

REPORT NUMBER 1834-D

October 2004

Class II Permissive Change to Report Number 1834

FCC ID: CASTBA-H0

Consisting of:

FUNCTIONAL DESCRIPTION	PRODUCT DESIGNATION CODE	SERIAL NUMBERS
Reciter	TBA40H1-PA00 TBA40H2-PA00 TBA40H3-PA00	18004461 18004708 18004484

In accordance with

FCC 47 CFR Parts 22, 74, 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:	TBA40H1-PA00	(Serial No 18004461)
	TBA40H2- PA00	(Serial No 18004708)
	TBA40H3- PA00	(Serial No 18004484)

in accordance with:

FCC CFR 47 Parts 22 & 90

FCC ID: CASTBA-H0

PREPARED FOR :

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

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APPROVED :

Hamish Newton

Senior Technician

Date :

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

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Copy No:

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DECLARATION OF CONFORMITY

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

Equipment: Base Station Transceiver

Type: TBAH0

Product codes: TBA40H1-PA00, TBA40H2- PA00,
TBA40H3- PA00

Serial Numbers: 18004461, 18004708, 18004484

Quantity: 1 each

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

FCC CFR 47 Parts 22, 90, & 74

Signature:_____

S. A. Crompton
Compliance Laboratory Manager.

Date:_____

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

Necessary bandwidth

Emission Designator

$$M = 1.8$$

$$D = 1.5\text{kHz (60\% of maximum deviation)}$$

6k60F2D

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

$$\begin{aligned} B_n &= 3.6 + 3 \times 1 \\ &= 6.6\text{kHz} \end{aligned}$$

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

Necessary bandwidth

Emission Designator

$$M = 1.8 \text{ kHz}$$

$$D = 3\text{kHz (60\% of maximum deviation)}$$

9k60F2D

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

$$\begin{aligned} B_n &= 3.6 + 6 \times 1 \\ &= 9.6\text{kHz} \end{aligned}$$

1. 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

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

MEASUREMENT RESULTS:

425.1 MHz	100 W nominal
POWER (W)	96.4
Variation from Nominal (%)	-3.6
460.1 MHz	100 W nominal
POWER (W)	95.4
Variation from Nominal (%)	-4.6
495.1 MHz	100 W nominal
POWER (W)	94.4
Variation from Nominal (%)	-5.6
Measurement Uncertainty (dB)	+0.63 -0.68

LIMIT CLAUSE: FCC 47 CFR 90.205

Radio Type: Base Station Transceiver

Frequency Band: 421 MHz ~ 430 MHz, 450 ~ 470 MHz, 470 ~ 512 MHz

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

TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC 47 CFR 2.1047 (a)

GUIDE: TIA/EIA-603B 2.2.6

MEASUREMENT PROCEDURE:

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

MEASUREMENT RESULTS:

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

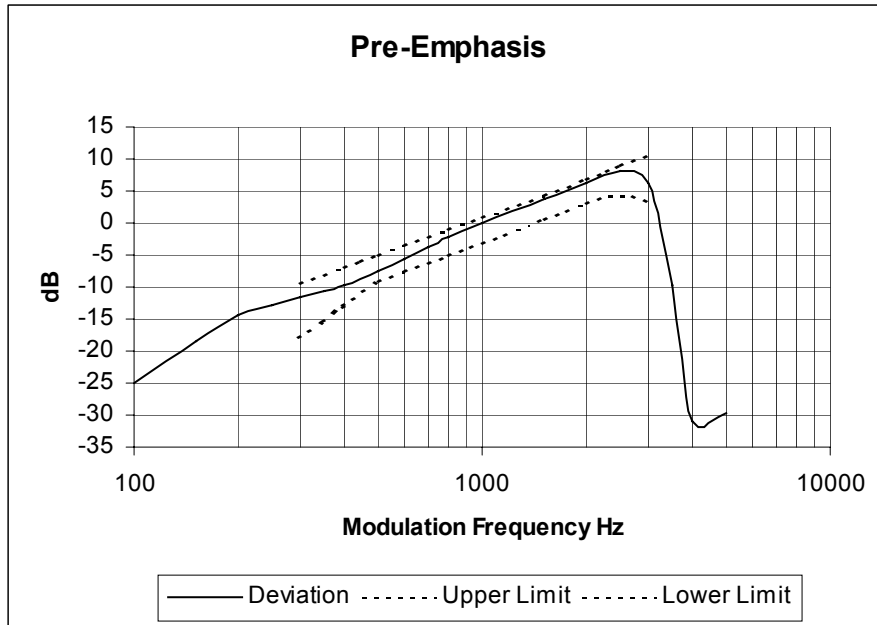
.

LIMIT CLAUSE: TIA/EIA-603B 3.2.6

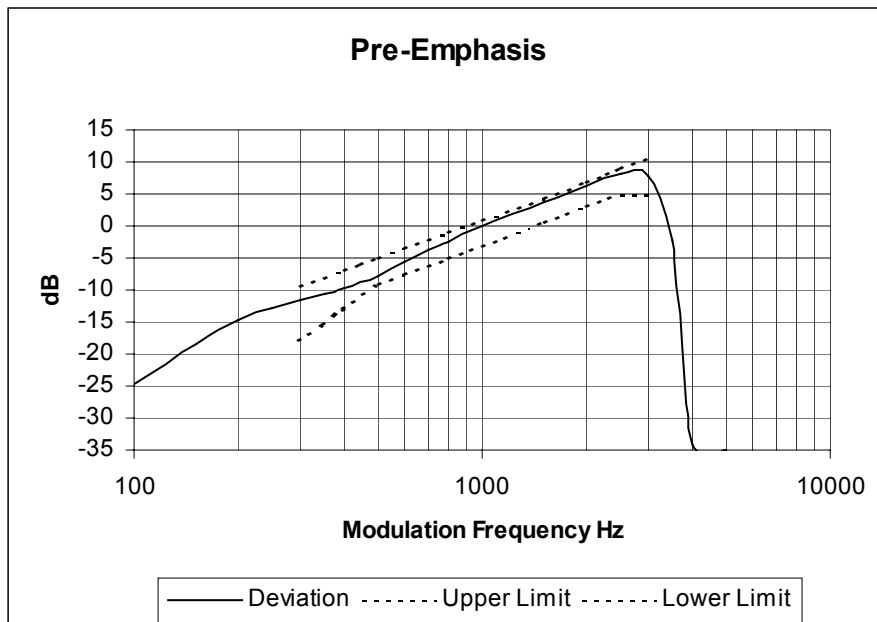
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 425.1 MHz 12.5 kHz Channel Spacing



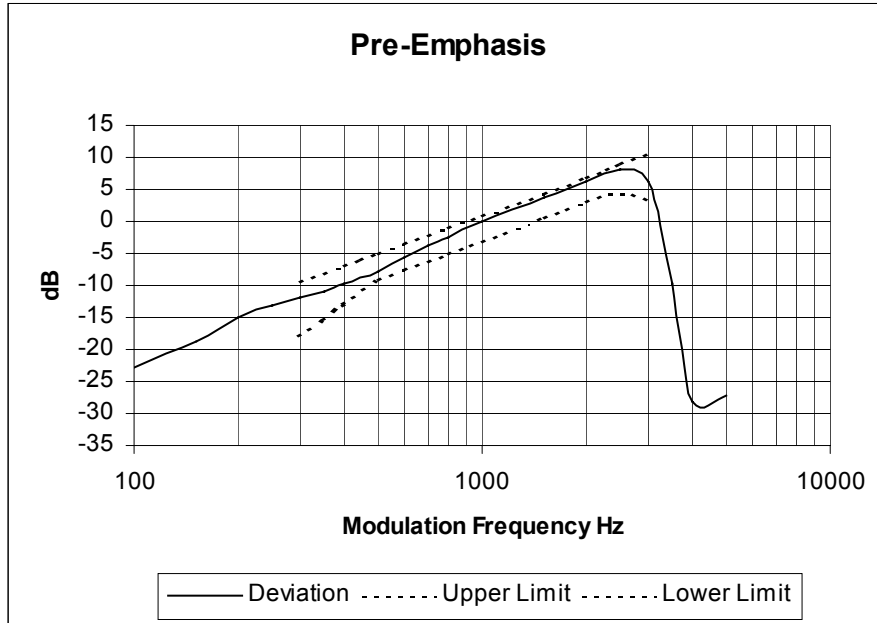
Tx FREQUENCY: 425.1 MHz 25.0 kHz Channel Spacing



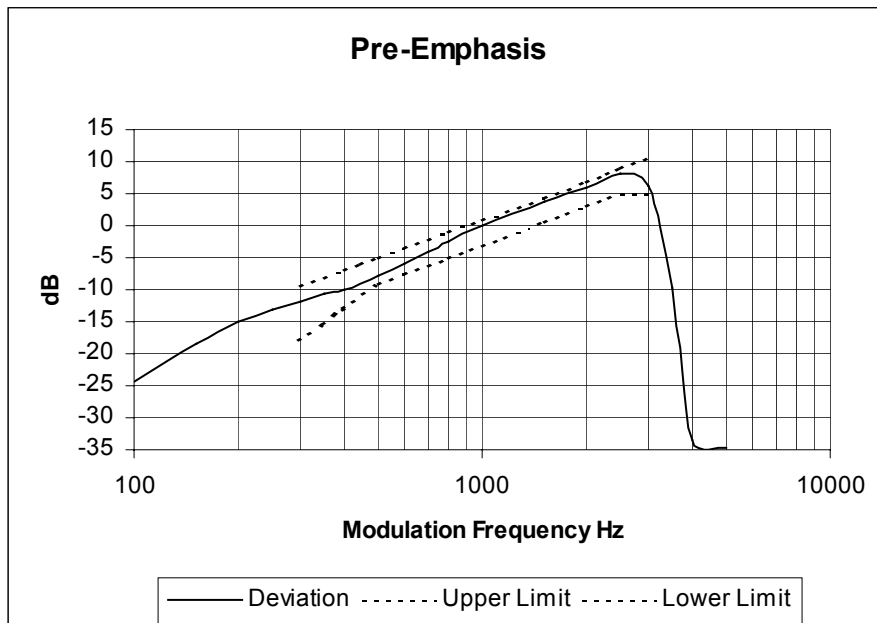
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 460.1 MHz 12.5 kHz Channel Spacing



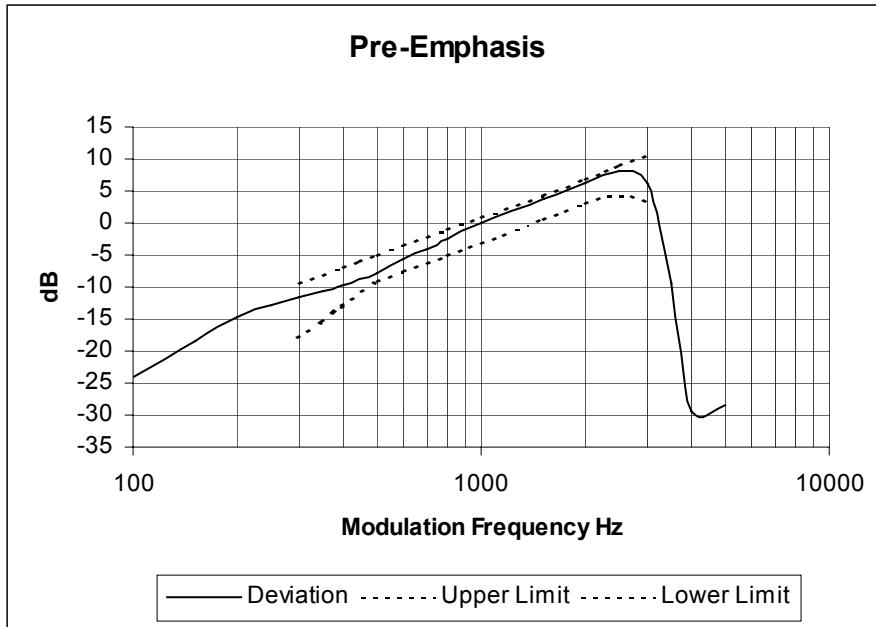
Tx FREQUENCY: 460.1 MHz 25.0 kHz Channel Spacing



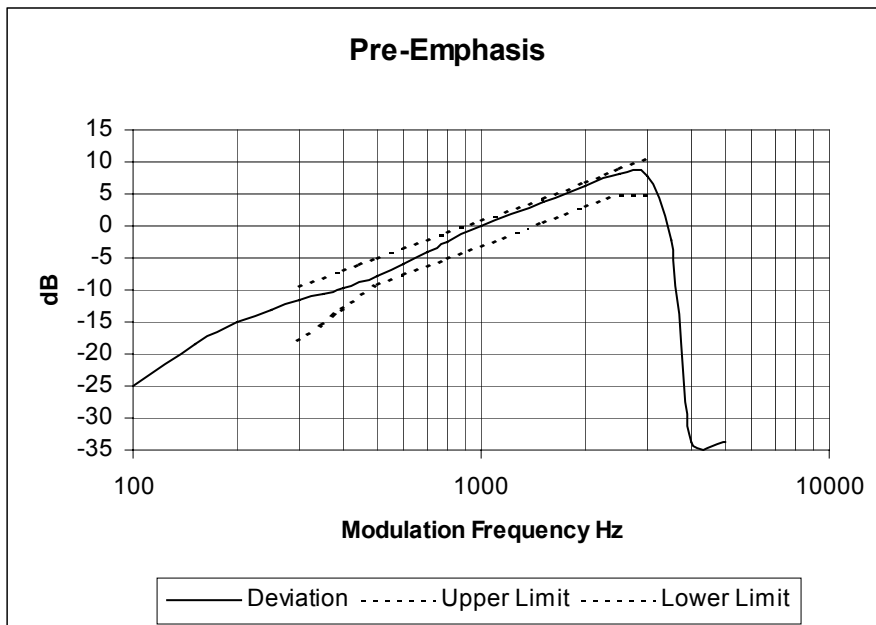
TRANSMITTER AUDIO FREQUENCY RESPONSE - PRE-EMPHASIS

SPECIFICATION: FCC CFR 2.1047 (a)

Tx FREQUENCY: 495.1 MHz 12.5 kHz Channel Spacing



Tx FREQUENCY: 495.1 MHz 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:

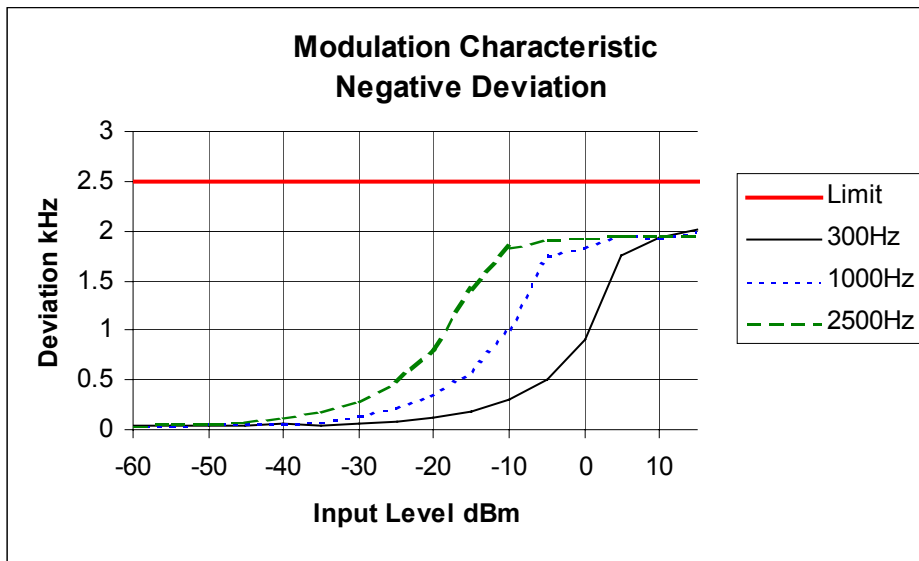
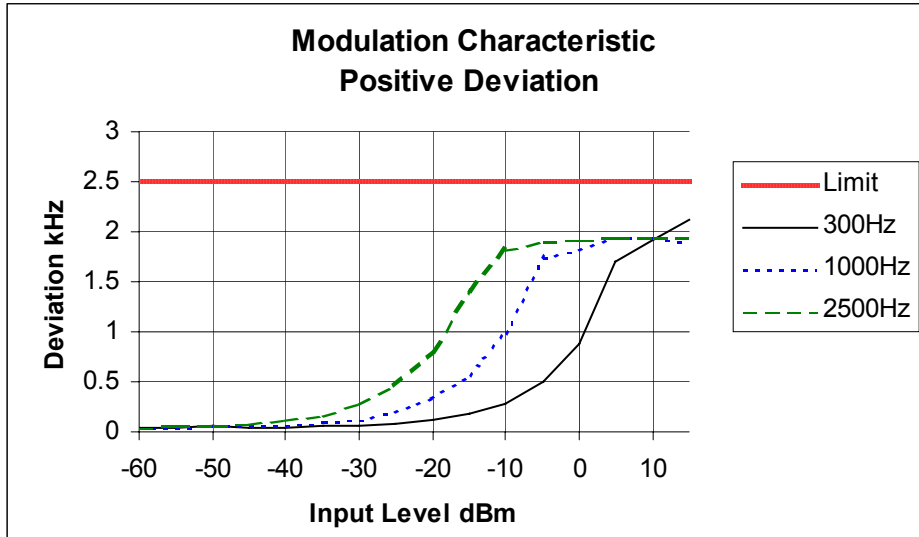
See the plots on the following pages for 12.5 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: TIA/EIA-603B 1.3.4.4

TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

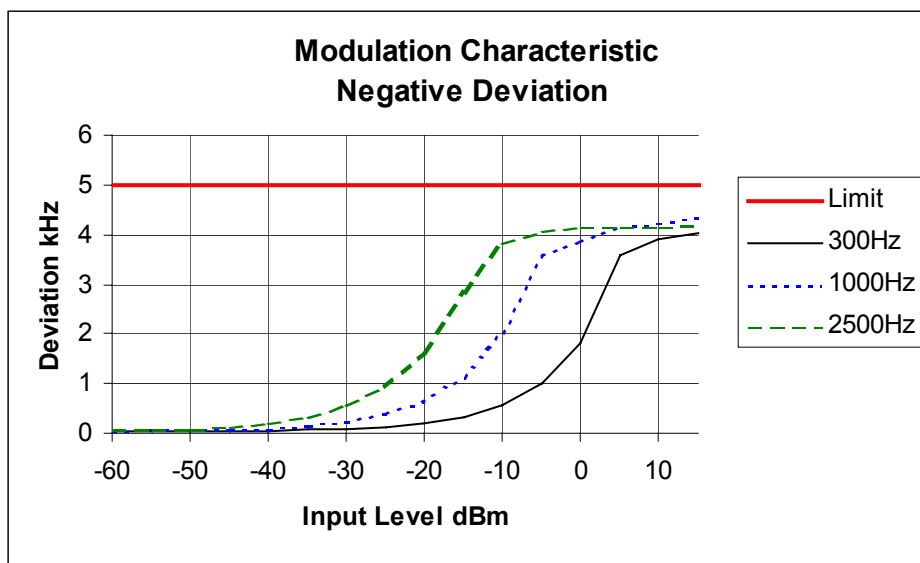
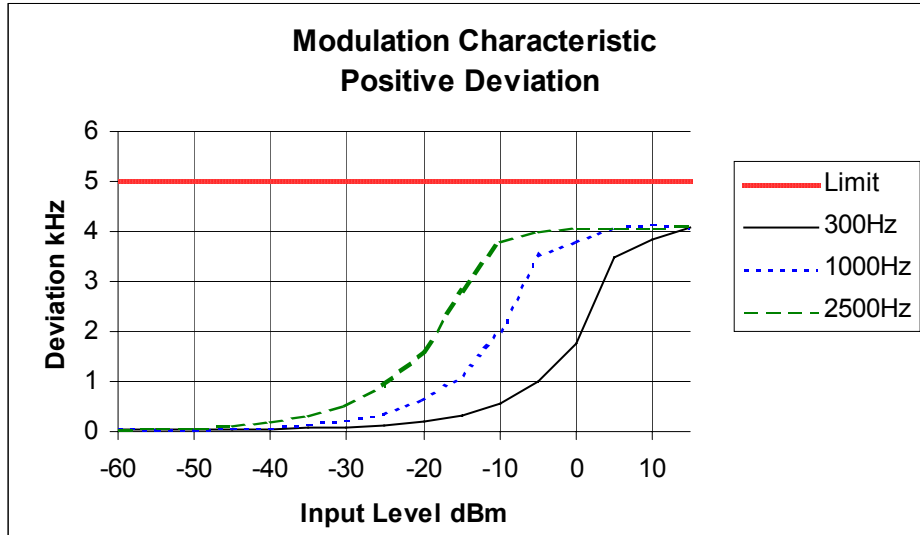
Tx FREQUENCY: 425.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

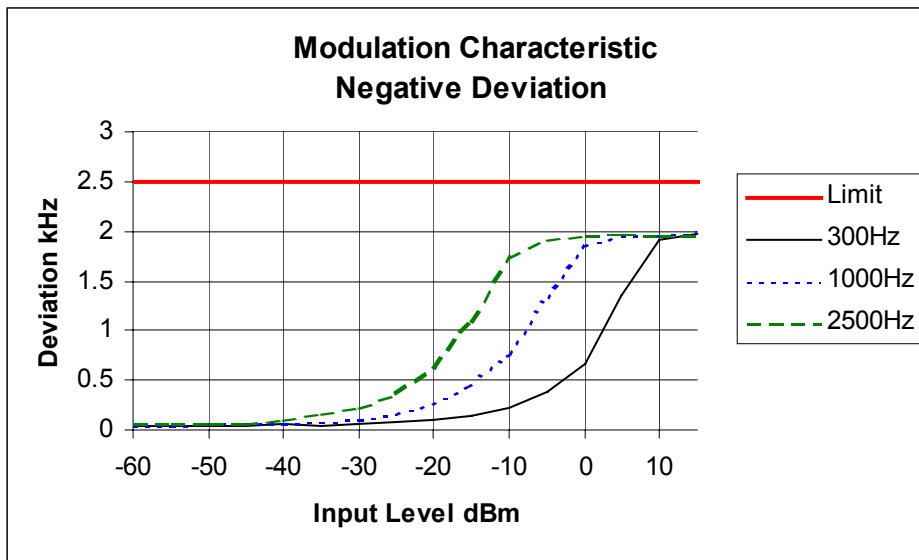
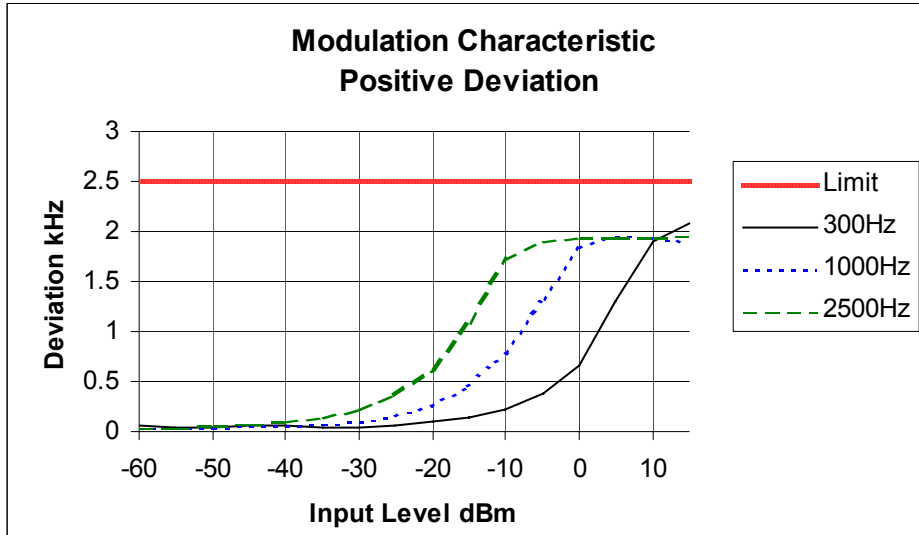
Tx FREQUENCY: 425.1 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

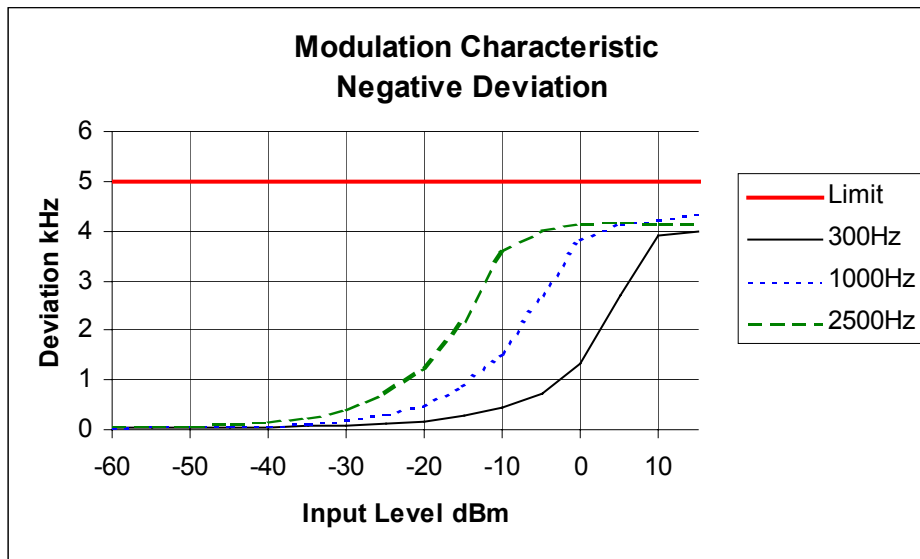
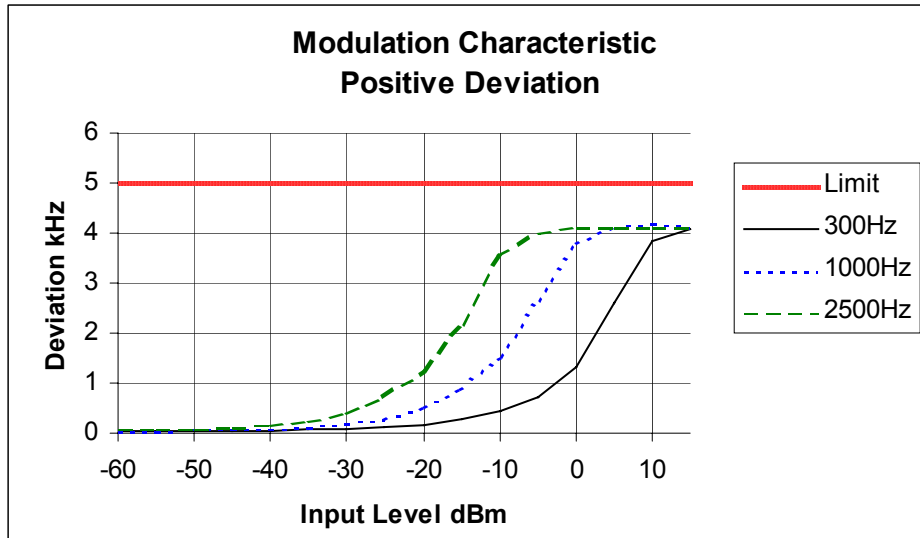
Tx FREQUENCY: 460.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

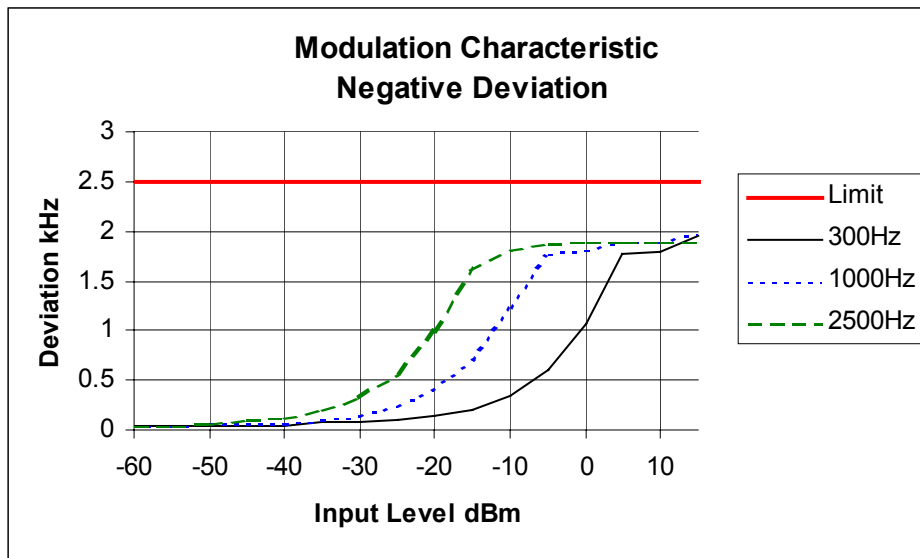
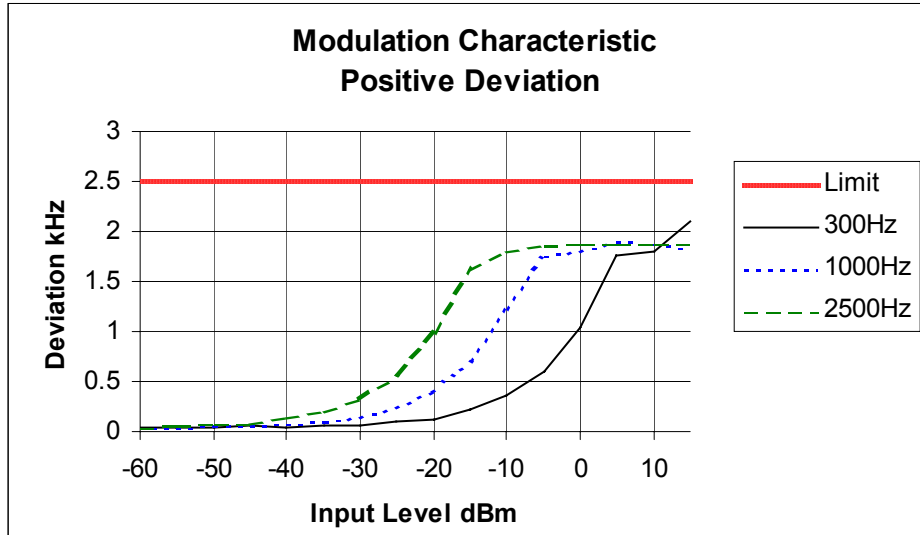
Tx FREQUENCY: 460.1 MHz 25.0 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

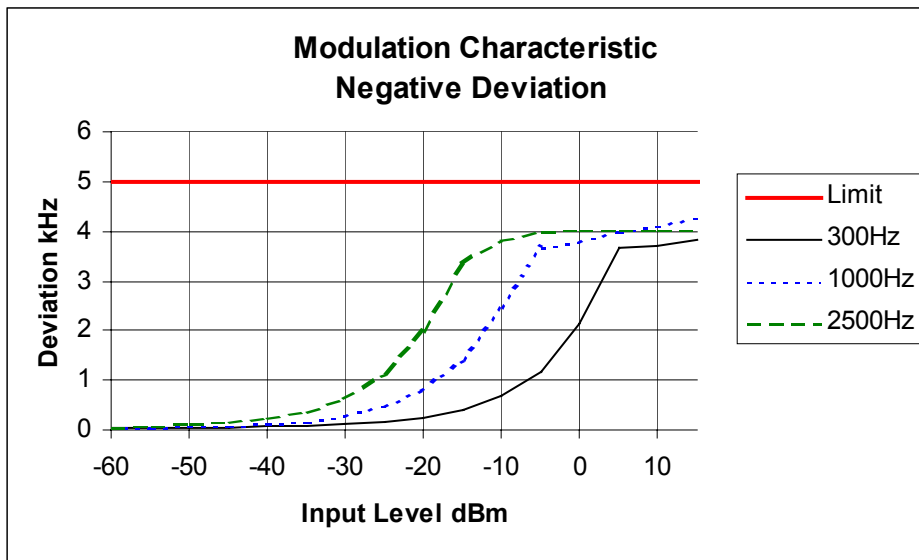
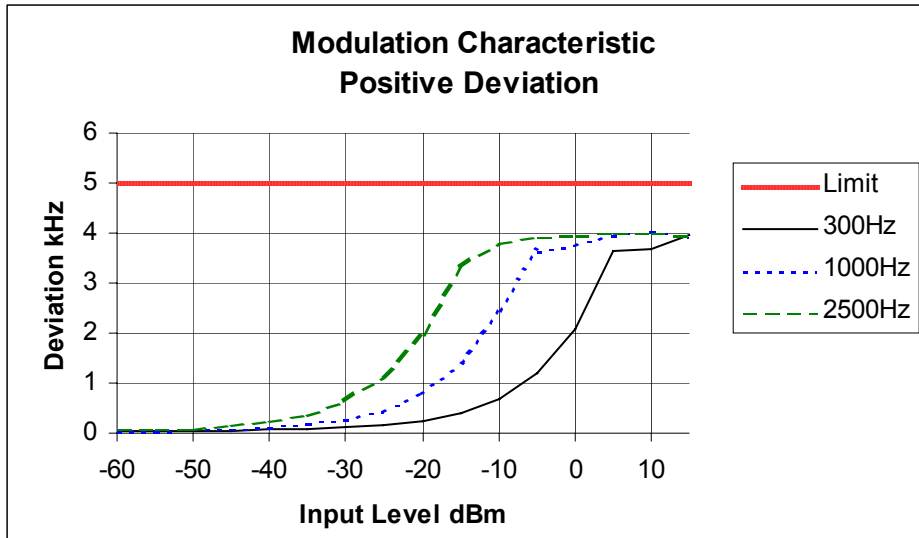
Tx FREQUENCY: 495.1 MHz 12.5 kHz Channel Spacing



