.1MHz 25.0 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.

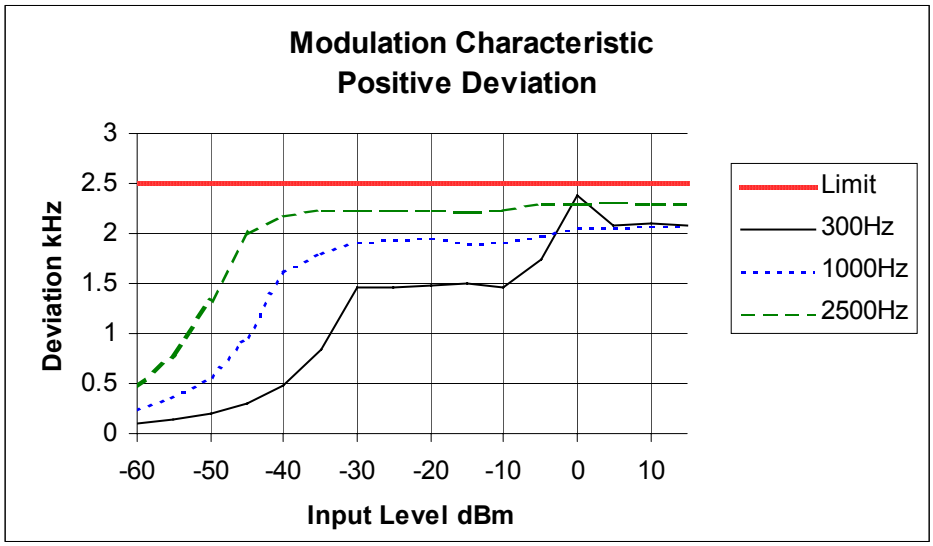
MEASUREMENT RESULTS:
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

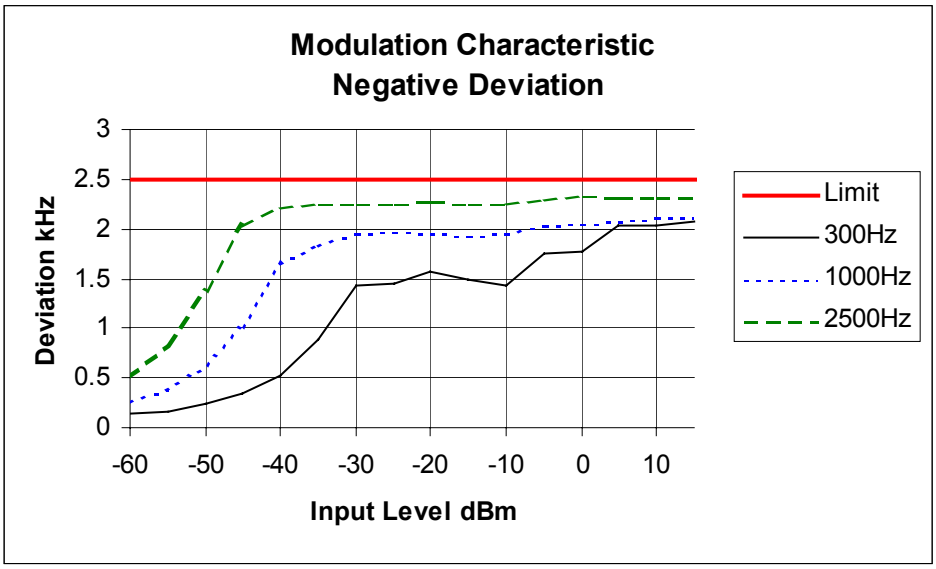
LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

TRANSMITTER MODULATION LIMITING

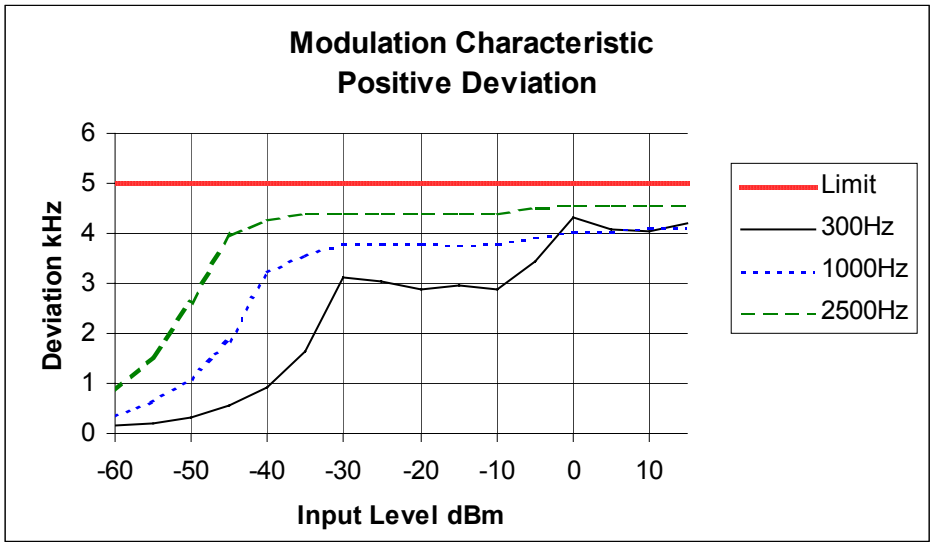
SPECIFICATION: FCC CFR 2.1047 (b)

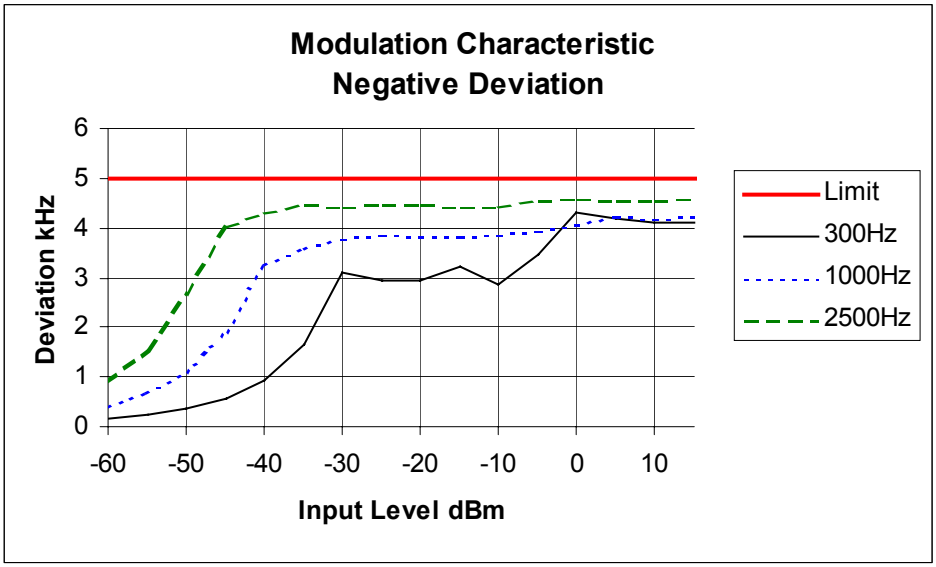
Tx FREQUENCY: 460.1MHz 12.5 kHz Channel Spacing





Tx FREQUENCY: 460.1MHz 25.0 kHz Channel Spacing





OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

GUIDE: TIA/EIA-603B 2.2.11 for Analogue
TIA/EIA-102CAAA-A 2.2.5 for Digital

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 Digital measurements: The EUT was modulated with an internally generated pseudo random bit sequence at the appropriate Baud rates.
3. The Occupied Bandwidth was measured on the Spectrum Analyser, with bandwidth settings as follows.

   Emission Mask D – Resolution Bandwidth = 100Hz, Video Bandwidth = 1 kHz
   Emission Mask B, and C – Resolution bandwidth = 300Hz, Video Bandwidth = 3 kHz

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

LIMIT CLAUSE: FCC 47 CFR 90.210

EMISSION MASKS

Emission Mask D	12.5 kHz Channel Spacing	Analog; Digital; FFSK; THSD
Emission Mask B	25.0 kHz Channel Spacing	Analog;
Emission Mask C	25.0 kHz Channel Spacing	Digital; FFSK; THSD

DATA SPEED

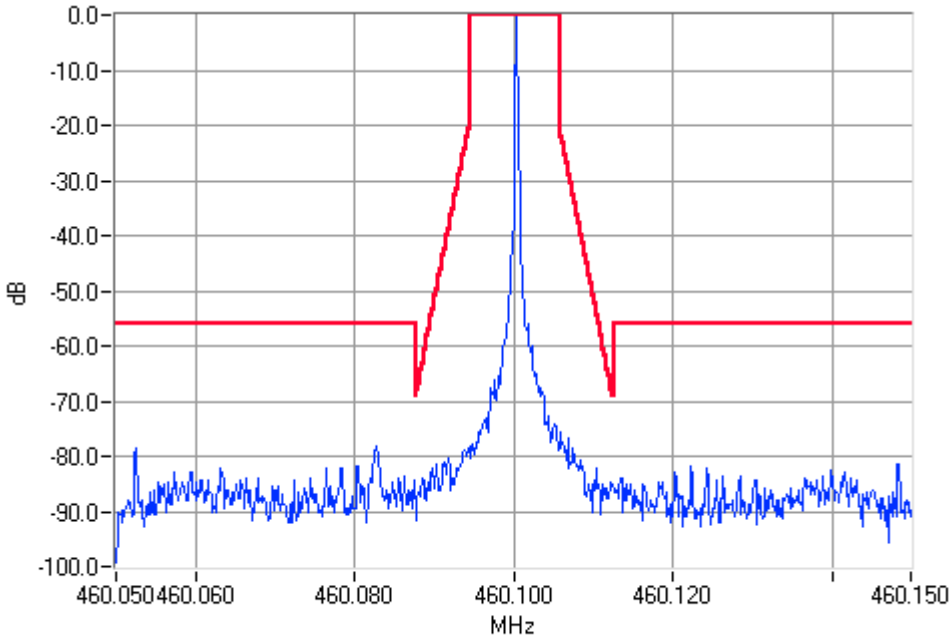
Digital 9600 bps	12.5 kHz Channel Spacing
Digital 9600 bps	25.0 kHz Channel Spacing
FFSK 1200 bps	12.5 kHz Channel Spacing
FFSK 1200 bps	25.0 kHz Channel Spacing
THSD 12000 bps	12.5 kHz Channel Spacing
THSD 19200 bps	25.0 kHz Channel Spacing

OCCUPIED BANDWIDTH

ANALOGUE VOICE

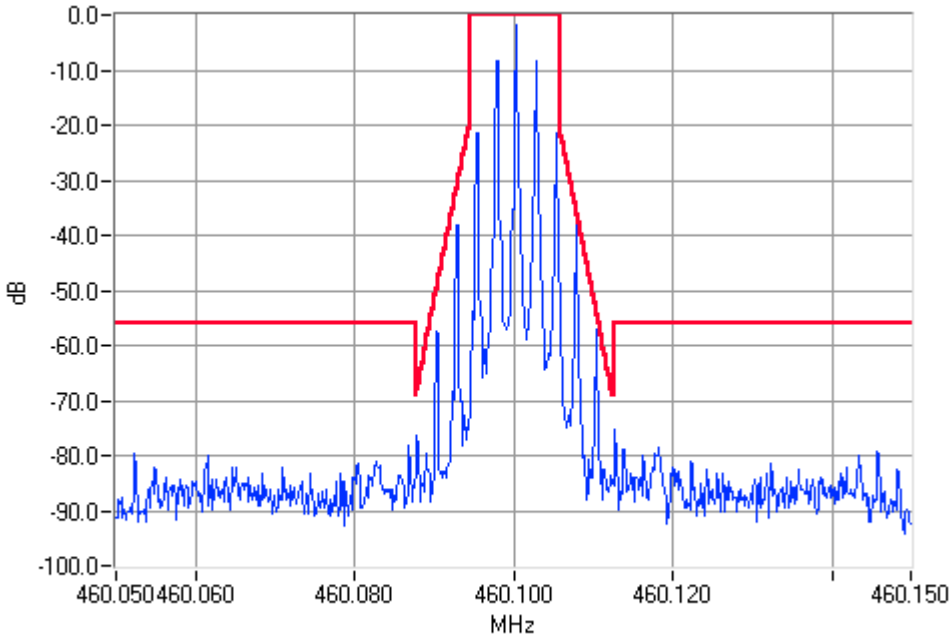
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



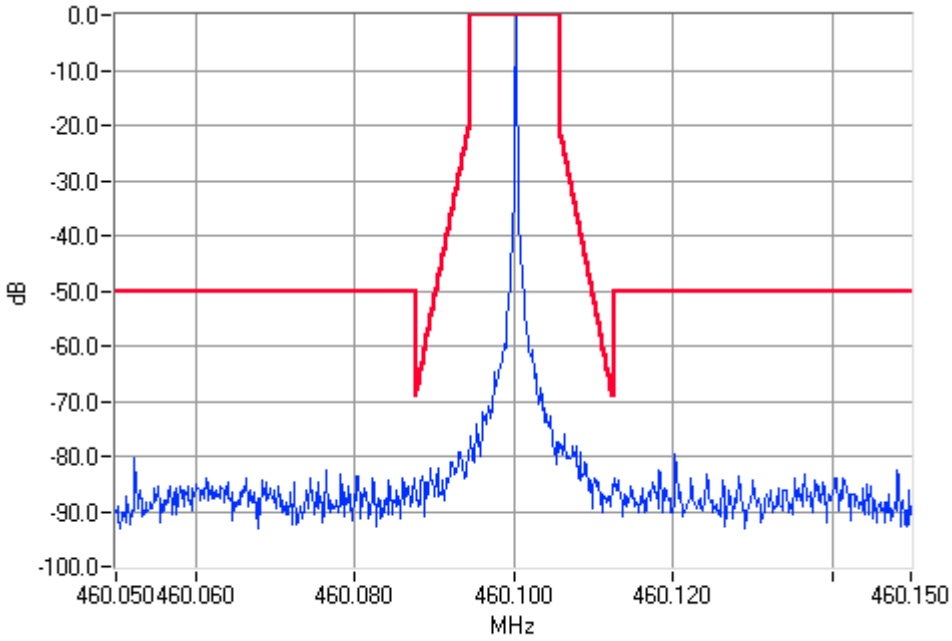
Analogue Modulation 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

ANALOGUE VOICE

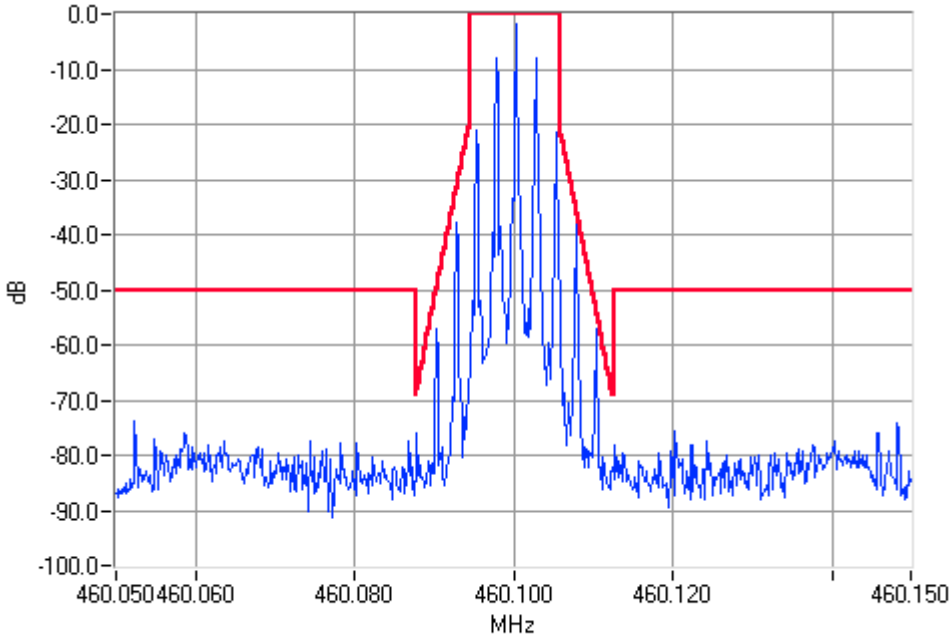
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



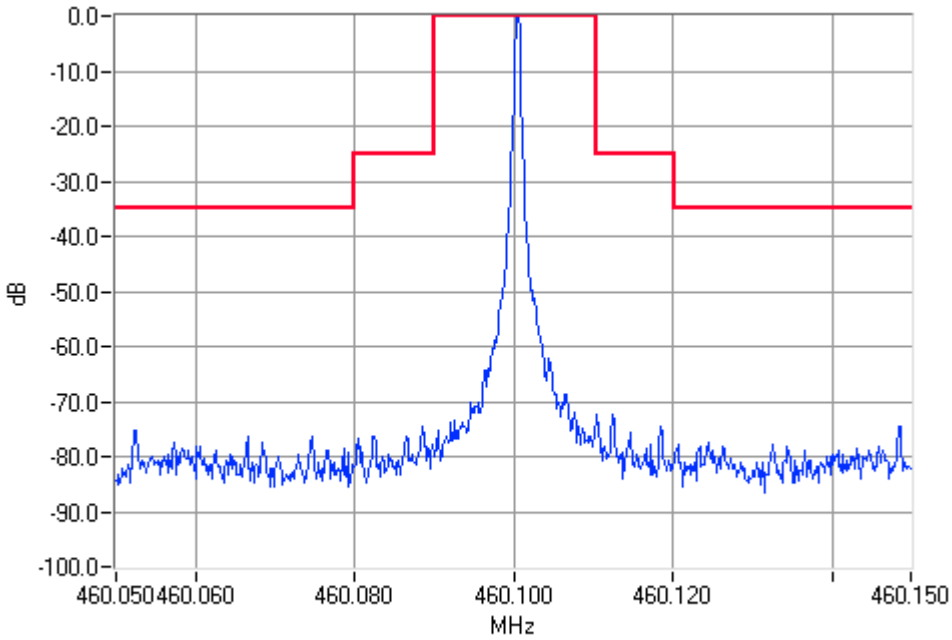
Analogue Modulation 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

ANALOGUE VOICE

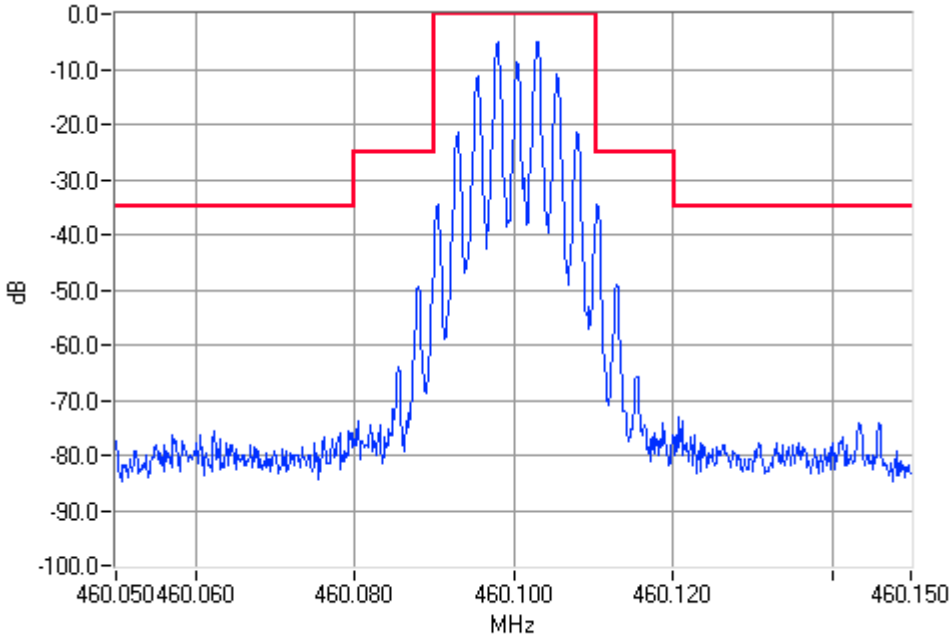
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask B 4W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



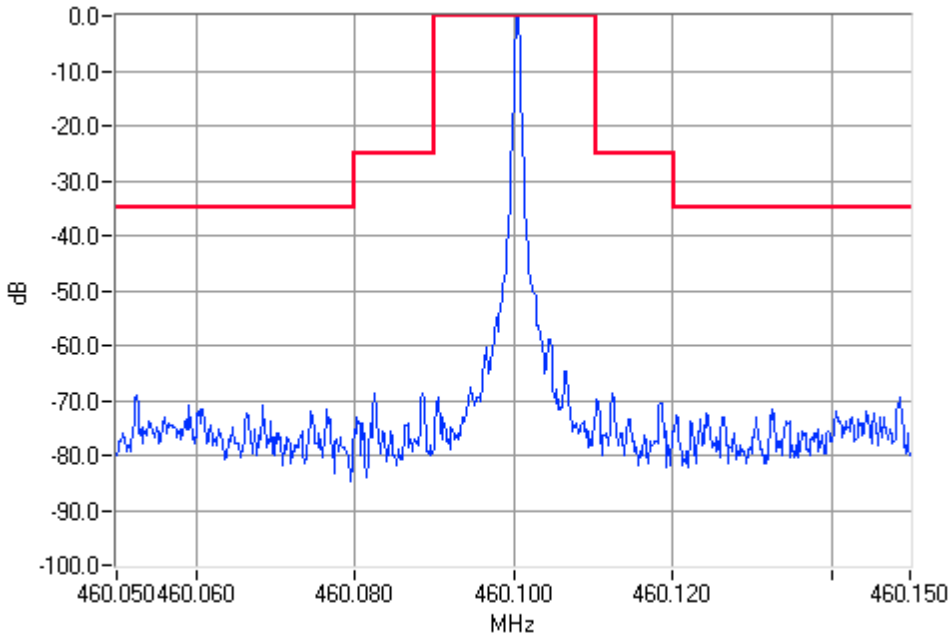
Analogue Modulation 460.1000MHz Mask B 4W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

ANALOGUE VOICE

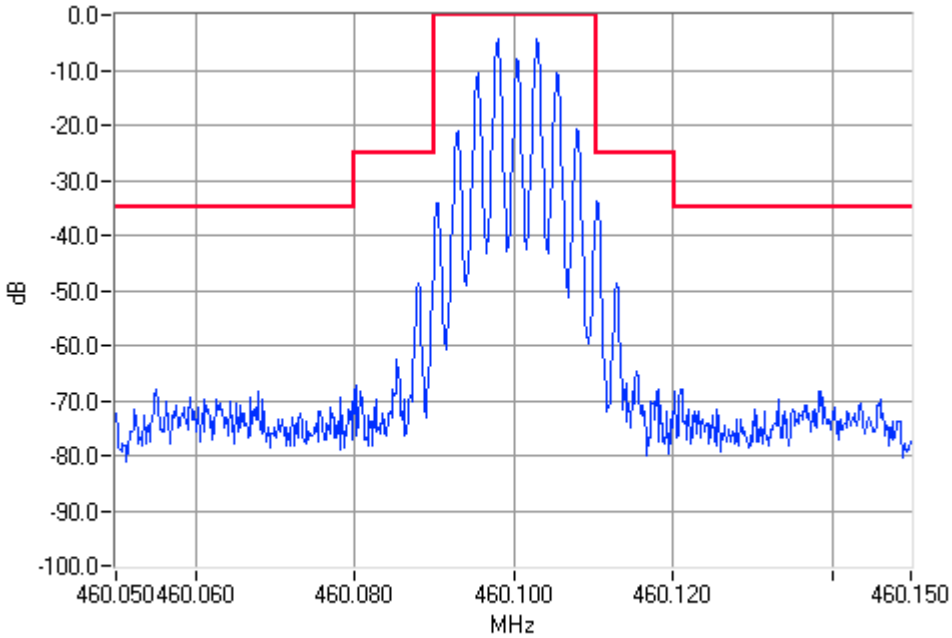
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