TRANSMITTER MODULATION LIMITING

SPECIFICATION: FCC CFR 2.1047 (b)

Tx FREQUENCY: 495.1 MHz 25.0 kHz Channel Spacing



OCCUPIED BANDWIDTH

SPECIFICATION: FCC 47 CFR 2.1049 (c)

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

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

DATA SPEED

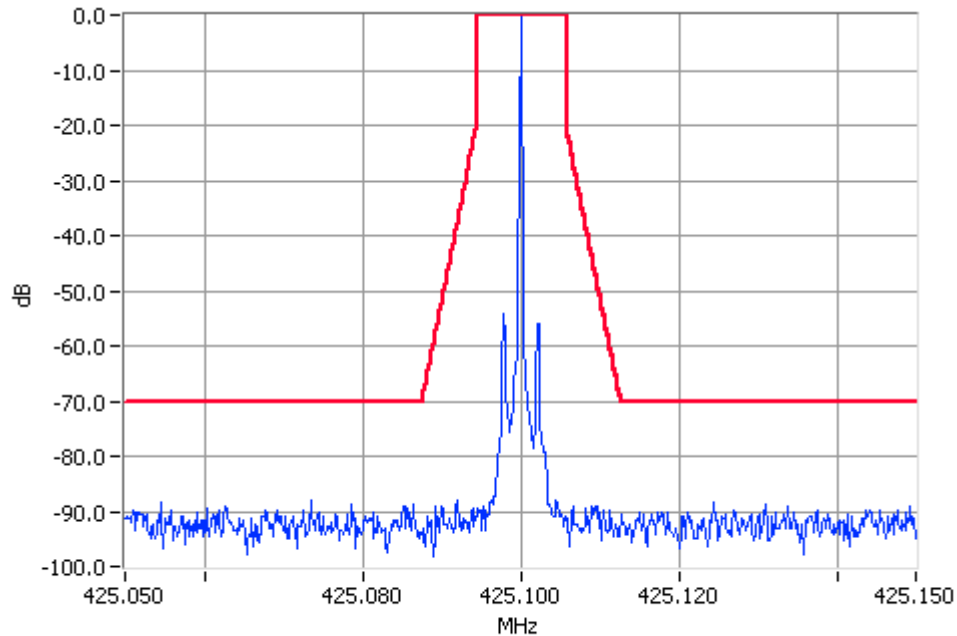
Digital	9600 bps	12.5 kHz Channel Spacing
Digital	9600 bps	25.0 kHz Channel Spacing
FFSK	1200 bps	12.5 kHz Channel Spacing
FFSK	1200 bps	25.0 kHz Channel Spacing

OCCUPIED BANDWIDTH

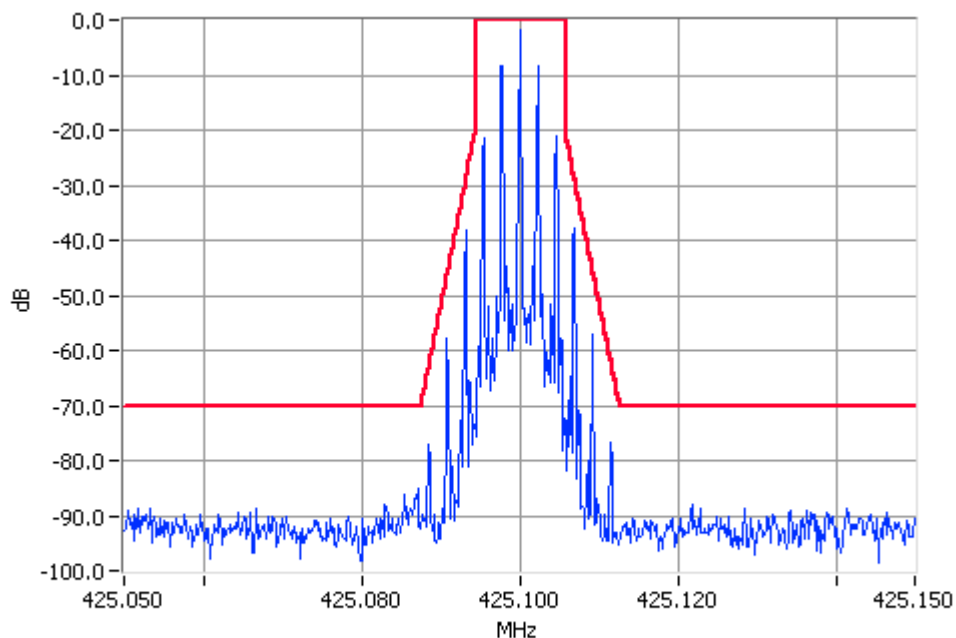
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



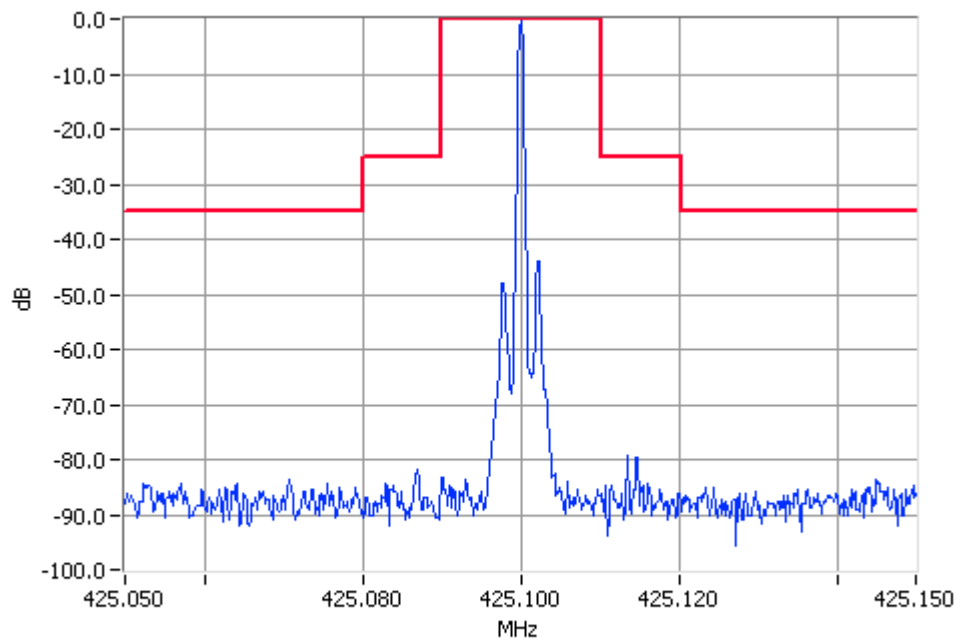
Analogue Modulation 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

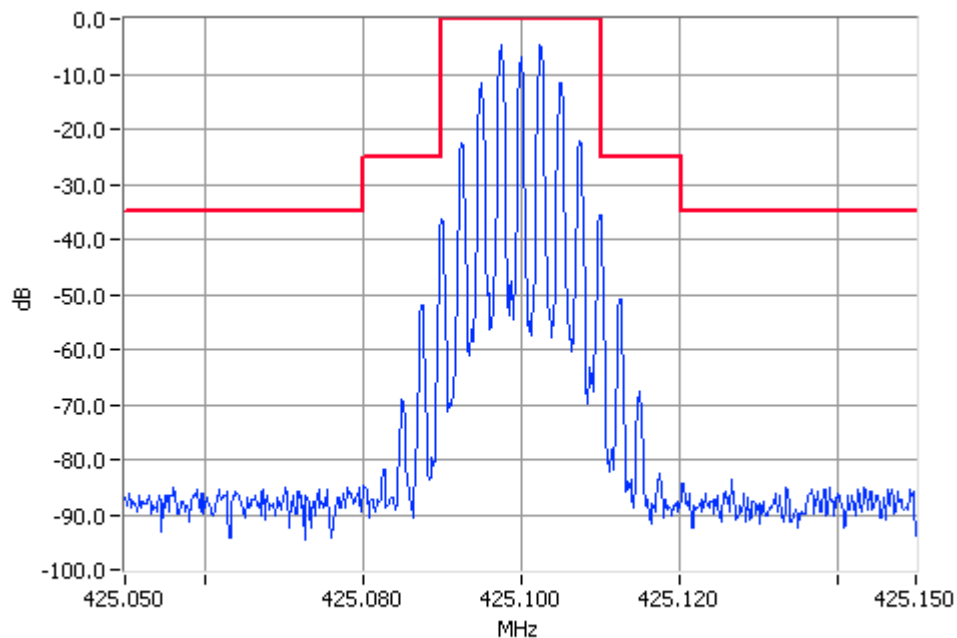
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 425.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz



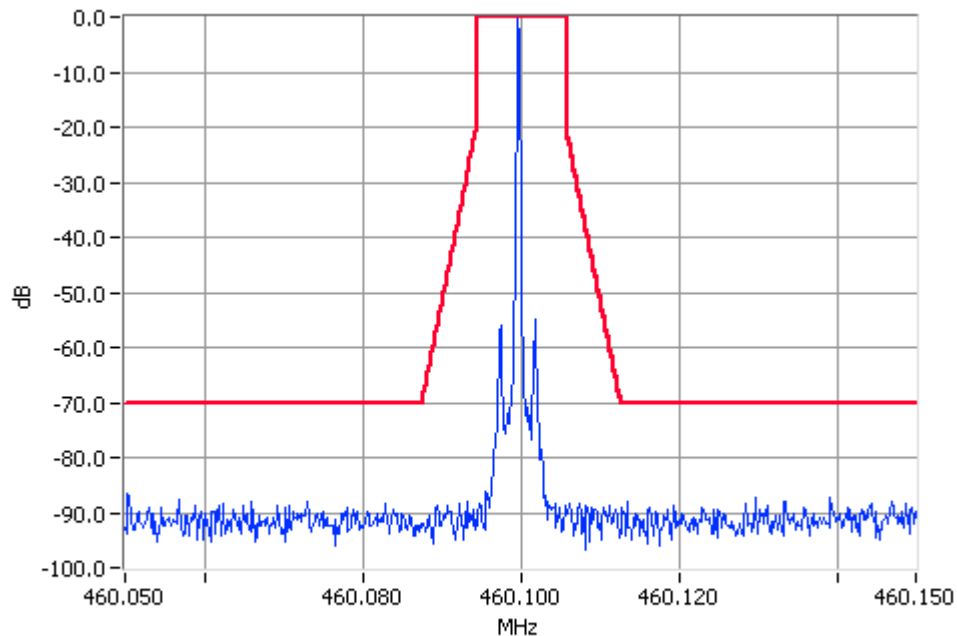
Analogue Modulation 425.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

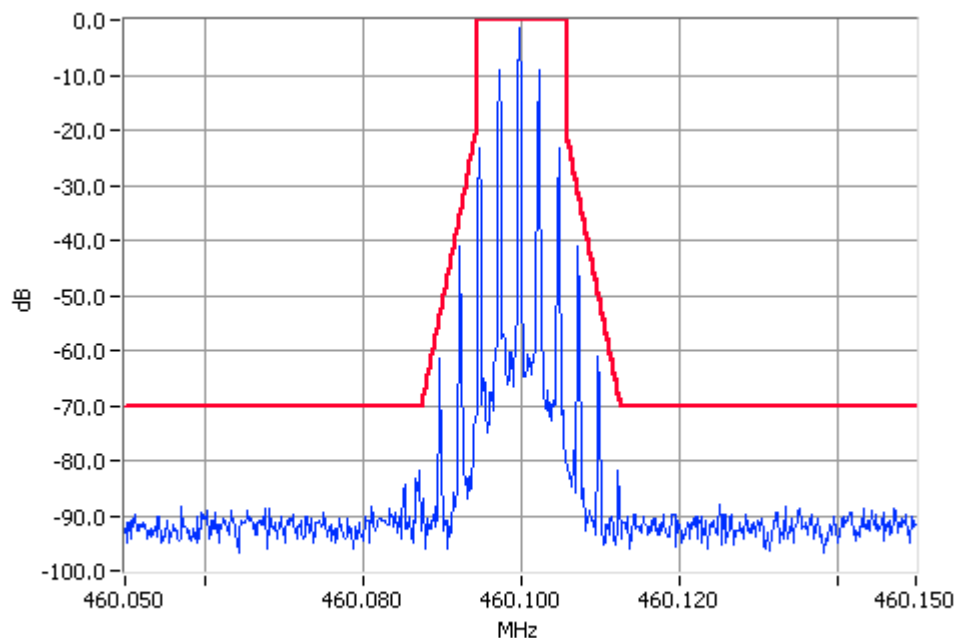
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 12.5 kHz Channel Spacing



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



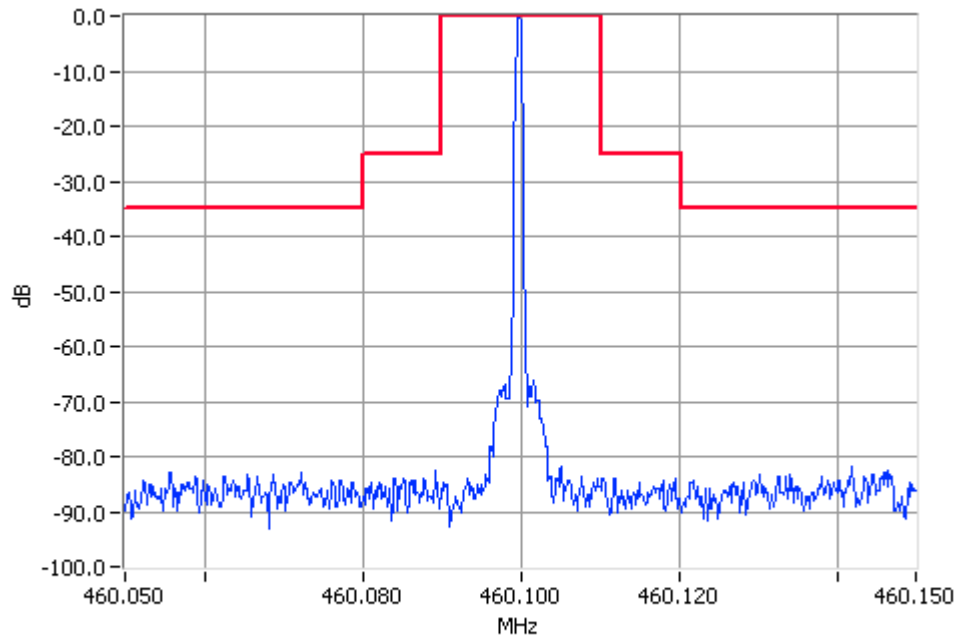
Analogue Modulation 460.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

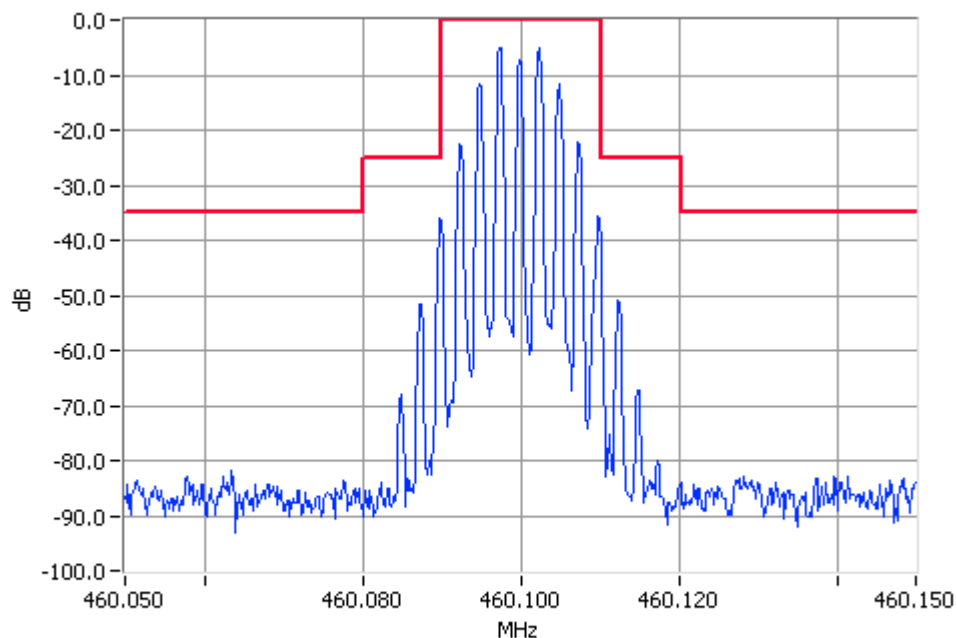
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz