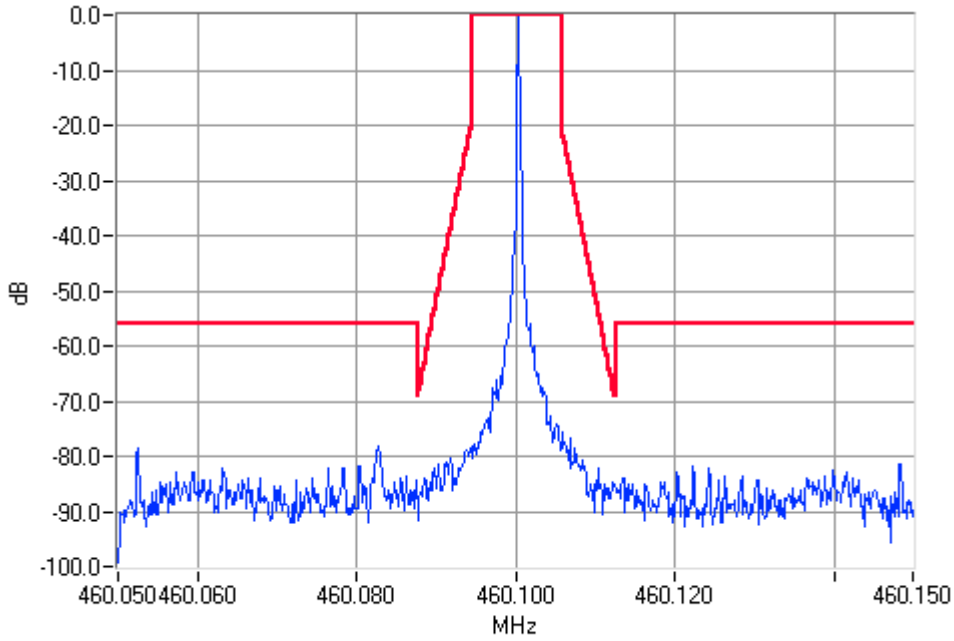
Analogue Modulation 460.1000MHz Mask B 1W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

DIGITAL - 4 Level FSK

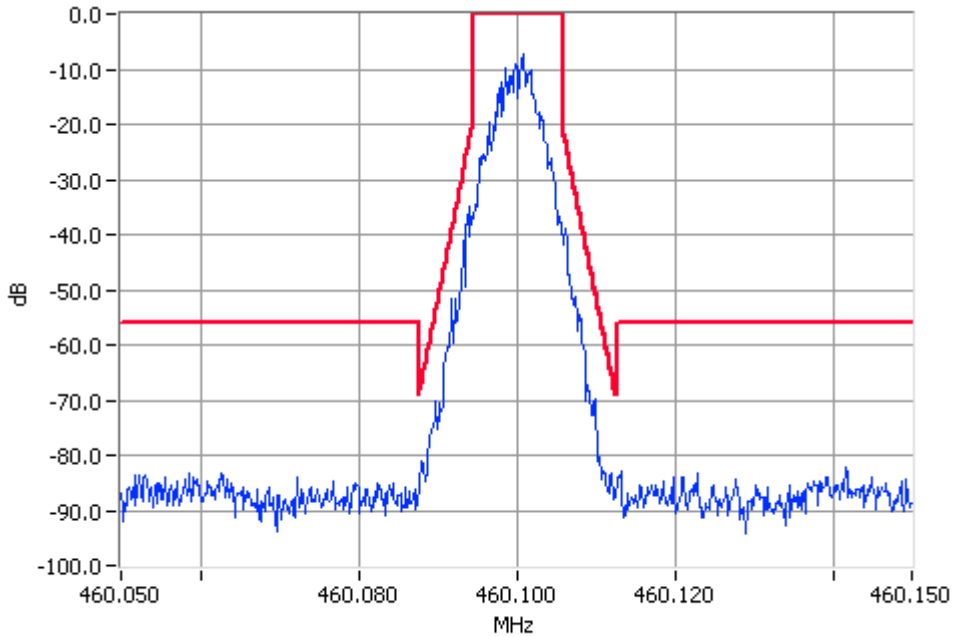
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1 MHz 4W 12.5 kHz Channel Spacing



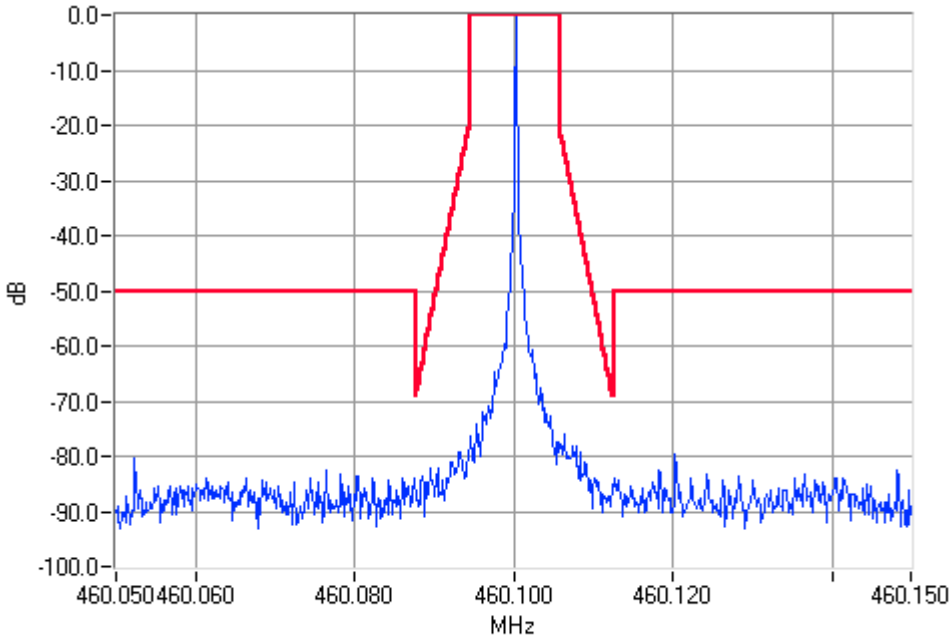
Digital Modulation 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

DIGITAL – 4 Level FSK

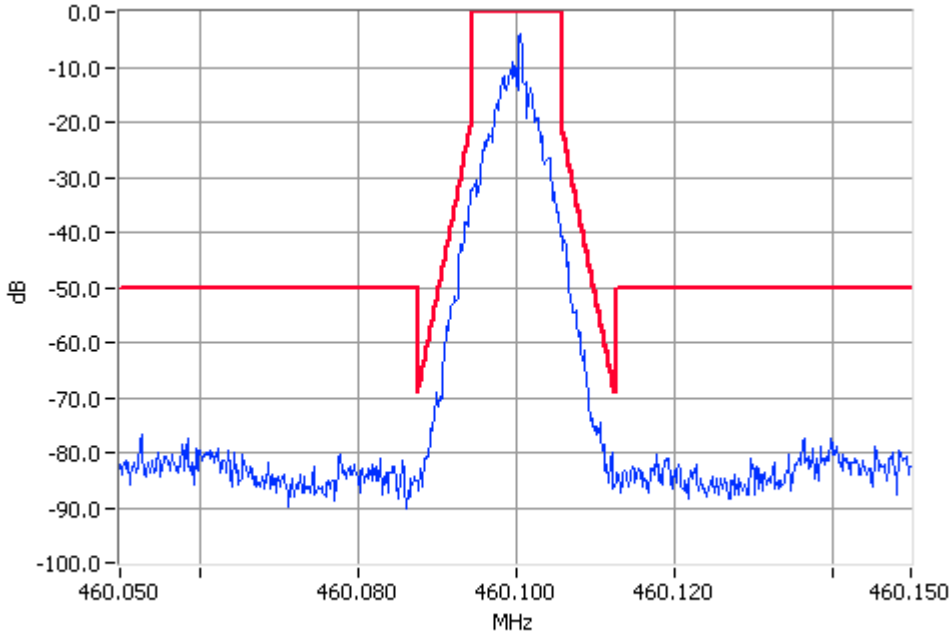
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



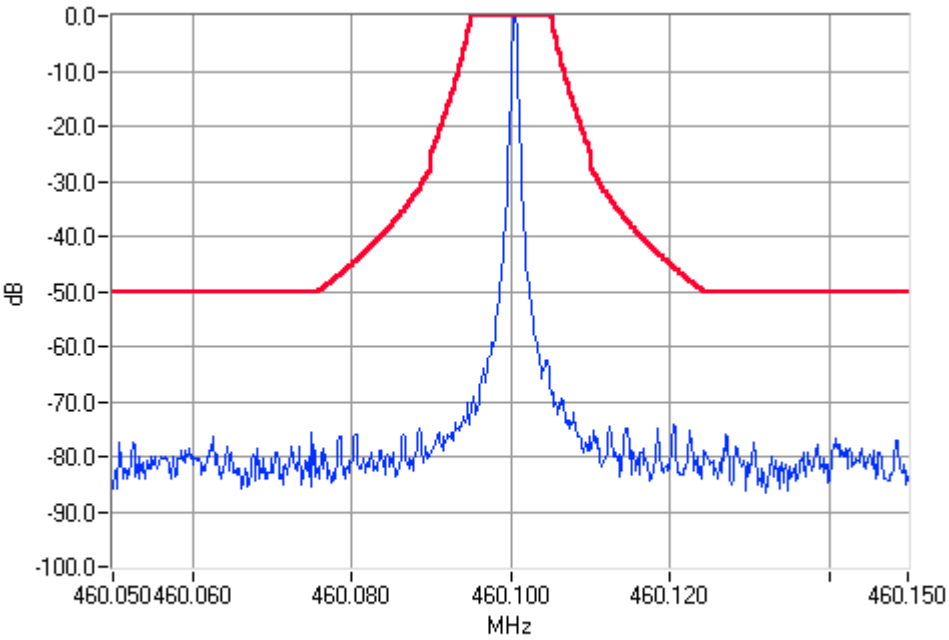
Digital Modulation 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

DIGITAL – 4 Level FSK

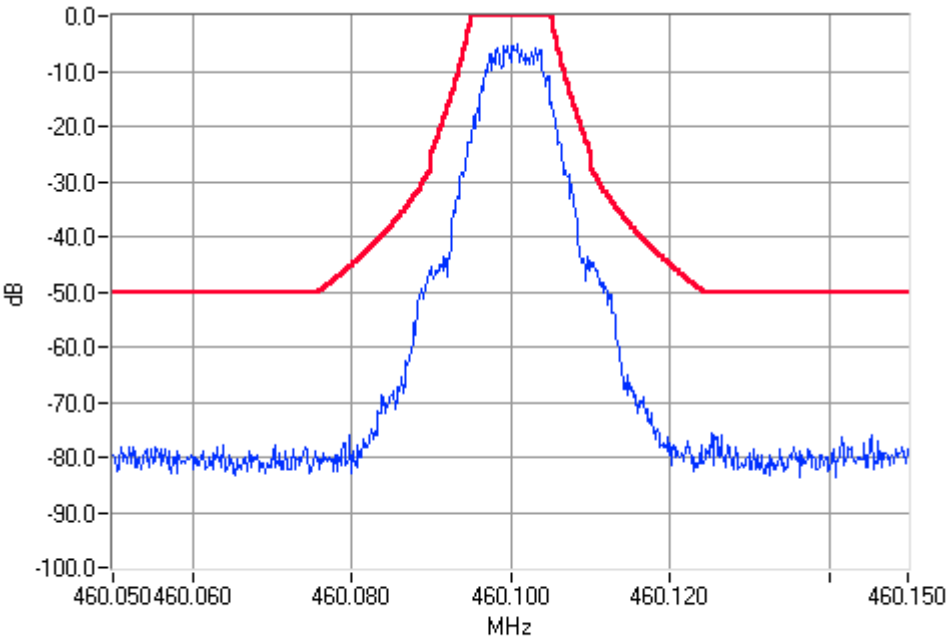
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1 MHz 4W 25 kHz Channel Spacing



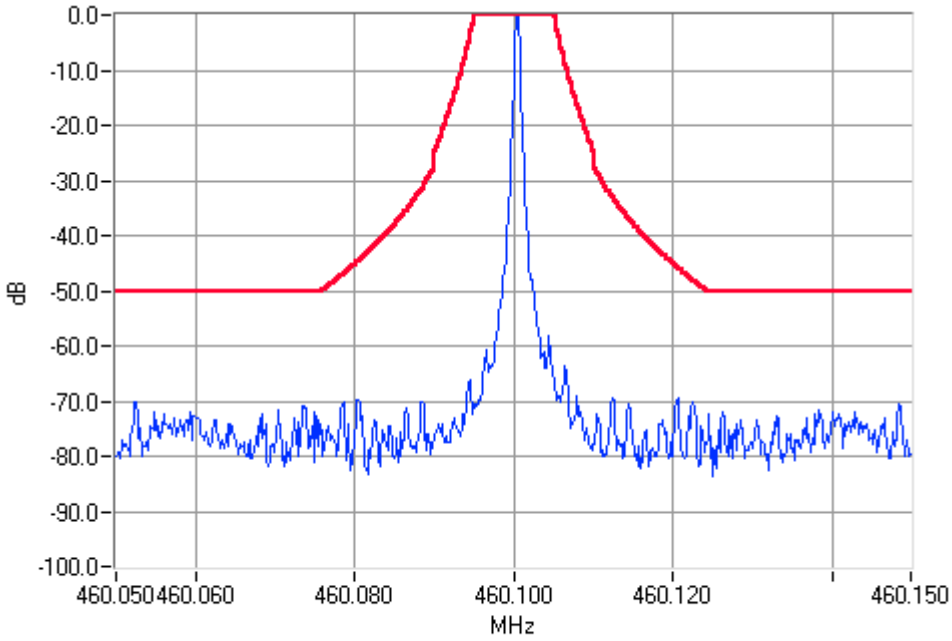
Digital Modulation 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

DIGITAL 4 – Level FSK

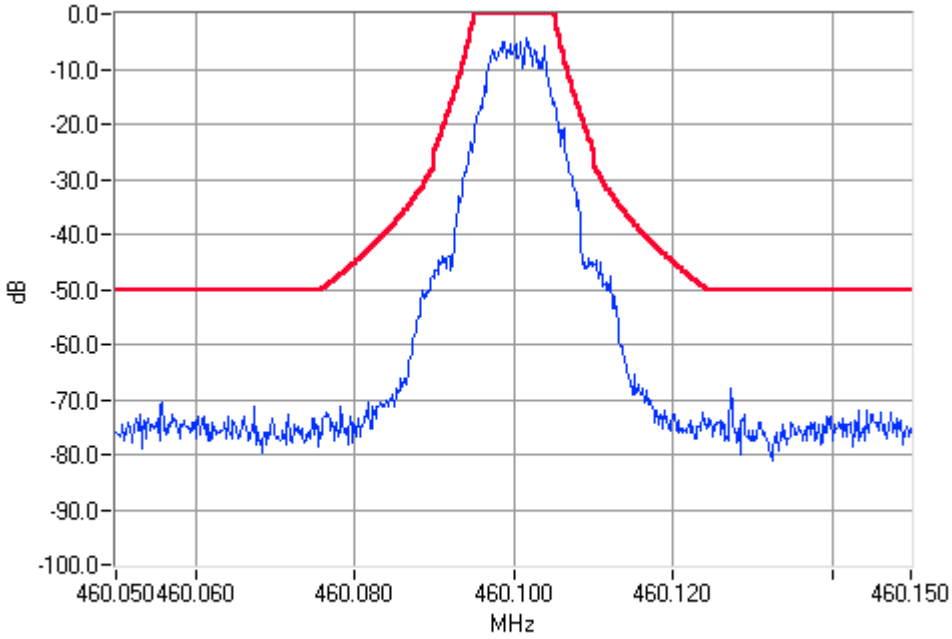
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



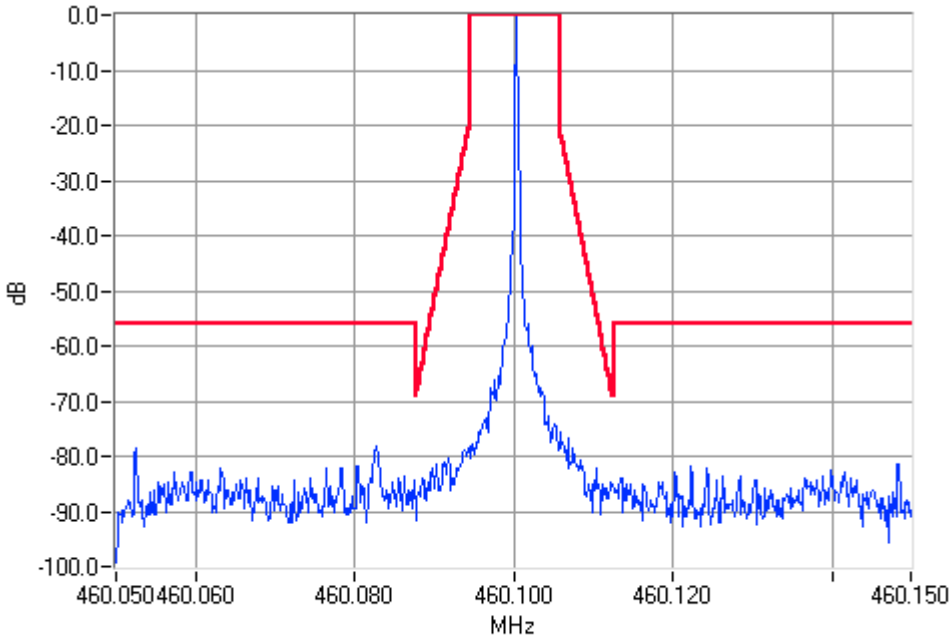
Digital Modulation 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

FFSK

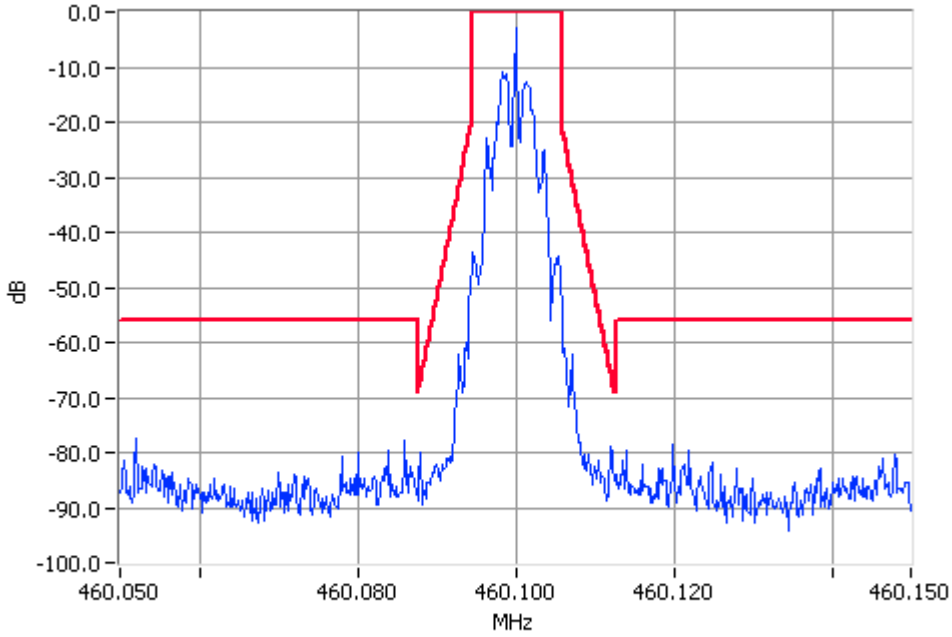
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



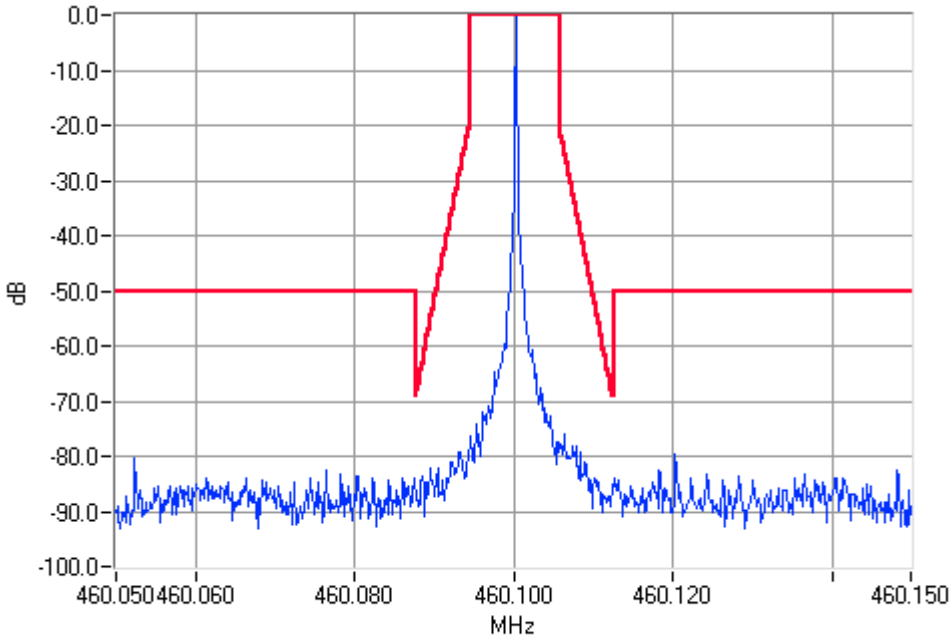
Digital Modulation 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

FFSK

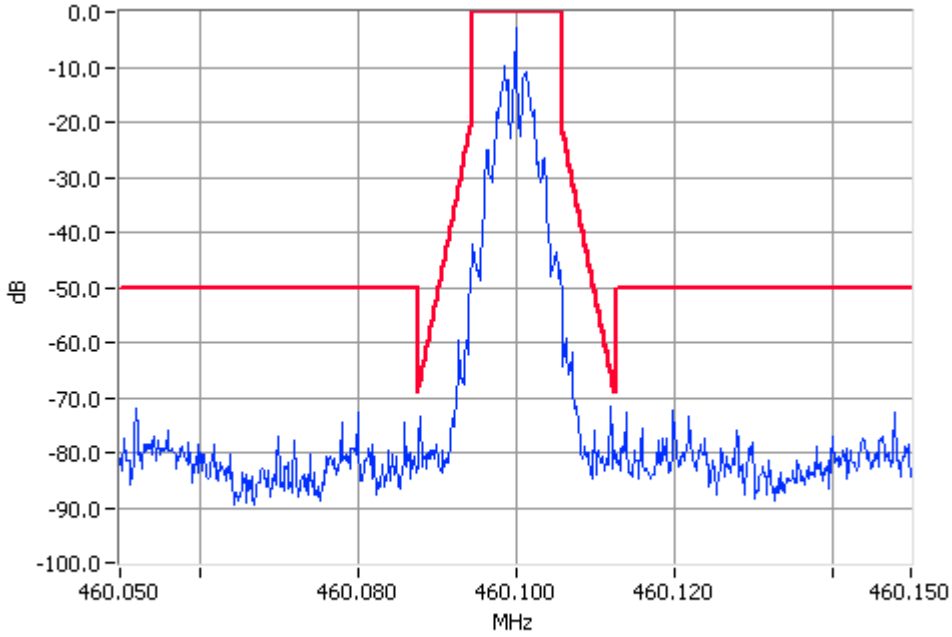
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