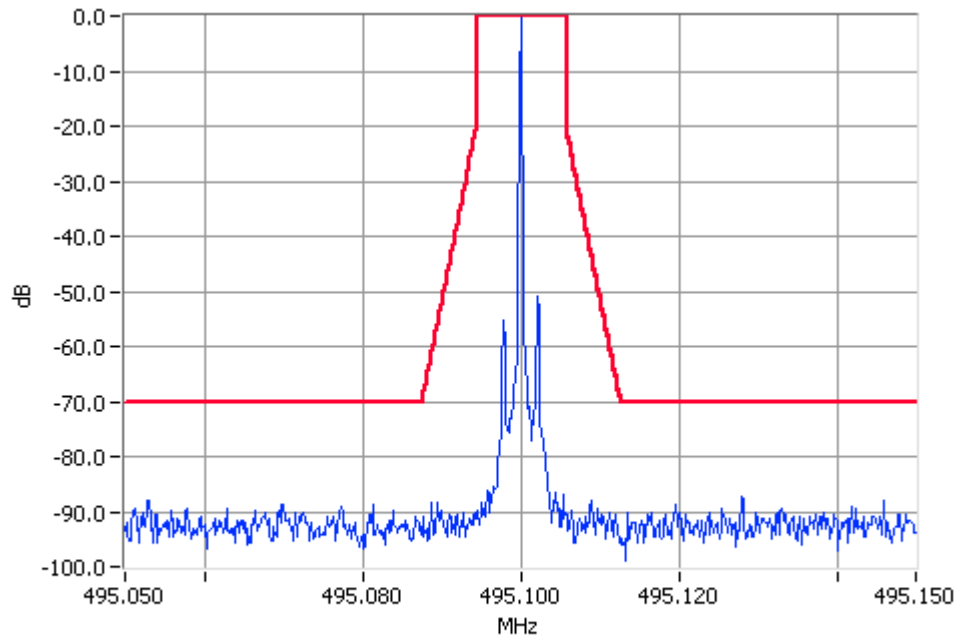
Analogue Modulation 460.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

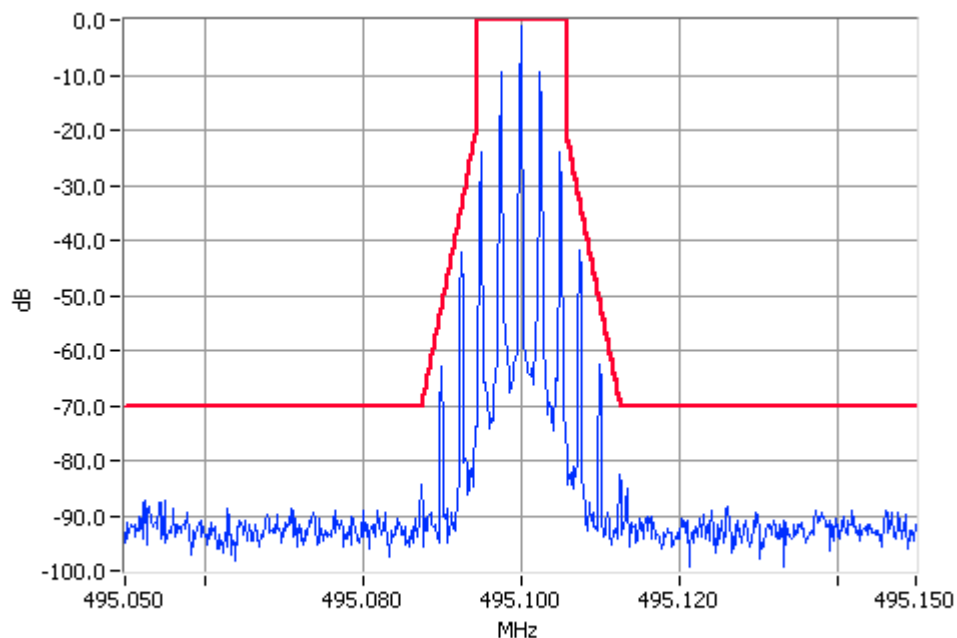
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



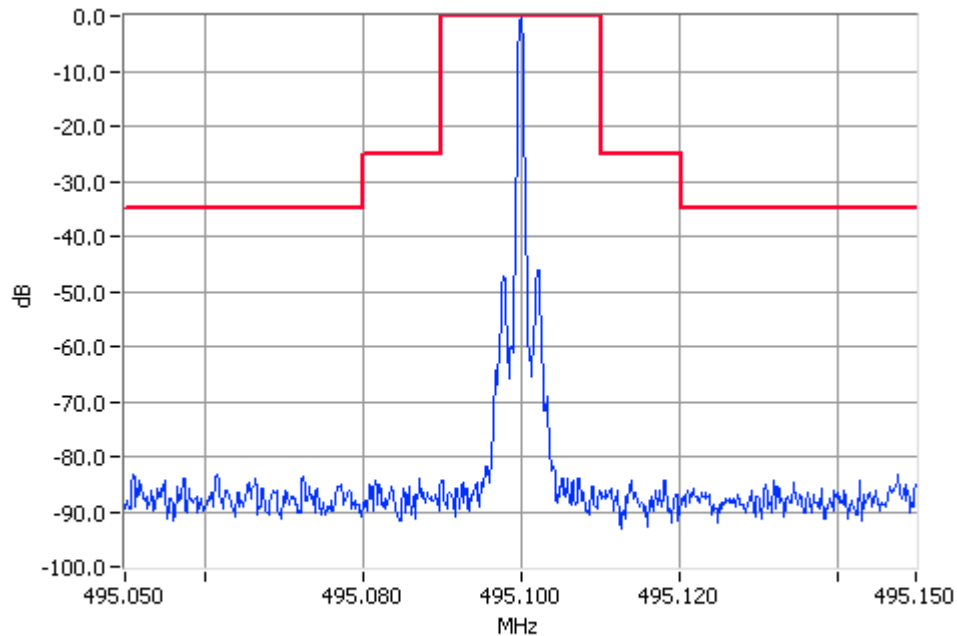
Analogue Modulation 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

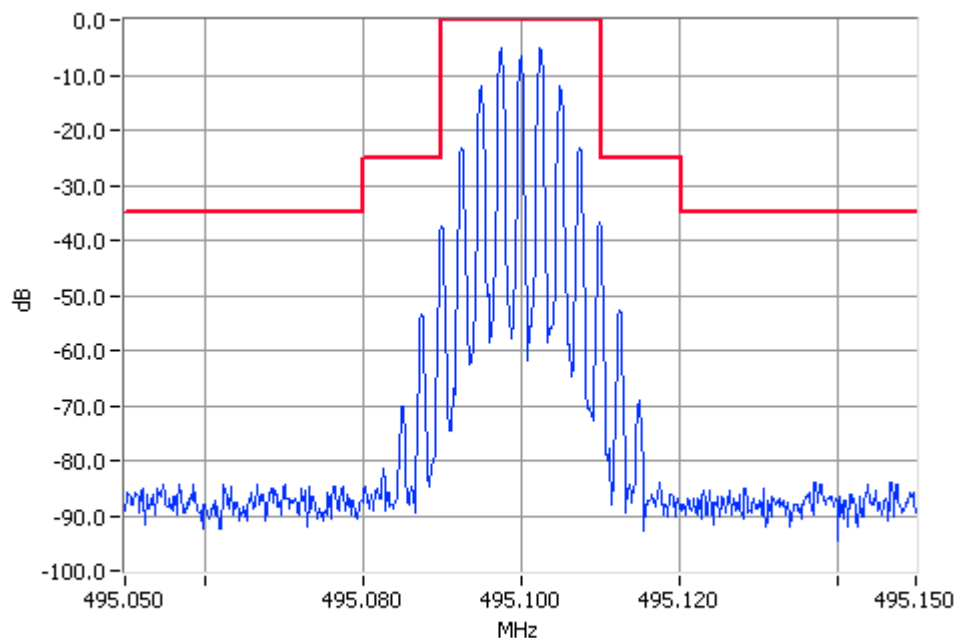
ANALOGUE VOICE

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 495.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz



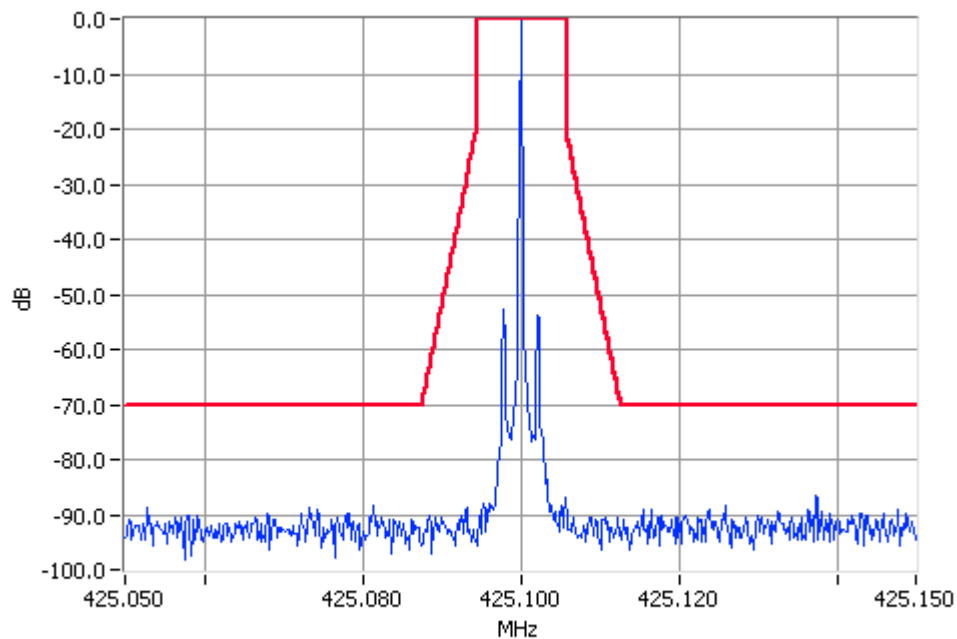
Analogue Modulation 495.1000MHz Mask B 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

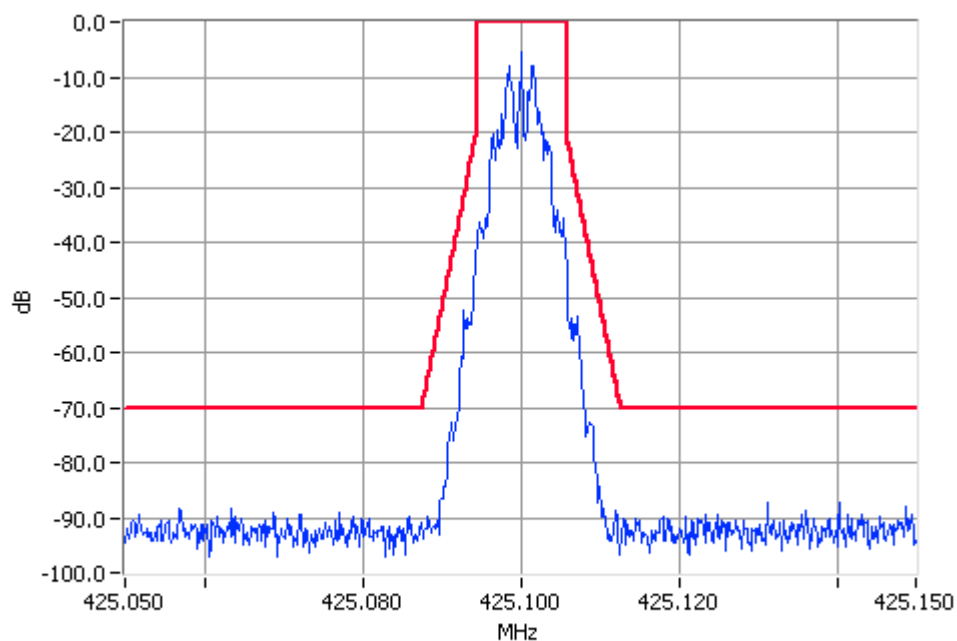
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



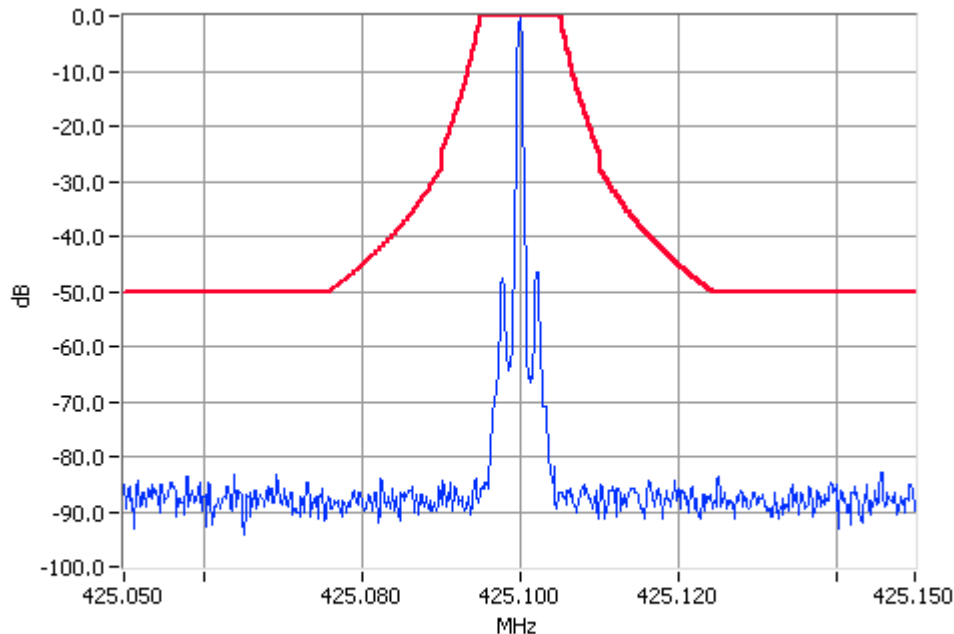
Digital Modulation 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

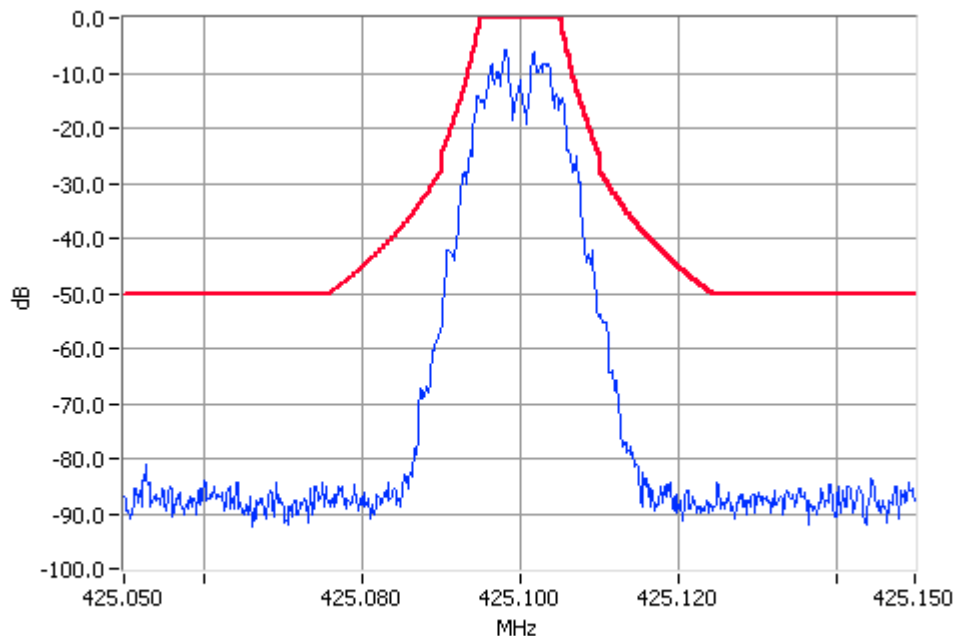
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 425.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