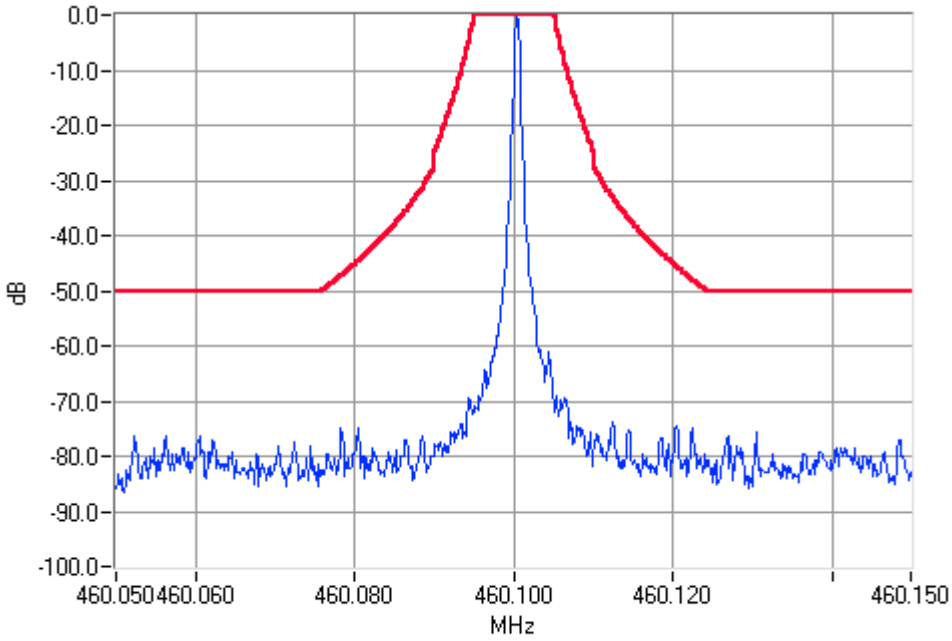
Digital Modulation 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

FFSK

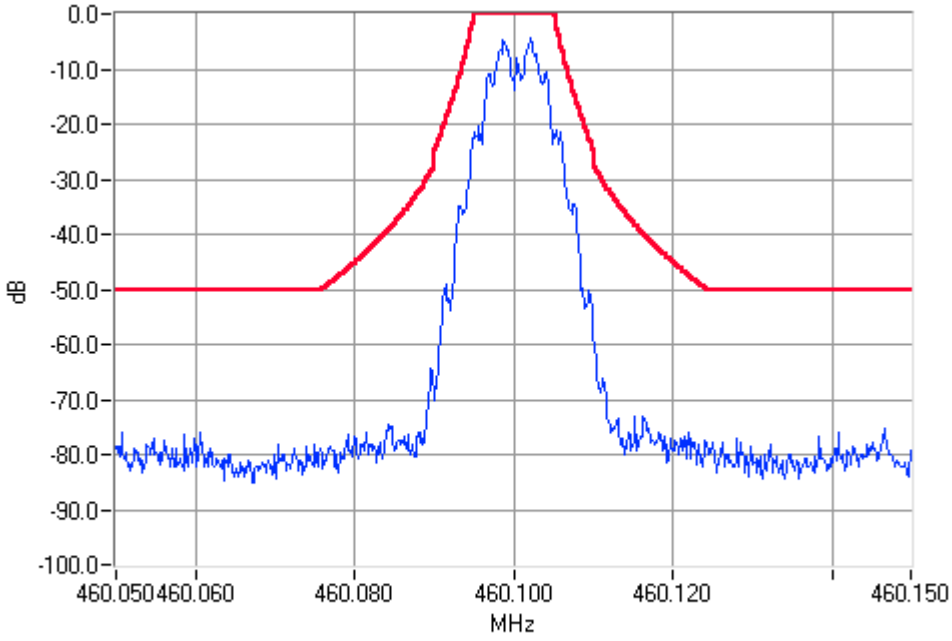
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



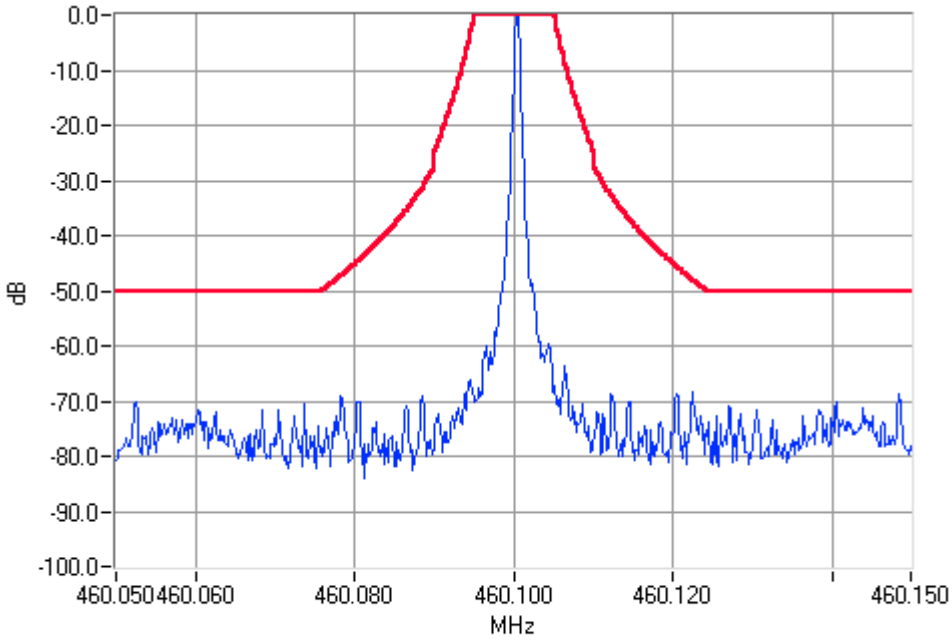
Digital Modulation 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

FFSK

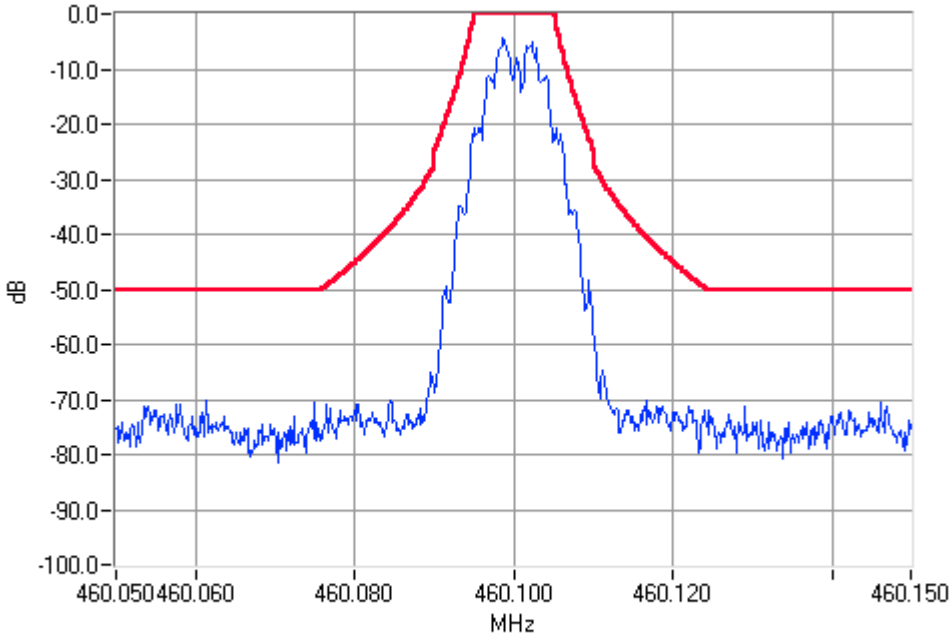
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



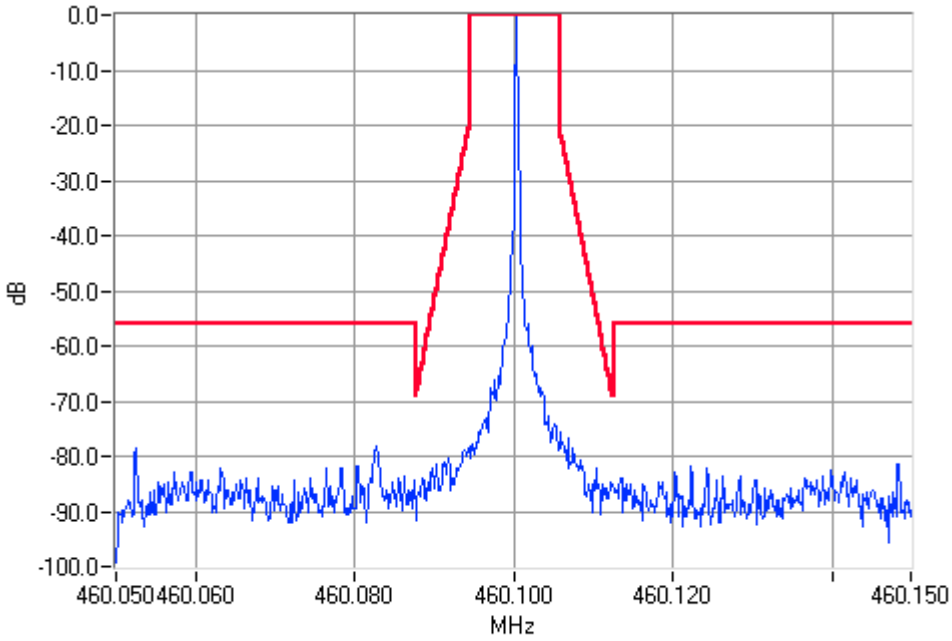
Digital Modulation 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

THSD

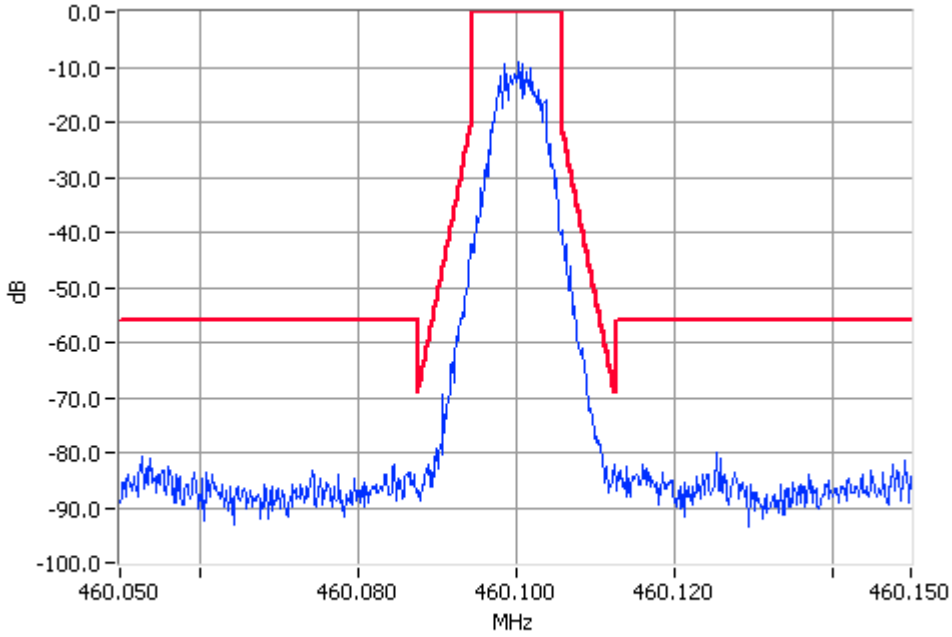
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz Channel Spacing