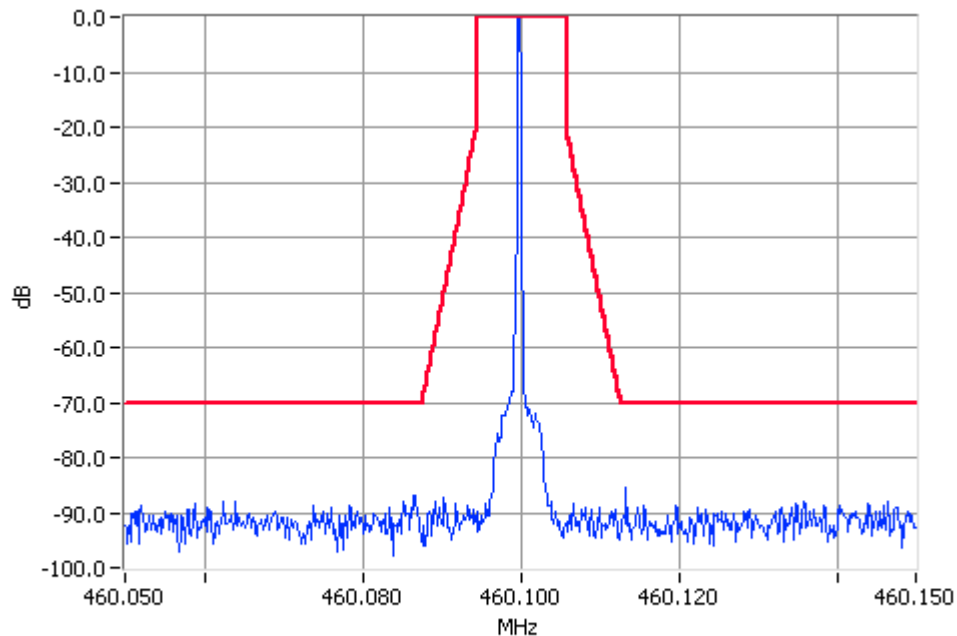
Digital Modulation 425.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

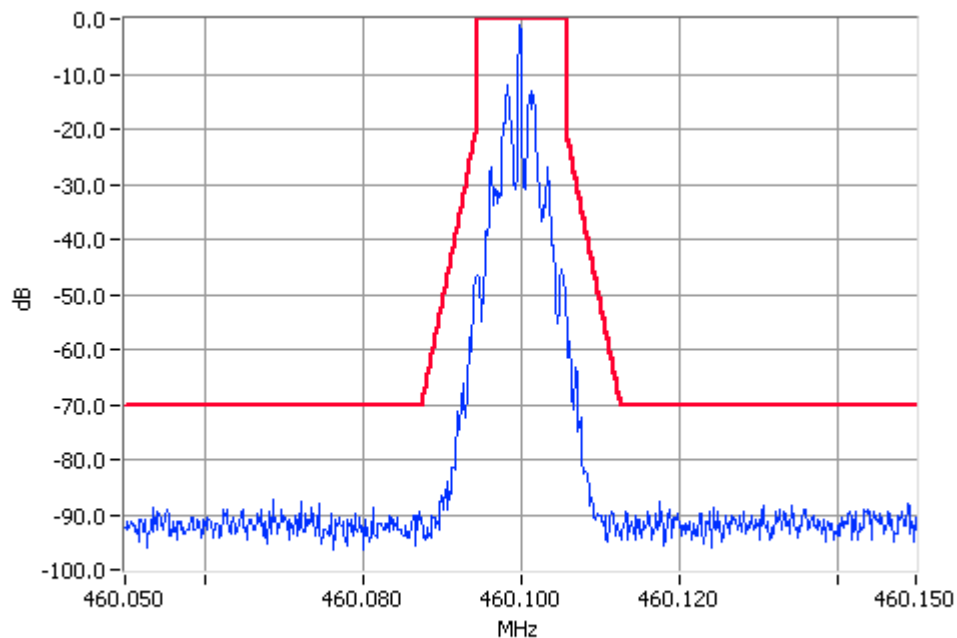
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 12.5 kHz Channel Spacing



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



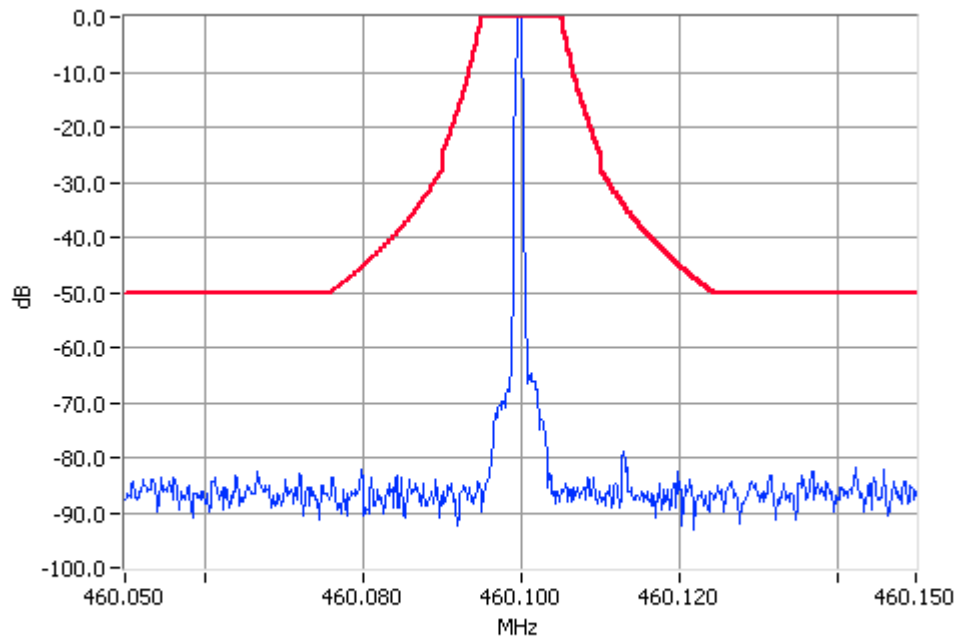
Digital Modulation 460.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

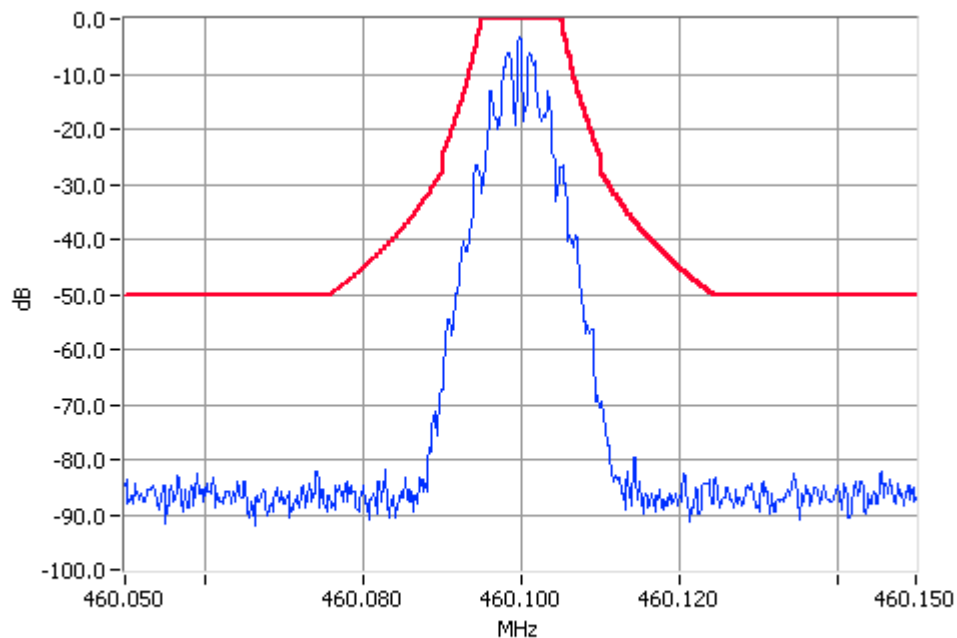
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



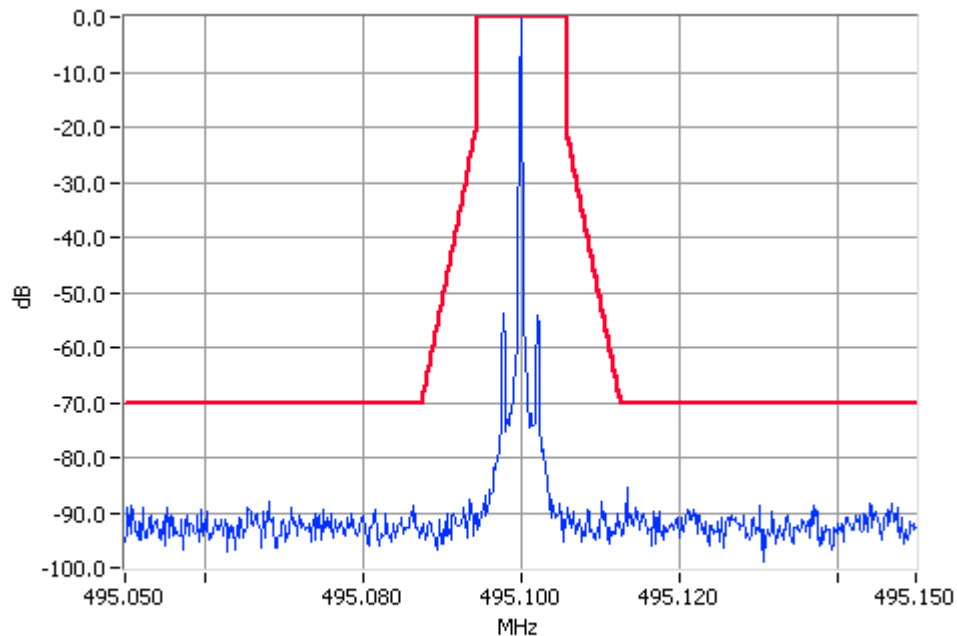
Digital Modulation 460.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

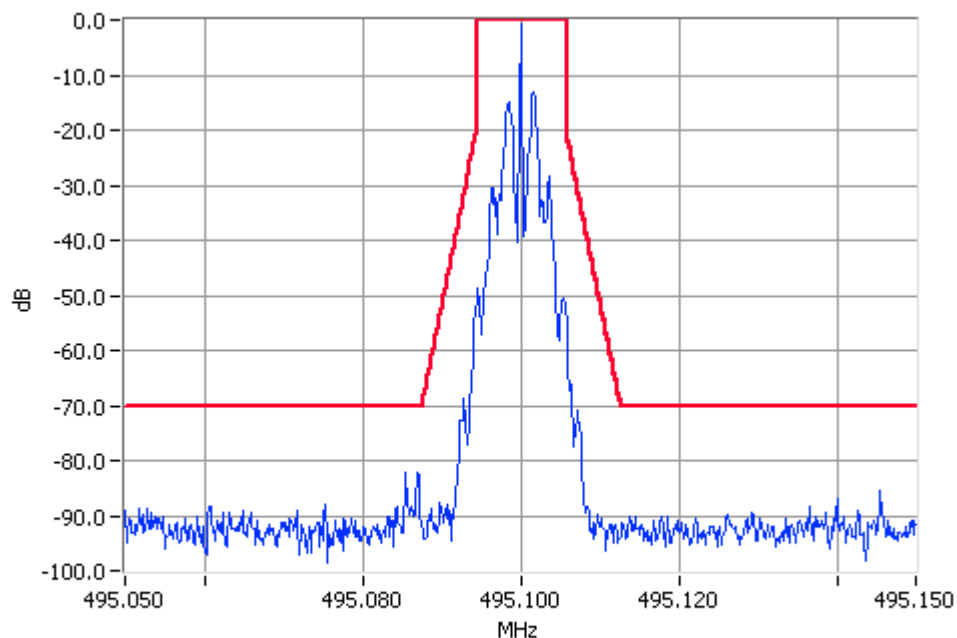
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



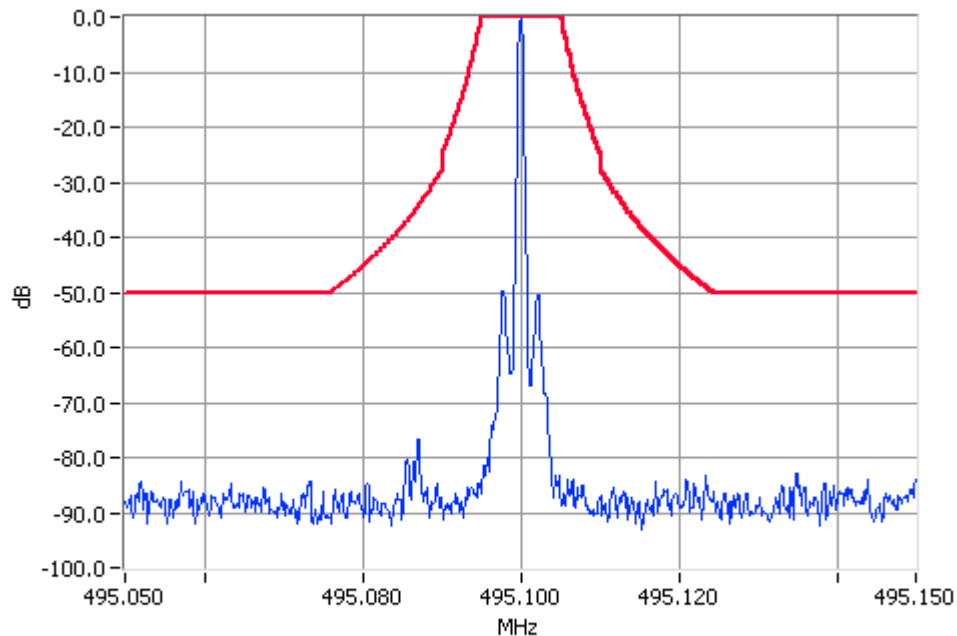
Digital Modulation 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

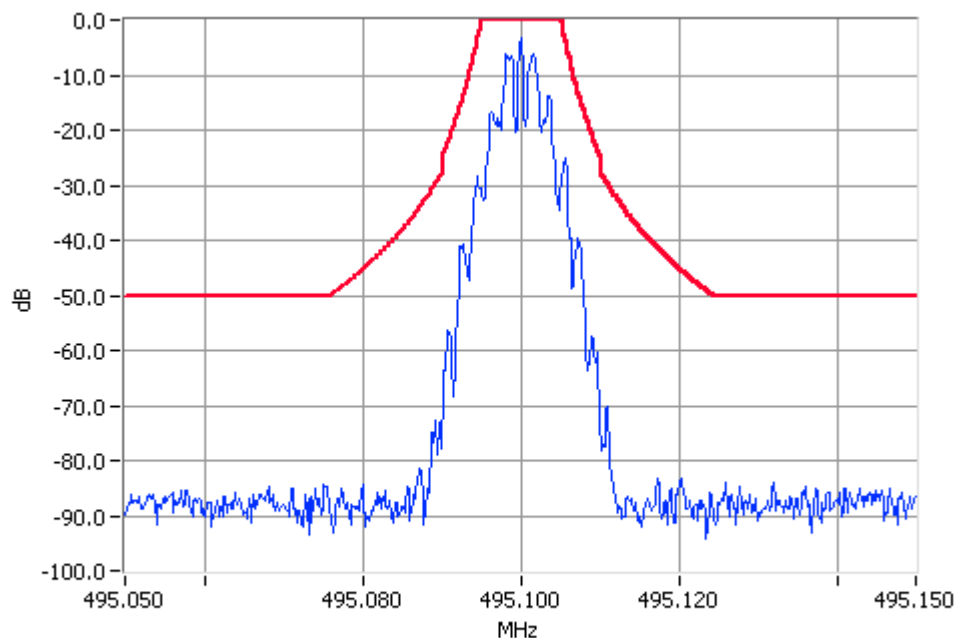
FFSK – Fast frequency shift keying

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 495.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



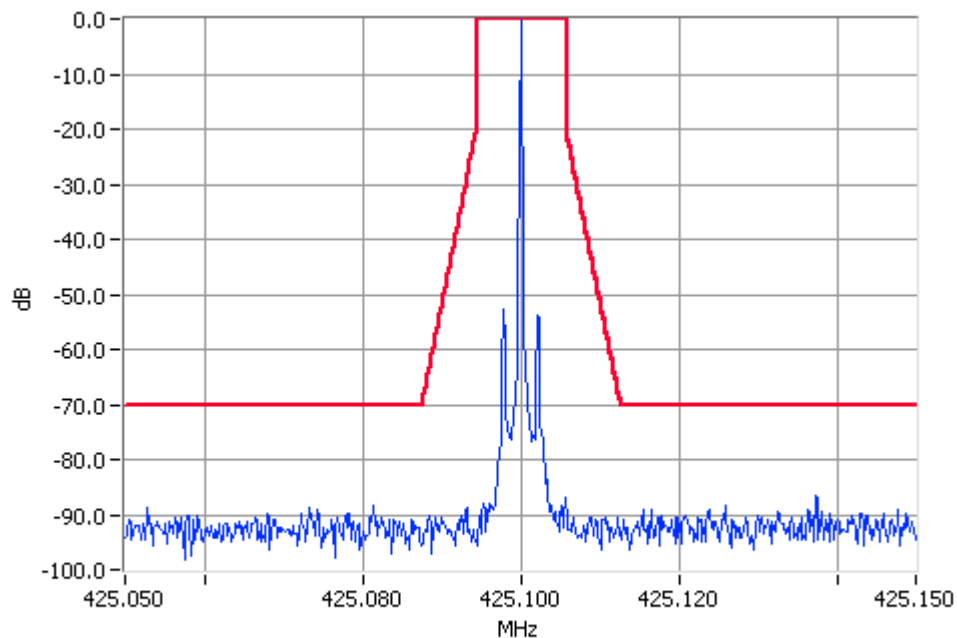
Digital Modulation 495.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