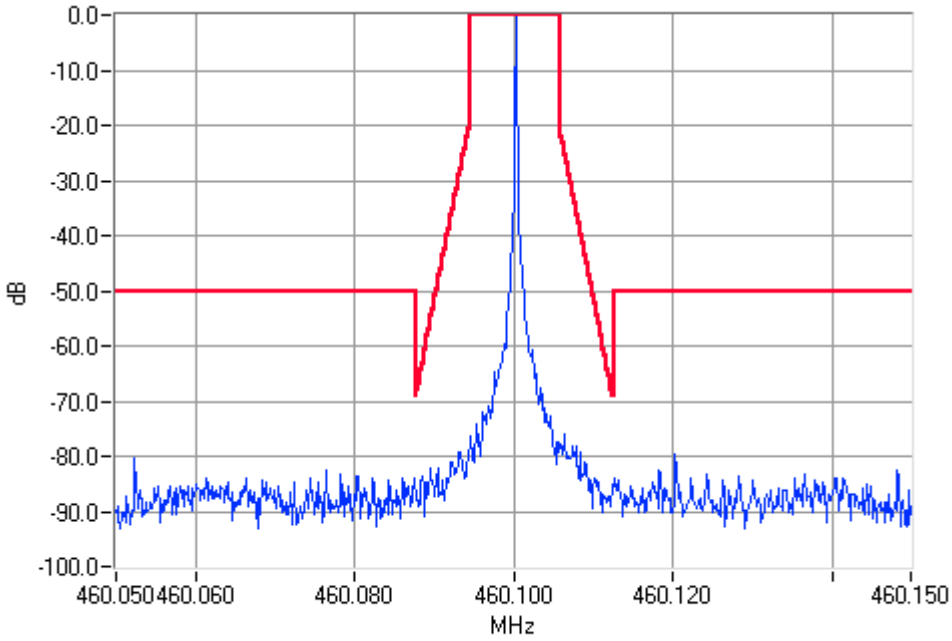
Digital Modulation 460.1000MHz Mask D 4W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

THSD

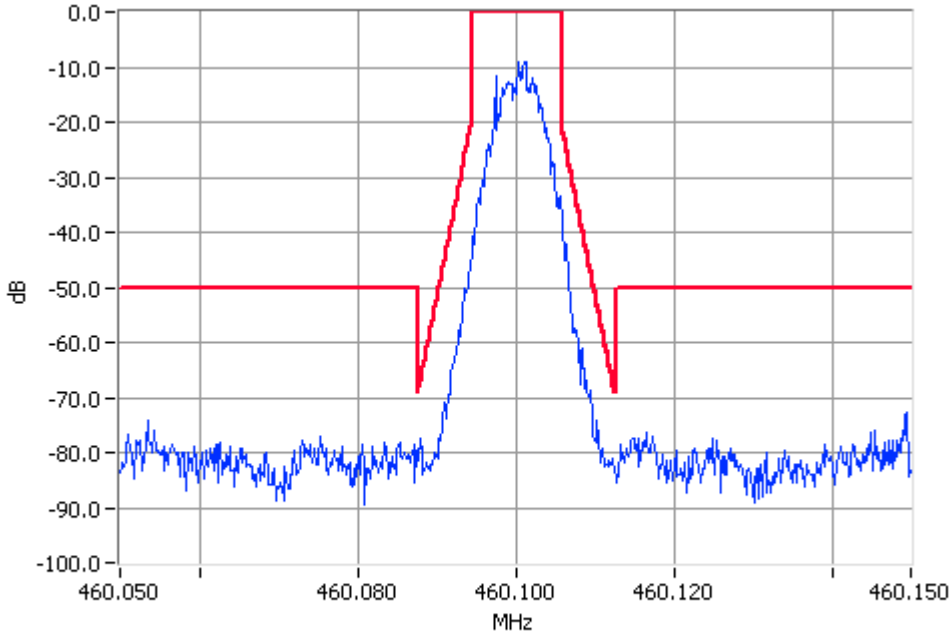
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



Unmodulated 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

Tx FREQUENCY: 460.1MHz 1W 12.5 kHz Channel Spacing



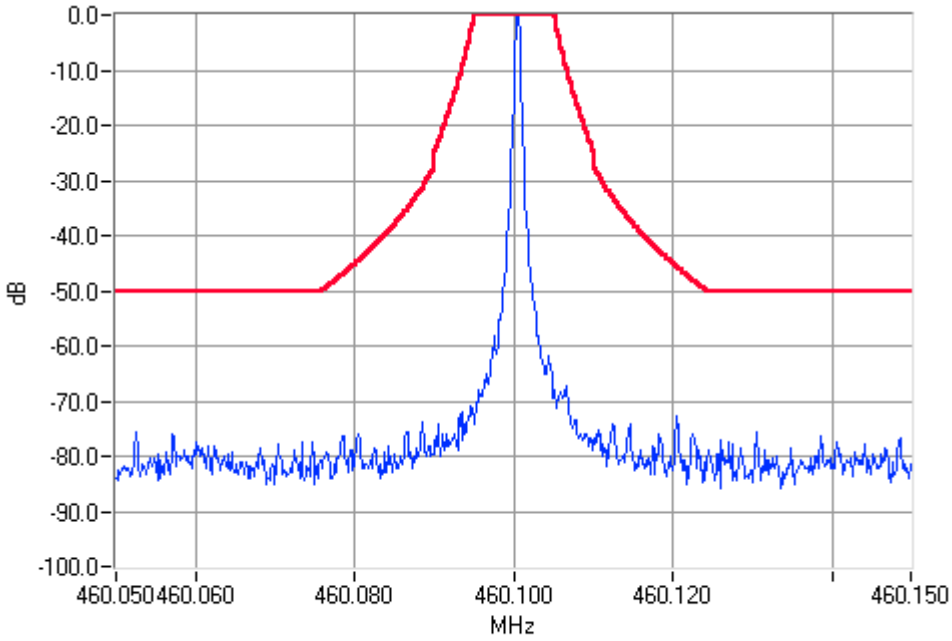
Digital Modulation 460.1000MHz Mask D 1W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

THSD

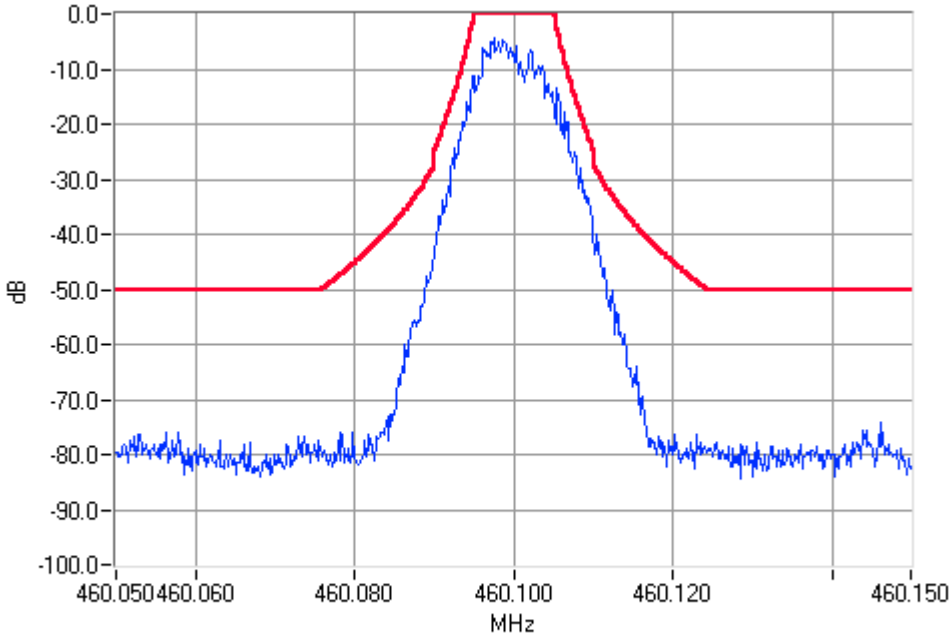
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 4W 25 kHz Channel Spacing



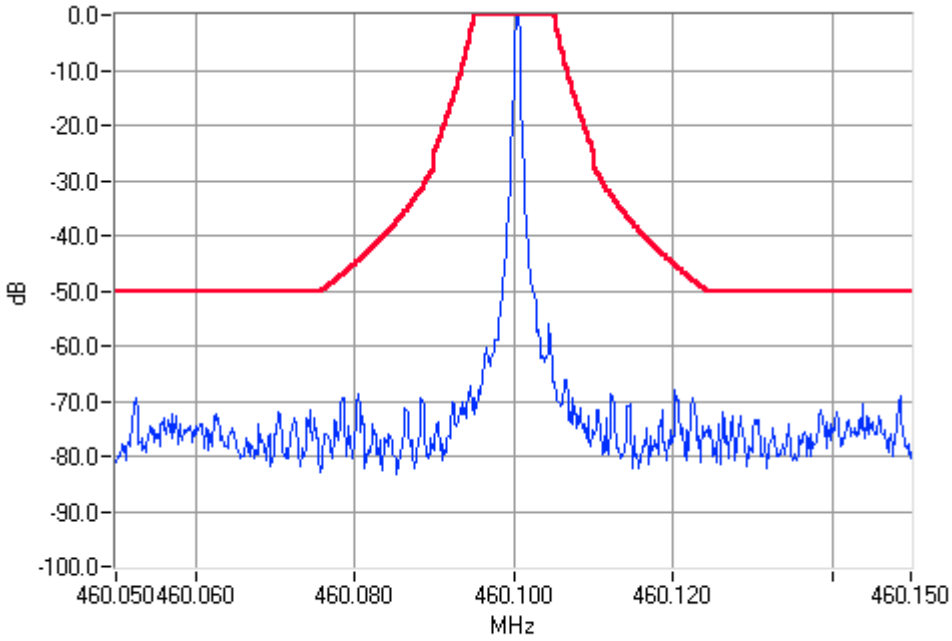
Digital Modulation 460.1000MHz Mask C 4W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

THSD

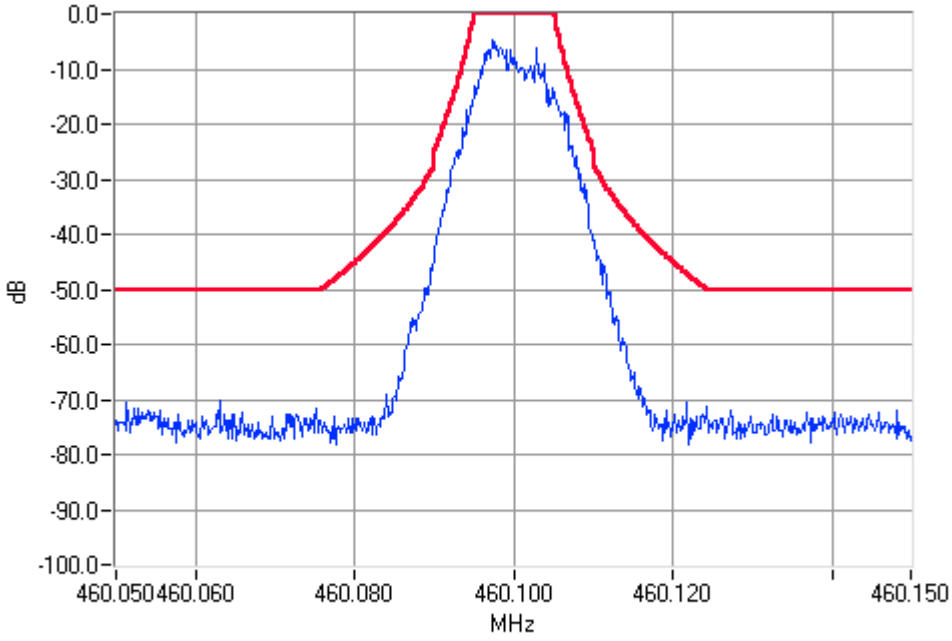
SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

Tx FREQUENCY: 460.1MHz 1W 25 kHz Channel Spacing



Digital Modulation 460.1000MHz Mask C 1W Pass
RBW=300Hz VBW=3000Hz

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: 460.1MHz

12.5 kHz Channel Spacing	460.1MHz @ 4 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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
1 W	-20 dBm	50 dBc
4 W	-20 dBm	56 dBc

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 460.1MHz

12.5 kHz Channel Spacing	460.1MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
459.7789	-37.8	68.1
460.4210	-38.2	68.5
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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
1 W	-20 dBm	50 dBc
4 W	-20 dBm	56 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA/EIA-603B 2.2.12

MEASUREMENT PROCEDURE:
1. The Equipment Under Test was set up as shown in the following diagram.
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^{o} 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

TEST SETUP: Refer Appendix A for set up details

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 460.1MHz

12.5 kHz Channel Spacing	460.1MHz @ 4 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1840.4	-35.13	71.36
3680.8	-31.92	68.15
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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
1 W	-20 dBm	50 dBc
4 W	-20 dBm	56 dBc

SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC CFR 2.1053

Tx FREQUENCY: 460.1MHz

12.5 kHz Channel Spacing	460.1MHz @ 1 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1380.3	-33.23	63.52
1840.4	-35.43	65.72
3680.8	-35.67	65.96
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 $50 + 10 \text{ Log}_{10} (P_{Watts})$	
1 W	-20 dBm	50 dBc
4 W	-20 dBm	56 dBc

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

GUIDE: TIA/EIA-603B 2.2.2

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

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

LIMIT CLAUSE: FCC 47 CFR 90.213

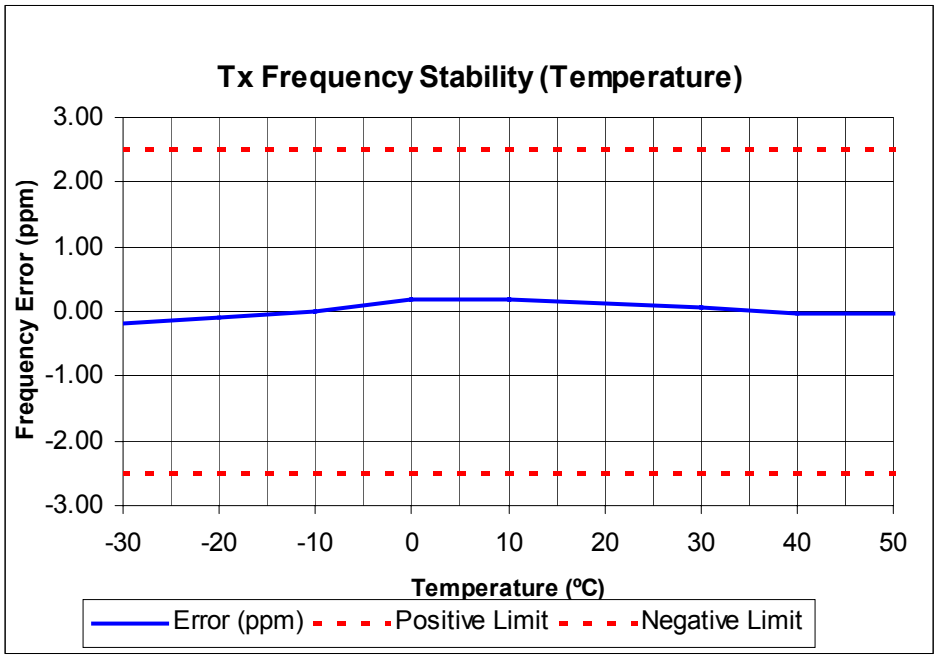
Frequency Range: 421 MHz to 512 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5
25.0	5.0

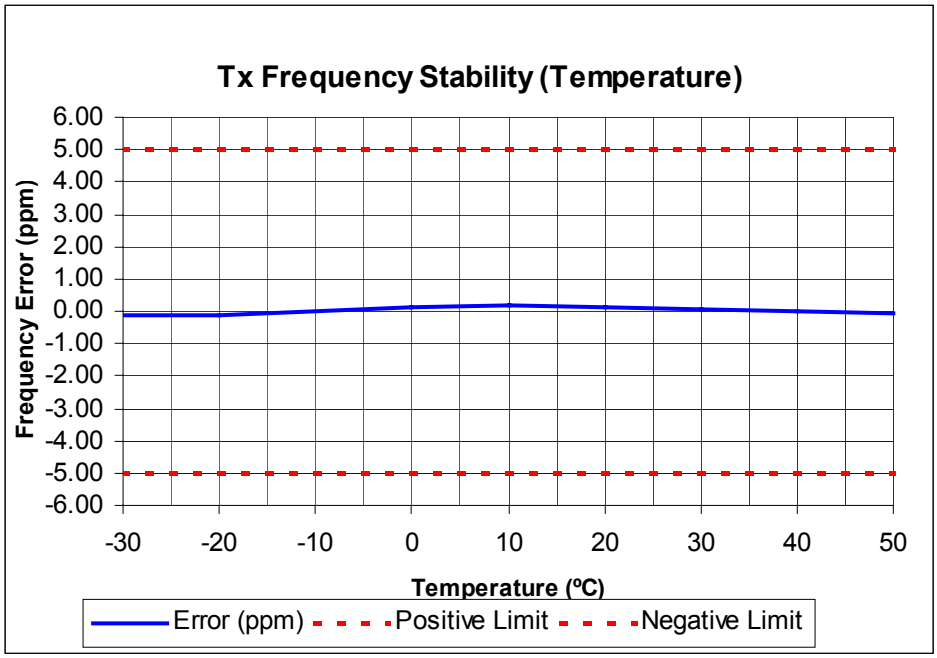
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 460.1MHz 4W 12.5 kHz channel Spacing



Tx FREQUENCY: 460.1MHz 4W 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:
4. Refer Appendix A for equipment set up.
5. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS: Frequency Range: 421MHz to 512MHz

Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 460.1MHz		
	6.0 V DC	7.5 V DC	8.5 VDC
12.5	0.14	-0.07	0.14
25.0	0.14	-0.07	0.14

LIMIT CLAUSE: FCC 47 CFR 90.213

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	2.5
25.0	5.0

TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214

GUIDE: TIA/EIA-603B 2.2.19

MEASUREMENT PROCEDURE:
6. Refer Appendix A for equipment set up.
7. Measurements and plots were made following the TIA/EIA procedure.

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

LIMIT CLAUSE: FCC 47 CFR 90.214

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1 MHz 4 W 12.5 kHz Channel Spacing

FREQUENCY	460.1 MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	0.7	N/A
t_2	0.4	N/A
t_3	N/A	0.6
$t_2 \rightarrow t_3$ ppm	-1.1	
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	

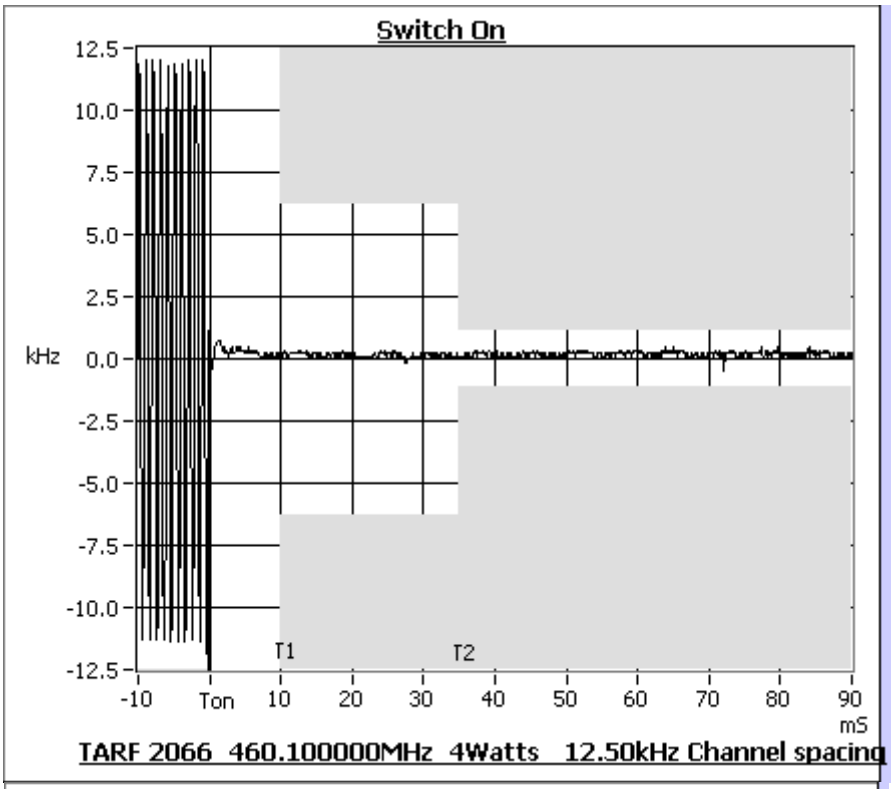
LIMIT:

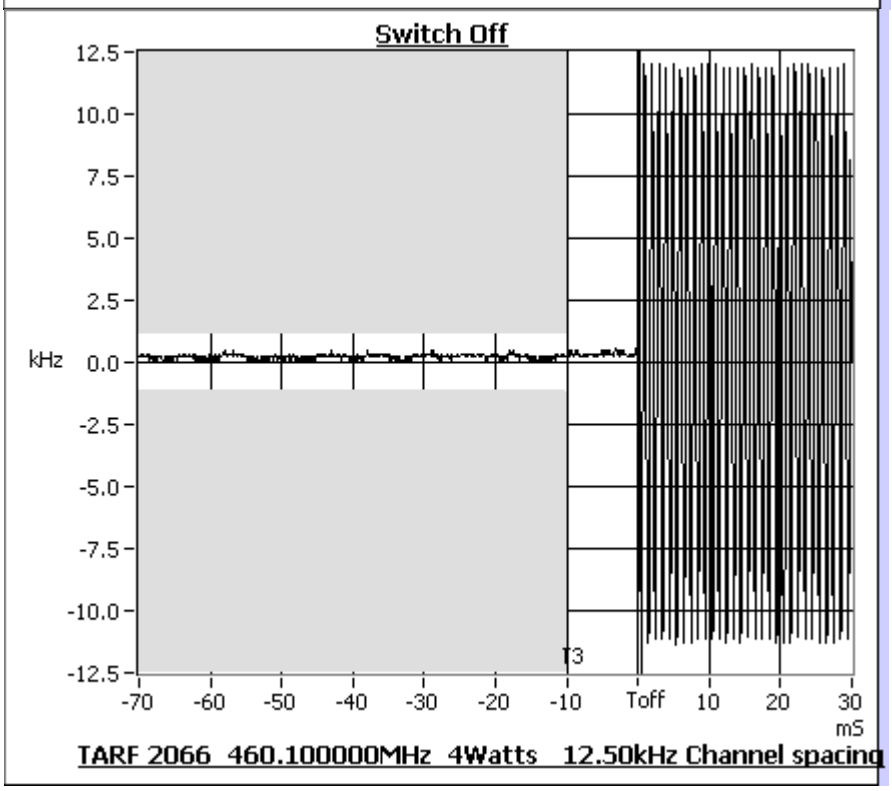
TRANSIENT PERIODS	FREQUENCY RANGE 150MHz – 174 MHz	FREQUENCY RANGE 421MHz – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1MHz 4 W 12.5 kHz Channel Spacing





TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1 MHz 4 W 25.0 kHz Channel Spacing

FREQUENCY	460.1MHz @ 4 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t_1	0.7	N/A
t_2	0.5	N/A
t_3	N/A	1.0
$t_2 \rightarrow t_3$ ppm	1.1	
ERROR LIMIT ($t_2 \rightarrow t_3$) ppm	5.0	