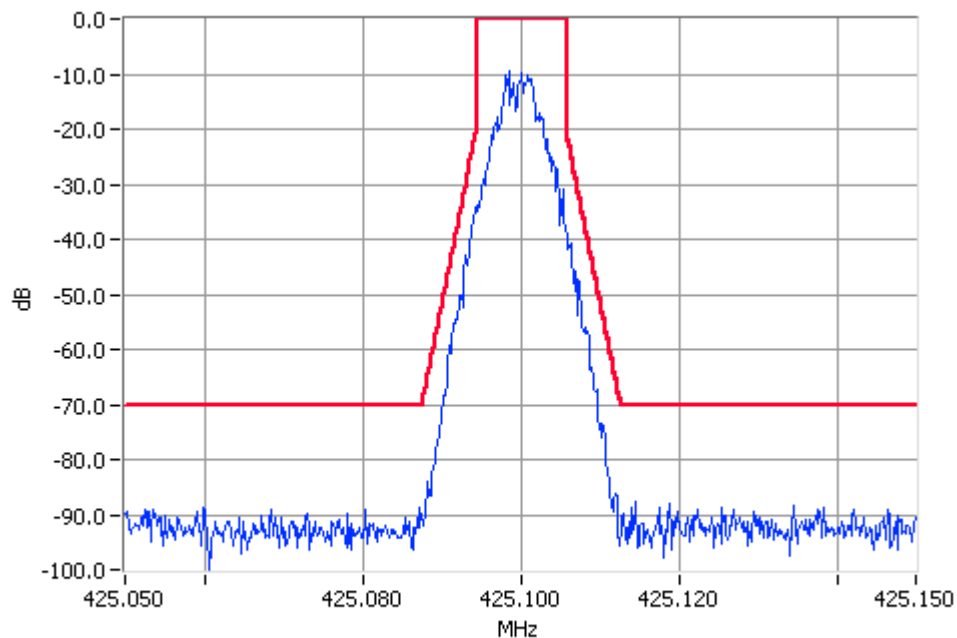
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



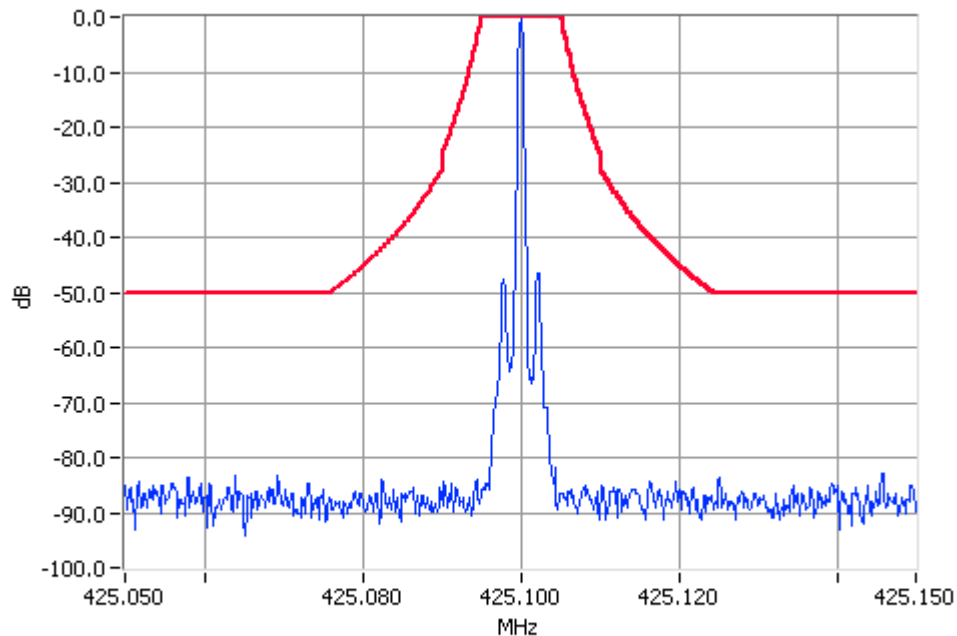
Digital Modulation 425.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

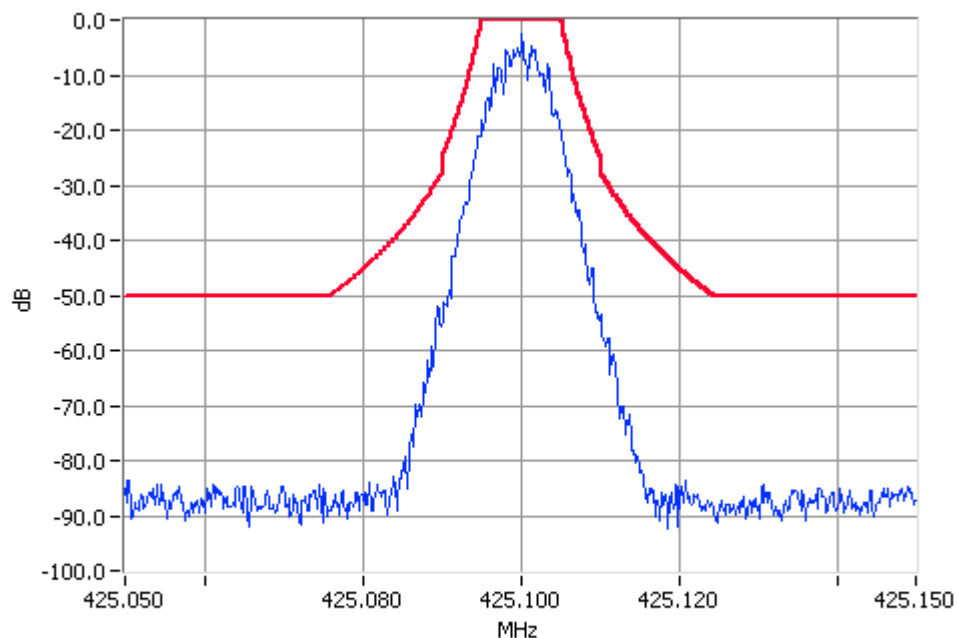
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 425.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 425.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



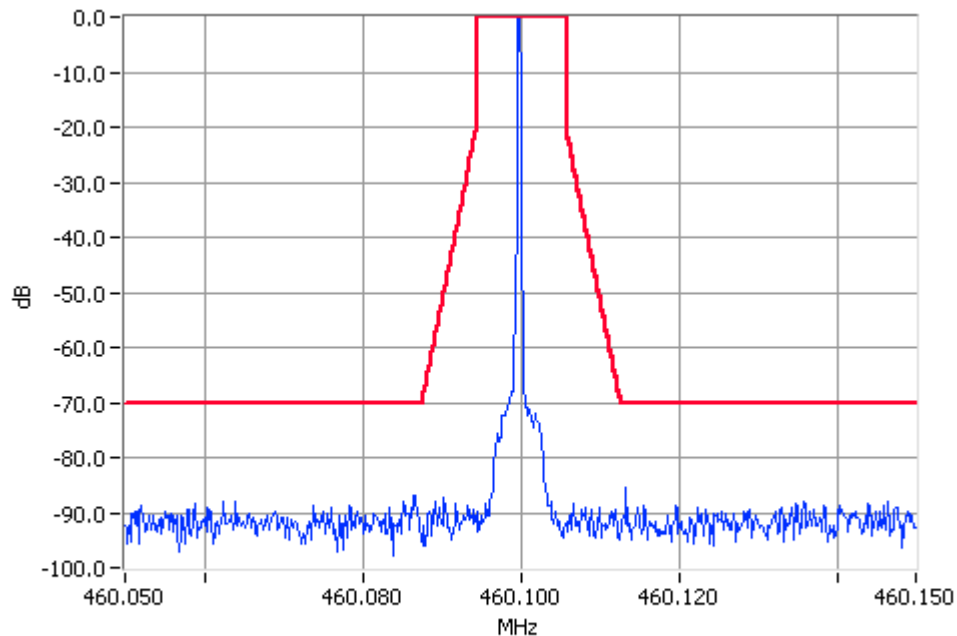
Digital Modulation 425.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

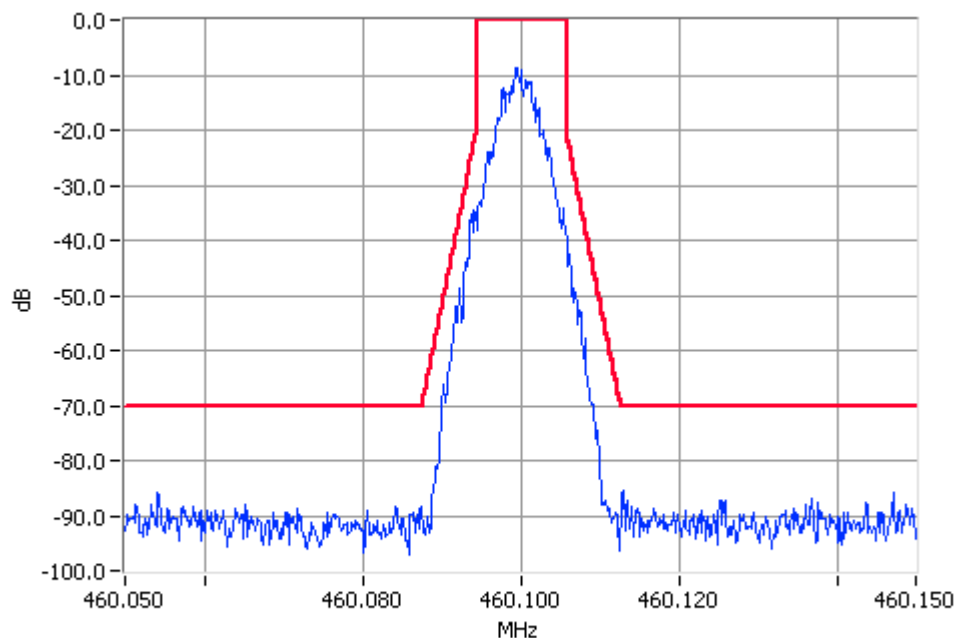
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 12.5 kHz Channel Spacing



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



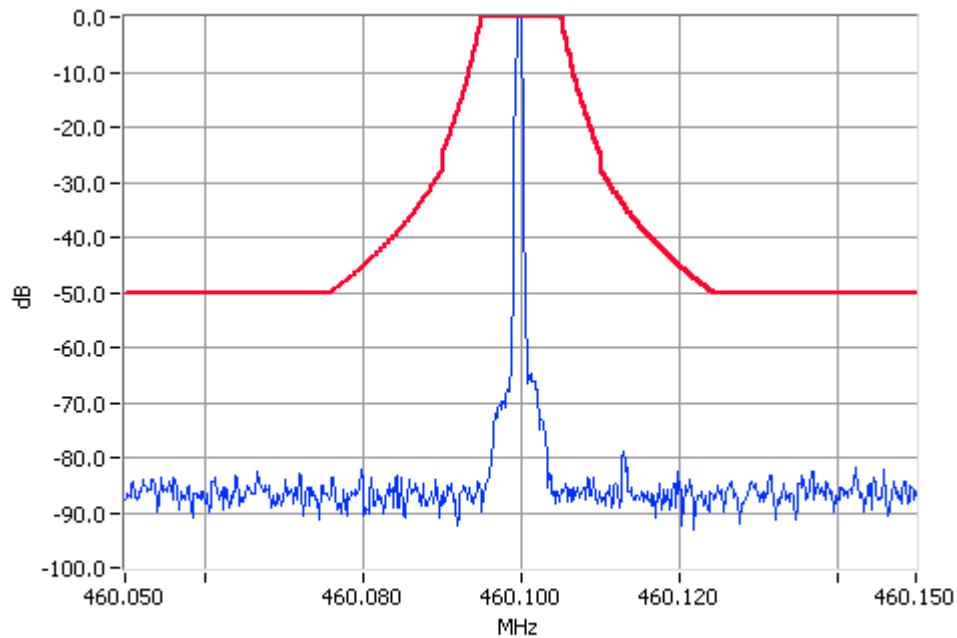
Digital Modulation 460.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

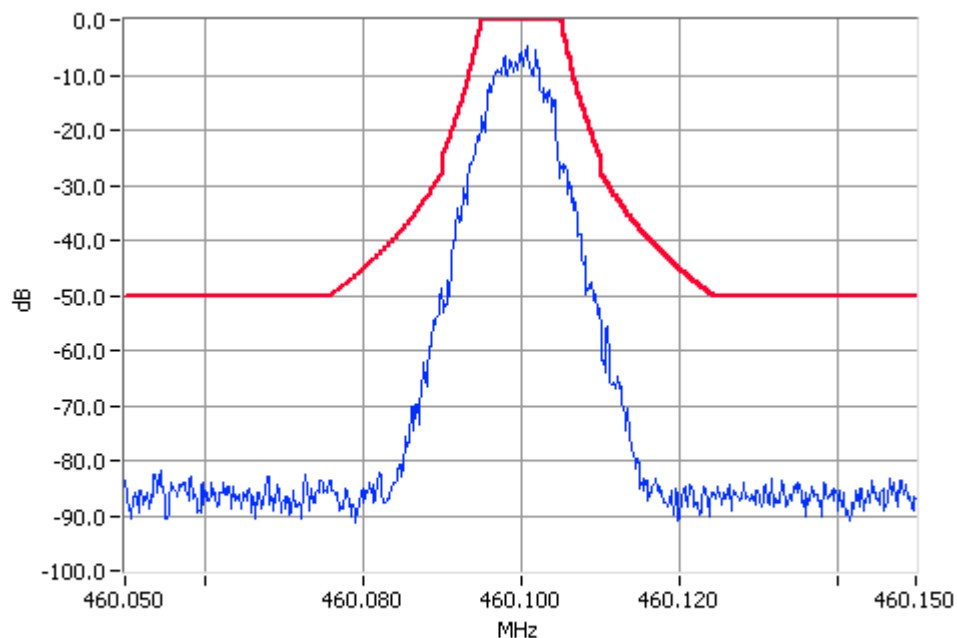
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 460.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 460.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



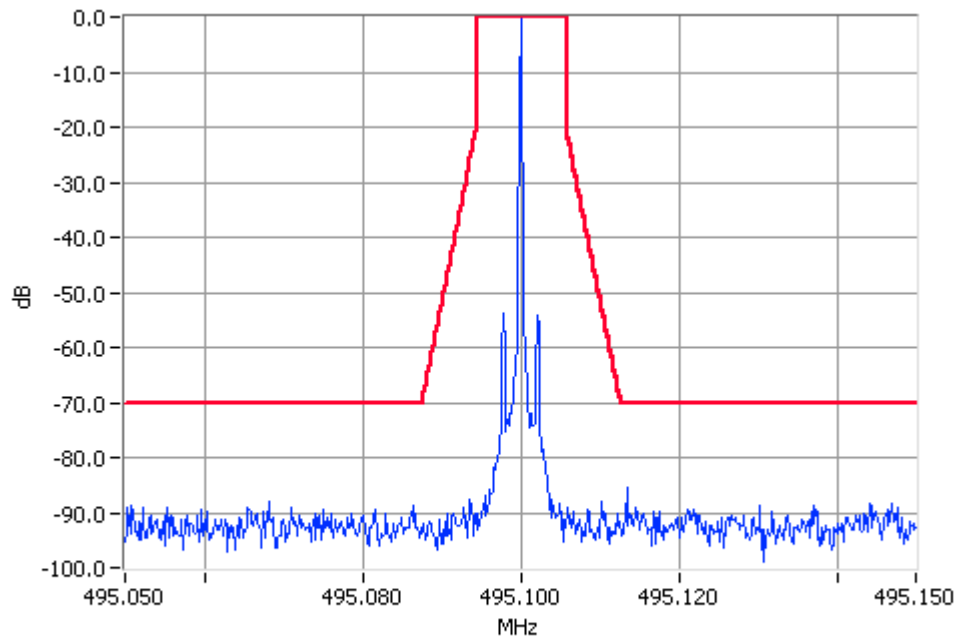
Digital Modulation 460.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz

OCCUPIED BANDWIDTH

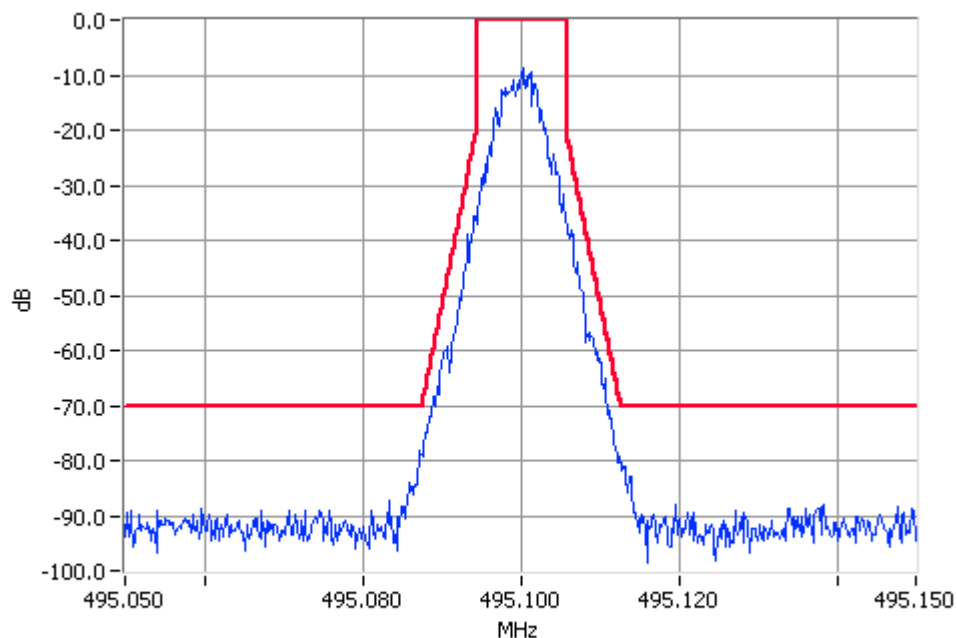
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 12.5 kHz Channel Spacing



Unmodulated 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz



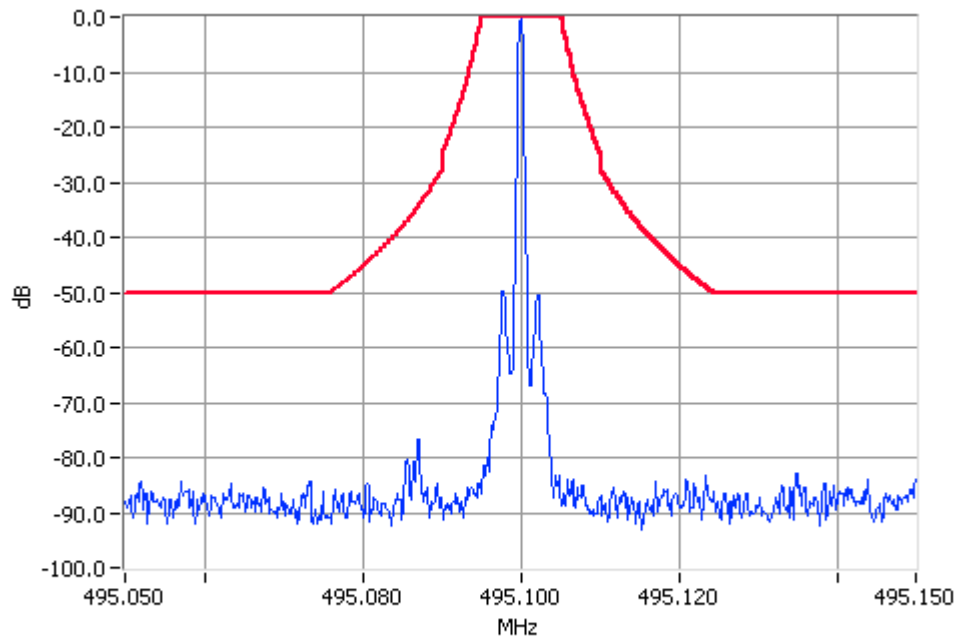
Digital Modulation 495.1000MHz Mask D 100W Pass
RBW=100Hz VBW=1000Hz

OCCUPIED BANDWIDTH

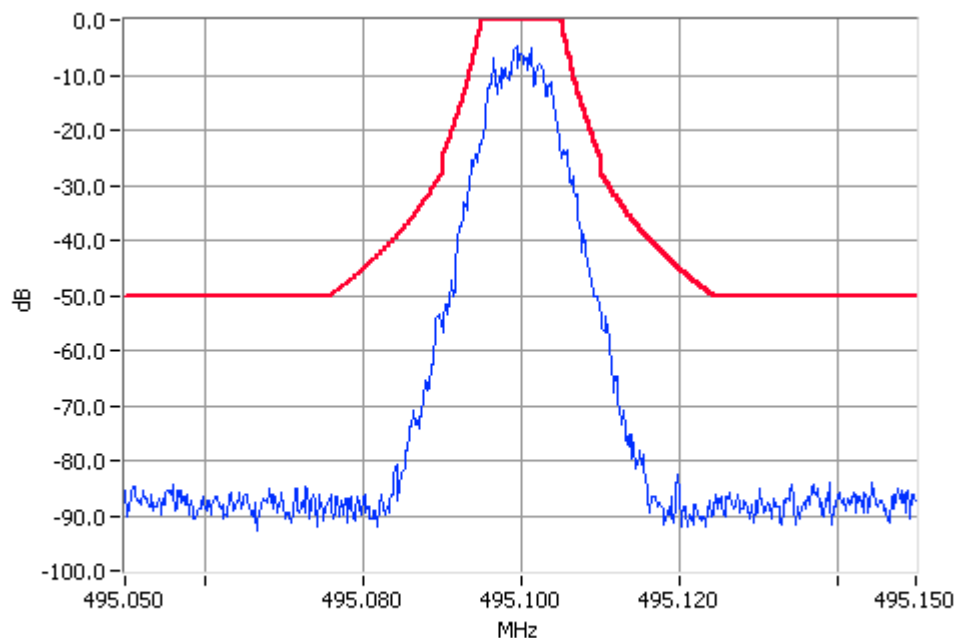
DIGITAL - 4 Level FSK

SPECIFICATION: FCC CFR 2.1049 (c)

Tx FREQUENCY: 495.1 MHz 100W 25 kHz Channel Spacing



Unmodulated 495.1000MHz Mask C 100W Pass
RBW=300Hz VBW=3000Hz



Digital Modulation 495.1000MHz Mask C 100W 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 5.0 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.

LIMIT CLAUSE: FCC 47 CFR 90.210

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 425.1 MHz

12.5 kHz Channel Spacing	425.1 MHz @ 100 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
2975.7002	-34.8	84.8
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

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

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 460.1 MHz

12.5 kHz Channel Spacing	460.1 MHz @ 100 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
2760.5983	-36.8	86.8
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

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

SPURIOUS EMISSIONS (CONDUCTED)

SPECIFICATION: FCC CFR 2.1051

Tx FREQUENCY: 495.1 MHz

12.5 kHz Channel Spacing	495.1 MHz @ 100 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
2970.6001	-33.1	83.1
No other emissions were detected at a level greater than 20 dB below the limit.		

LIMITS:

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

TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

GUIDE: TIA/EIA-603B 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Appendix A for equipment set up.
2. The EUT was tested for frequency error from -30°C to $+50^{\circ}\text{C}$ in 10°C increments
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

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

LIMIT CLAUSE: FCC 47 CFR 90.213

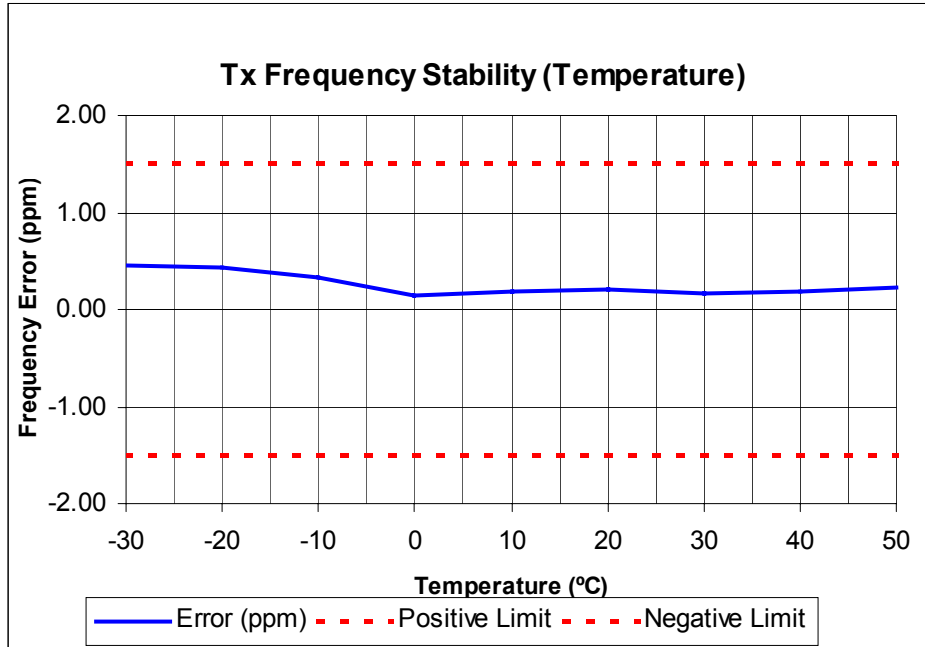
Frequency Range: 421 MHz ~ 512 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5
25.0	2.5

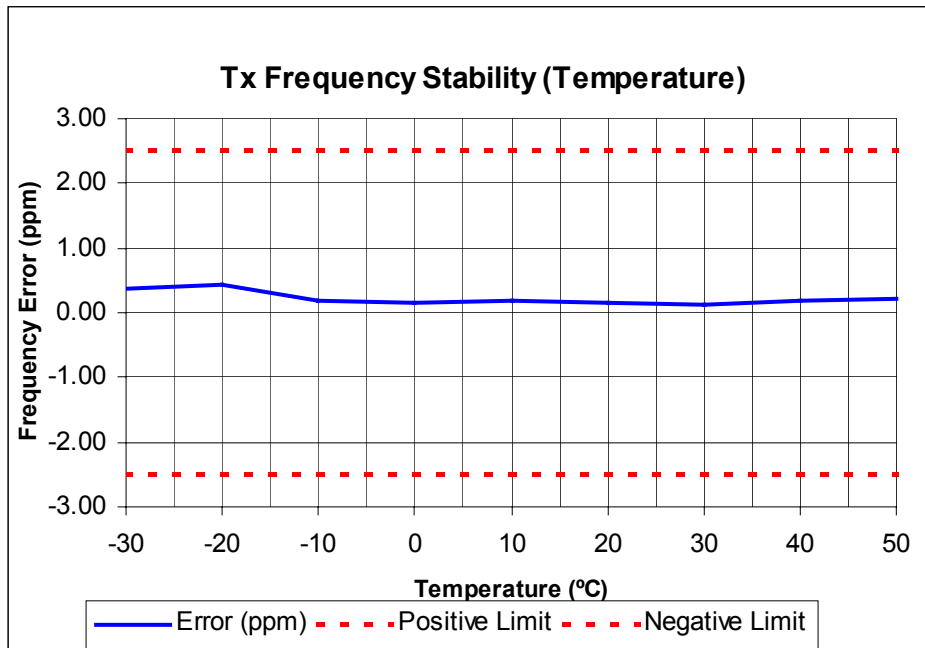
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 425.1 MHz 100 W 12.5 kHz channel Spacing



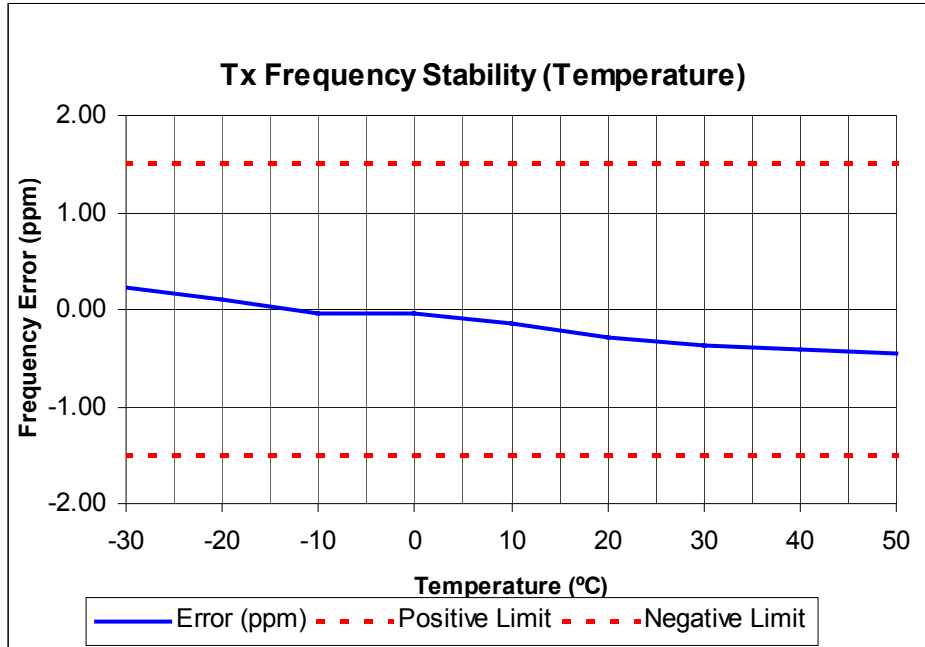
Tx FREQUENCY: 425.1 MHz 100 W 25.0 kHz channel Spacing



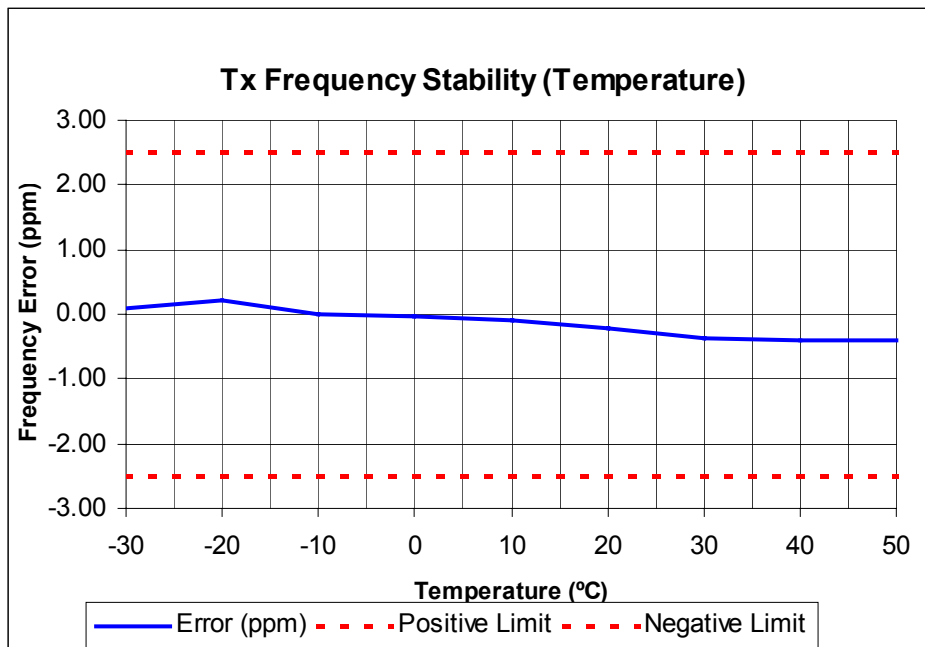
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 460.1 MHz 100 W 12.5 kHz channel Spacing



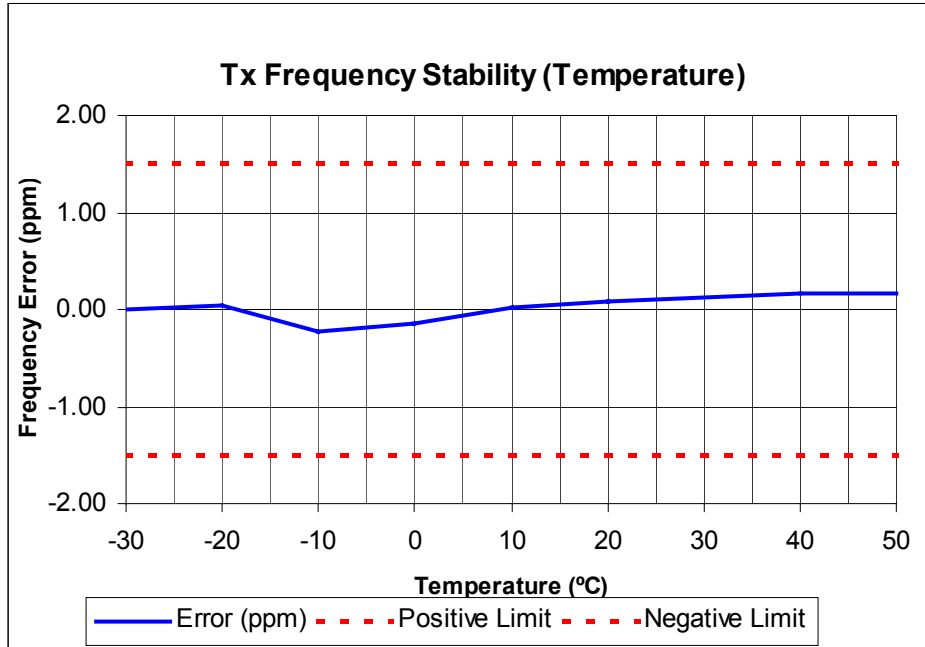
Tx FREQUENCY: 460.1 MHz 100 W 25.0 kHz channel Spacing