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	

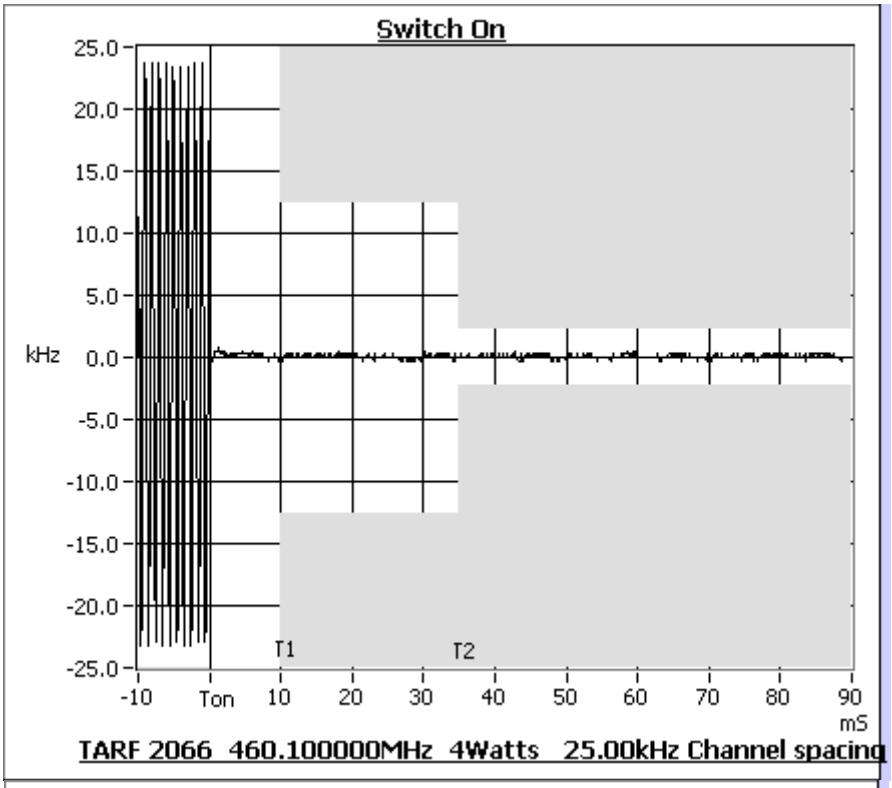
LIMIT:

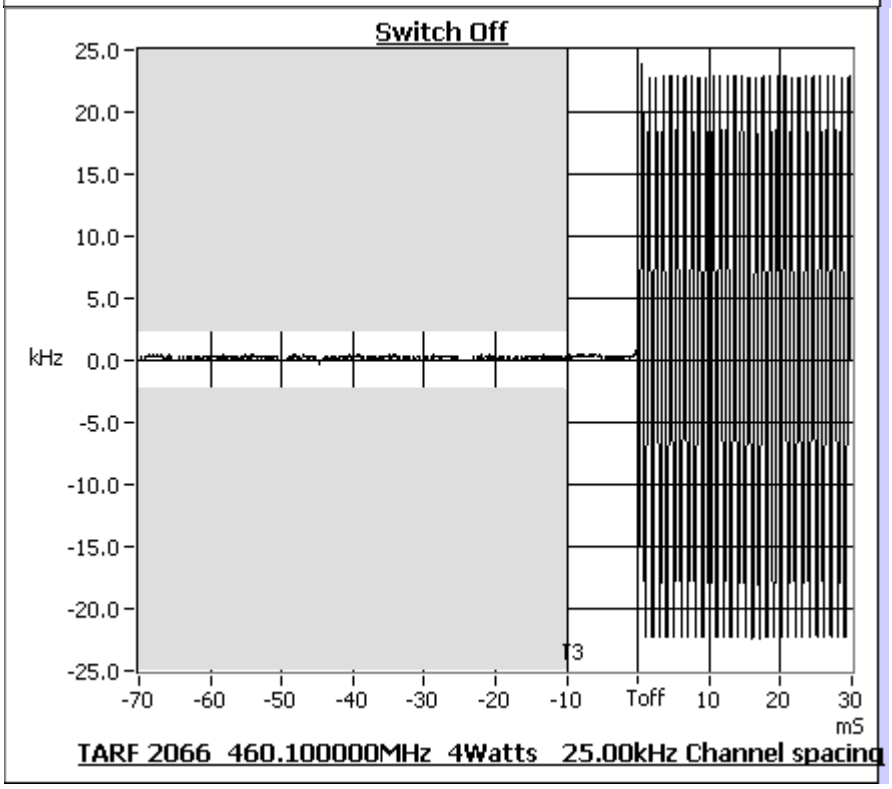
TRANSIENT PERIODS	FREQUENCY RANGE 150MHz – 174 MHz	FREQUENCY RANGE 421MHz – 512 MHz
t_1 (ms)	5 ms	10 ms
t_2 (ms)	20 ms	25 ms
t_3 (ms)	5 ms	10 ms

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1 MHz 4 W 25.0 kHz Channel Spacing





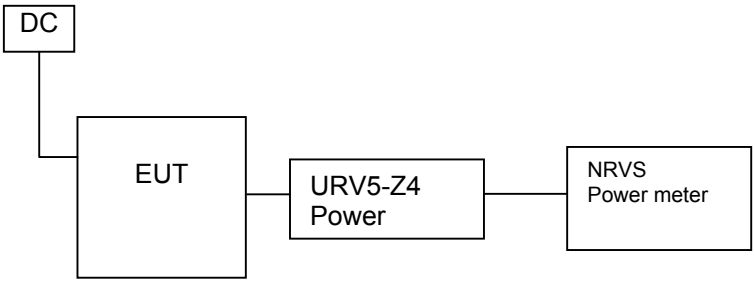
TEST EQUIPMENT LIST

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1	Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	18-Feb-05
3	Signal Generator	Agilent	E4422B	GB40050320	E3788	22-Oct-04
4	Signal Generator	Hewlett Packard	HP8648C	3443U00543	E3558	11-Sep-05
5	Signal Generator	Rohde & Schwarz	SMY01 1062.5502.11	841736/019	E3553	29-Oct-04
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	05-Aug-04
12	Modulation Analyser	Rohde & Schwarz	FMA0852.8500.52	842541/001	E3554	18-Jul-04
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	15-Oct-04
15	Power Meter	Rohde & Schwarz	NRVS 1020.1809.02	841954/005	E3555	11-Mar-05
16	Power Sensor	Rohde & Schwarz	URV5- Z4 395.1619. 55	841.498/003	E3557	11-Mar-05
20	Power Supply	Hewlett Packard	HP6032A	2441A-0041Z	E3075	15-Oct-04
22	Oscilloscope	Tektronics	TDS340	B013611	E3585	25-Nov-04
42	Reference Horn Antenna	Emco	DRG3115	9512-4638	E3560	27-Sep-06
43	Horn Antenna	Emco	DRG3115		E3076	27-Sep-06
60	RF Attenuator 250W	Weinschel	45-30-34	JW663	E3386	09-Jul-04
65	RF Attenuator 50W	Weinschel	24-20-44	AW1266	E3562	28-Jun-05
67	RF Attenuator 150W Treva	Weinschel	40-20-33	CJ405	E3733	28-Jun-05
71	RF Load 50W	Weinschel	F1426	BF0487	E3675	11-Aug-04
72	RF Load 50W	Weinschel	F1426	AE2490	E3624	14-Jul-05
82	3m Coax Cable BLUE)	Suhner	Sucoflex 104A	25033/4A	E3694	11-Aug-04
83	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25006/4A	E3693	11-Aug-04
86	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25003/4A	E3690	11-Aug-04
88	Spectrum Analyser	Hewlett Packard	HP8562E	3821A00779	E3715	06-Jan-05
91	20m Coax Cable		RG214/U-50 (Ext Cal)	CBL01	E3404	08-Sep-04
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	16-Oct-04
111	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	15-Oct-04
115	Environ. Chamber	Contherm	5400 RHSLT.M		E4051	04-Mar-05
117	RF Attenuator	Weinschel	Model 1	BL9950	E4080	17-May-05
118	RF Attenuator	Weinschel	Model 1	BL9958	E4081	24-May-05
119	RF Attenuator 150W Treva	Weinschel	40-20-23	MF817	E4082	17-May-05
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	23-Apr-05

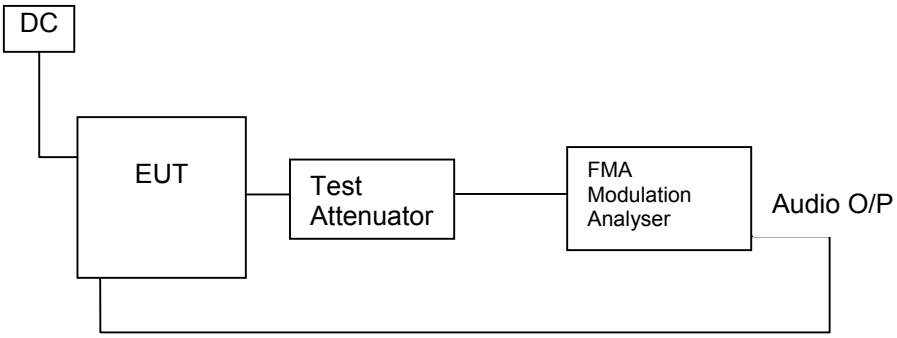
APPENDIX A

TEST SETUP DETAILS

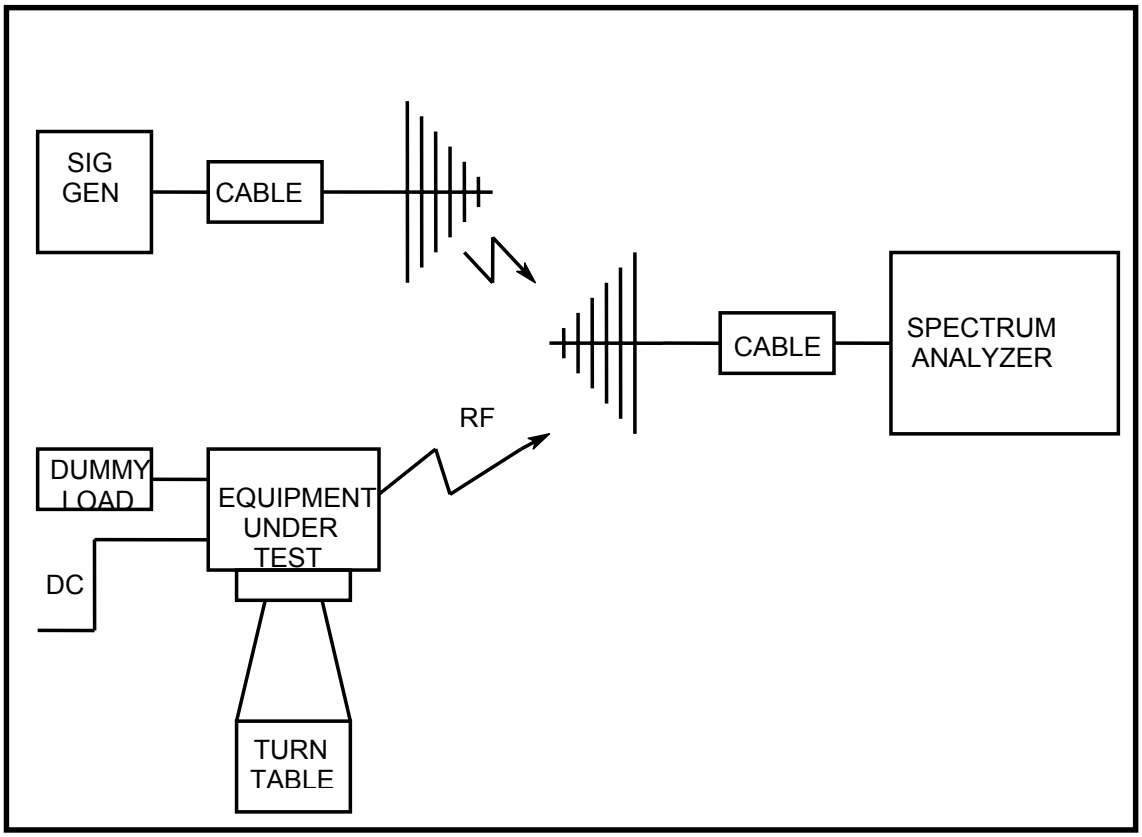
Test set up for Transmitter Carrier Power (Conducted)



Test set up for Transmitter Audio Frequency Response – Pre-Emphasis



Test set up for Spurious Emissions (Radiated)



All other testing was 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.