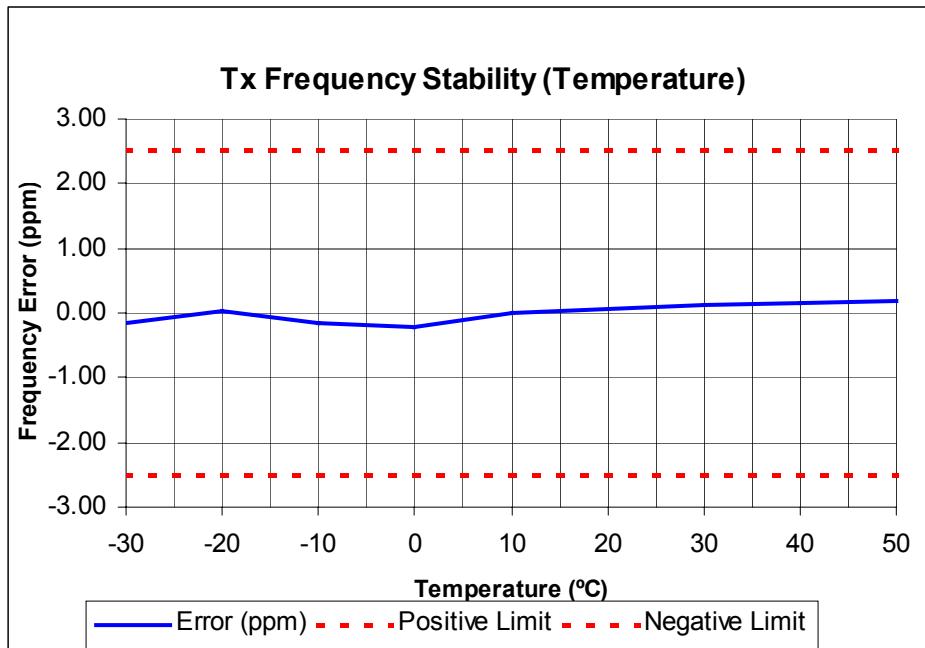
TRANSMITTER FREQUENCY STABILITY (TEMPERATURE)

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

Tx FREQUENCY: 495.1 MHz 100 W 12.5 kHz channel Spacing



Tx FREQUENCY: 495.1 MHz 100 W 25.0 kHz channel Spacing



TRANSMITTER FREQUENCY STABILITY (VOLTAGE)

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

GUIDE: TIA/EIA-603B 2.2.2

MEASUREMENT PROCEDURE:

1. Refer Appendix A for equipment set up.
2. The EUT was tested for frequency error at an input voltage to the radio of 85% to 115%.
3. The frequency error was recorded in parts per million (ppm).

MEASUREMENT RESULTS:

Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 425.1 MHz		
	102 V DC	120 V DC	138 V DC
12.5	0.15	0.15	0.14
25.0	0.14	0.14	0.15
Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 460.1 MHz		
	102 V DC	120 V DC	138 V DC
12.5	-0.23	-0.23	-0.24
25.0	-0.30	-0.31	-0.31
Channel Spacing (kHz)	FREQUENCY ERROR (ppm) @ 495.1 MHz		
	102 V DC	120 V DC	138 V DC
12.5	0.11	0.10	0.09
25.0	0.08	0.07	0.08

FCC 47 CFR 90.213

LIMIT CLAUSE: Frequency Range: 421 MHz ~ 512 MHz

Channel Spacing (kHz)	Frequency Error (ppm)
12.5	1.5
25.0	2.5

TRANSIENT FREQUENCY BEHAVIOR

SPECIFICATION: FCC 47 CFR 90.214

GUIDE: TIA/EIA-603B 2.2.19

MEASUREMENT PROCEDURE:

1. Refer Appendix 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 kHz & 25.0 kHz channel spacings.

LIMIT CLAUSE: FCC 47 CFR 90.214

TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 425.1 MHz 100 W 12.5 kHz Channel Spacing

FREQUENCY	425.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	-0.4	N/A
t ₂	-0.3	N/A
t ₃	N/A	0.2
t ₂ → t ₃ ppm	-0.7	
ERROR LIMIT (t ₂ → t ₃) ppm	1.5	

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	

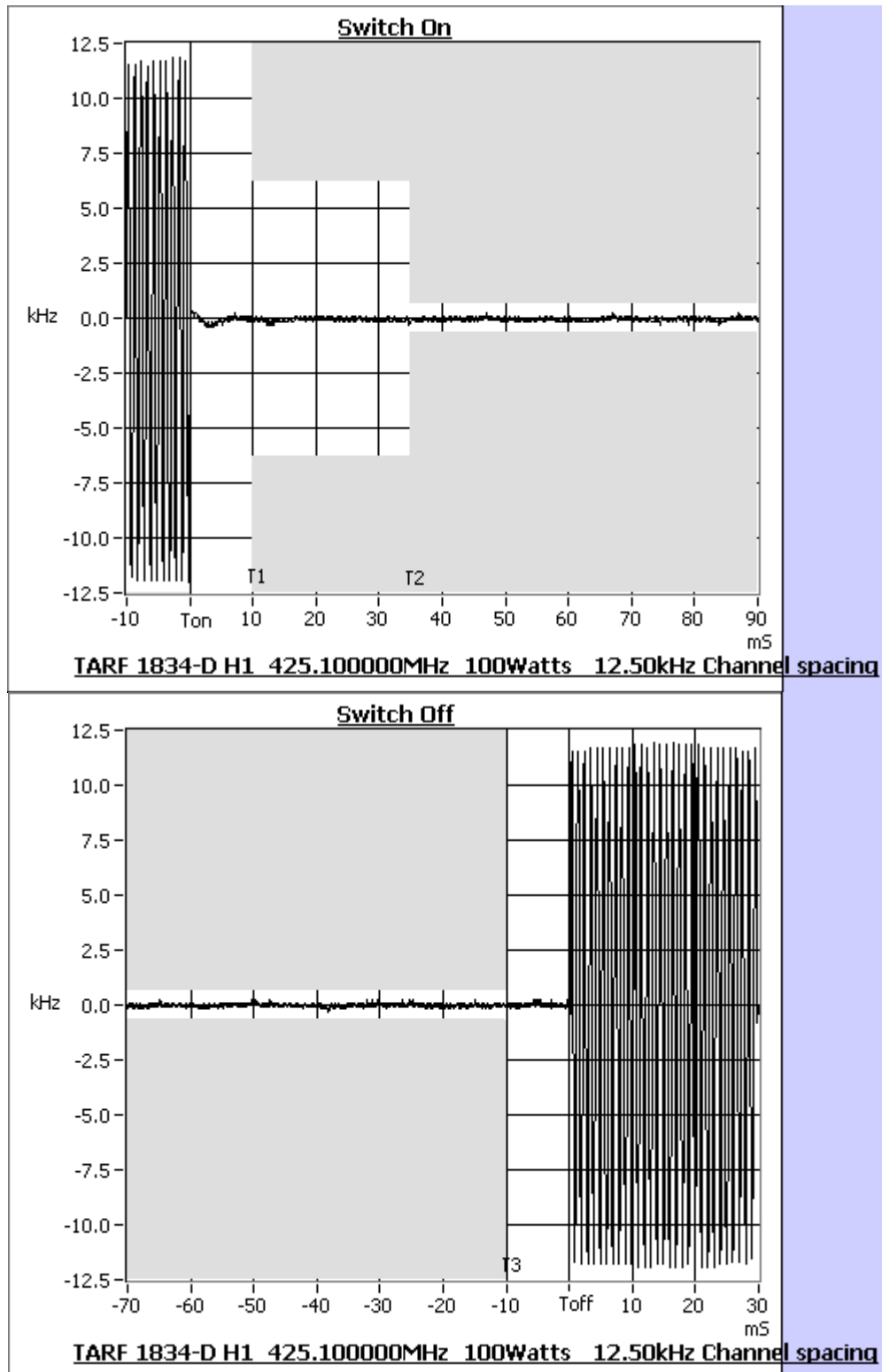
LIMIT:

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: 425.1 MHz 100 W 12.5 kHz Channel Spacing



TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 425.1 MHz 100 W 25.0 kHz Channel Spacing

FREQUENCY	425.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	-2.5	N/A
t ₂	-0.5	N/A
t ₃	N/A	0.5
t ₂ → t ₃ ppm	-1.1	
ERROR LIMIT (t ₂ → 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	

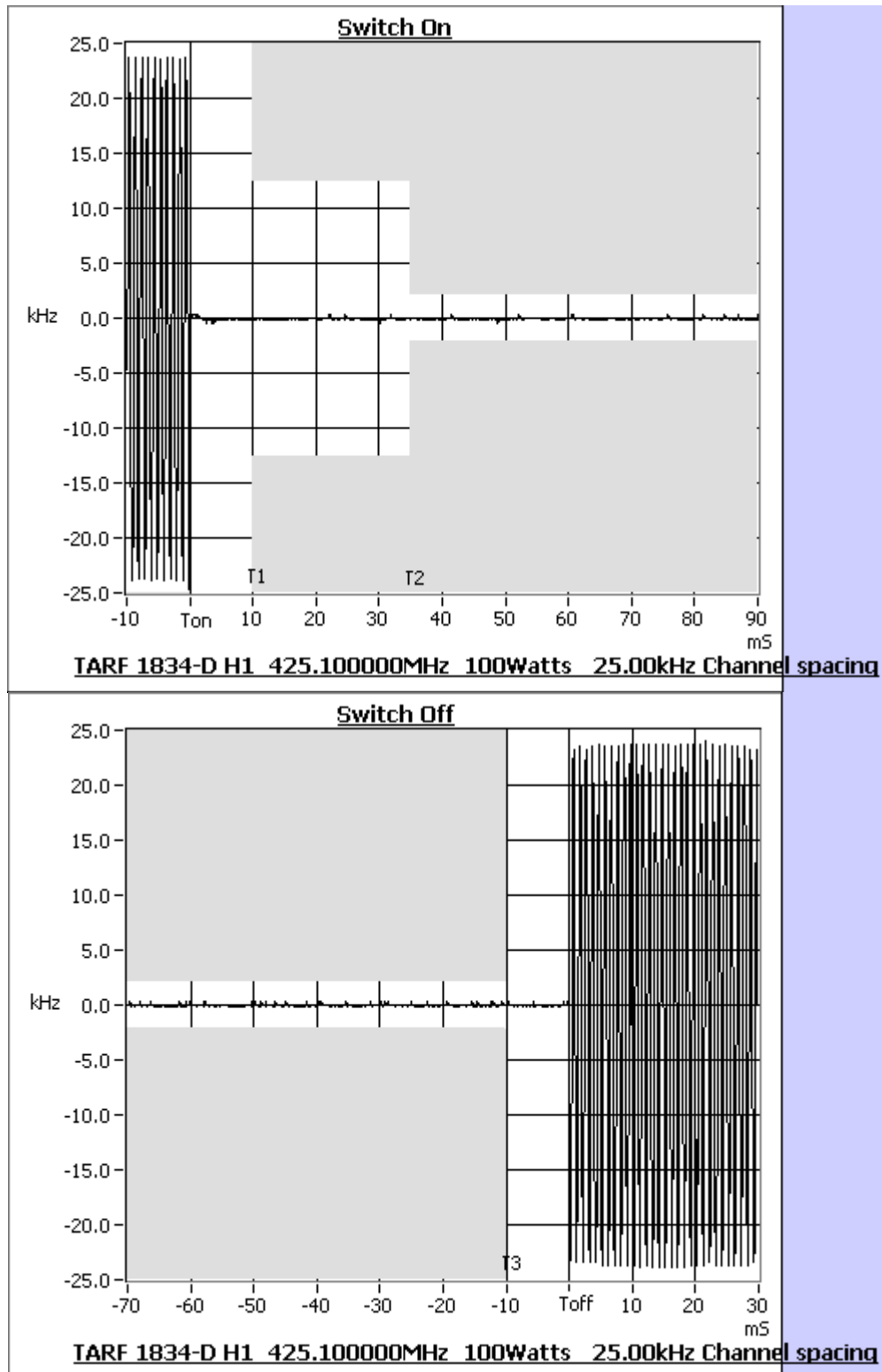
LIMIT:

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: 425.1 MHz 100 W 25.0 kHz Channel Spacing



TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1 MHz 100 W 12.5 kHz Channel Spacing

FREQUENCY	460.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	-1.4	N/A
t ₂	-0.4	N/A
t ₃	N/A	-0.4
t ₂ → t ₃ ppm	-0.8	
ERROR LIMIT (t ₂ → t ₃) ppm	1.5	

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	

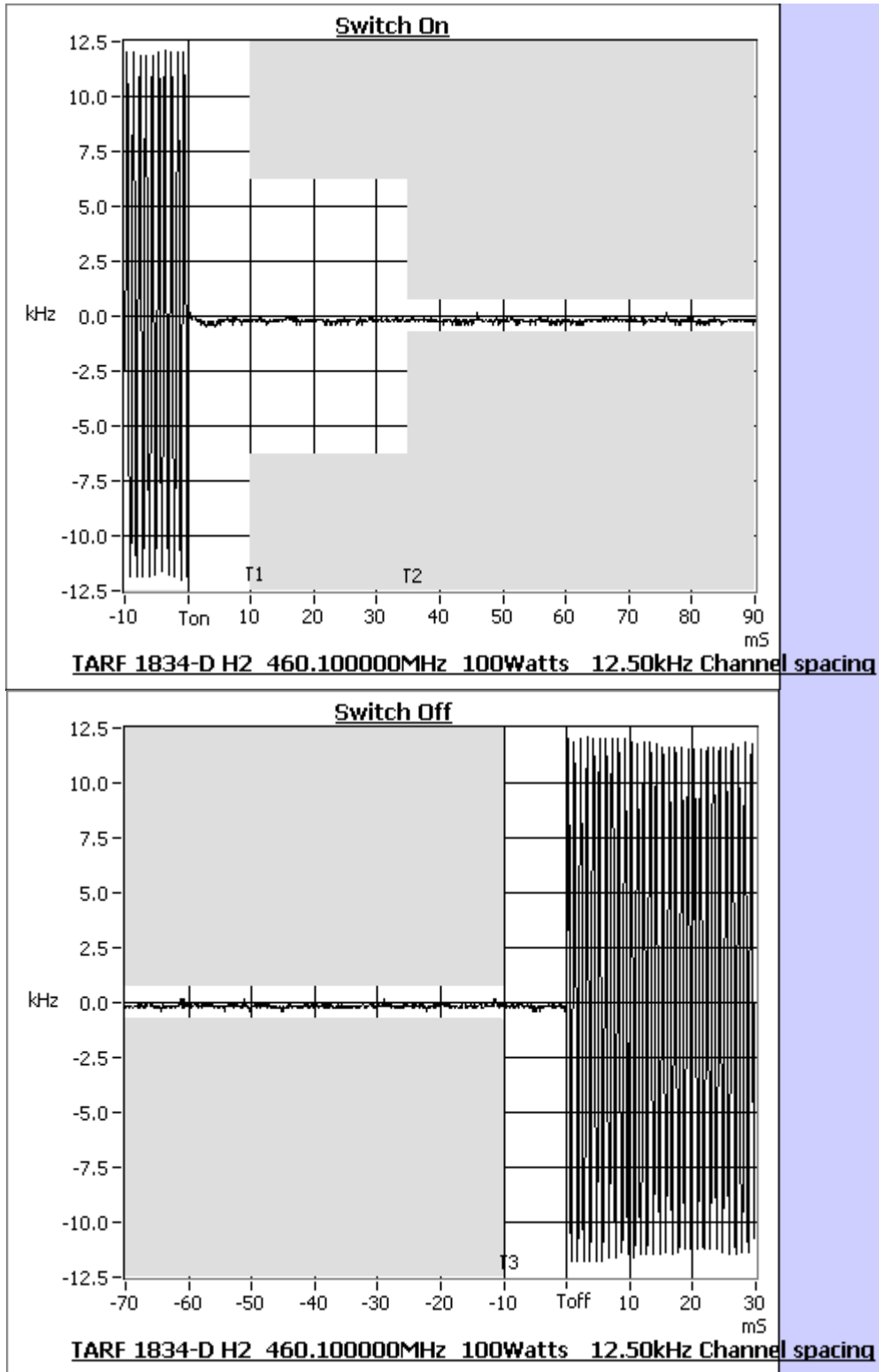
LIMIT:

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: 460.1 MHz 100 W 12.5 kHz Channel Spacing



TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 460.1 MHz 100 W 25.0 kHz Channel Spacing

FREQUENCY	460.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	-1.7	N/A
t ₂	-0.7	N/A
t ₃	N/A	-0.7
t ₂ → t ₃ ppm	-1.5	
ERROR LIMIT (t ₂ → 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	

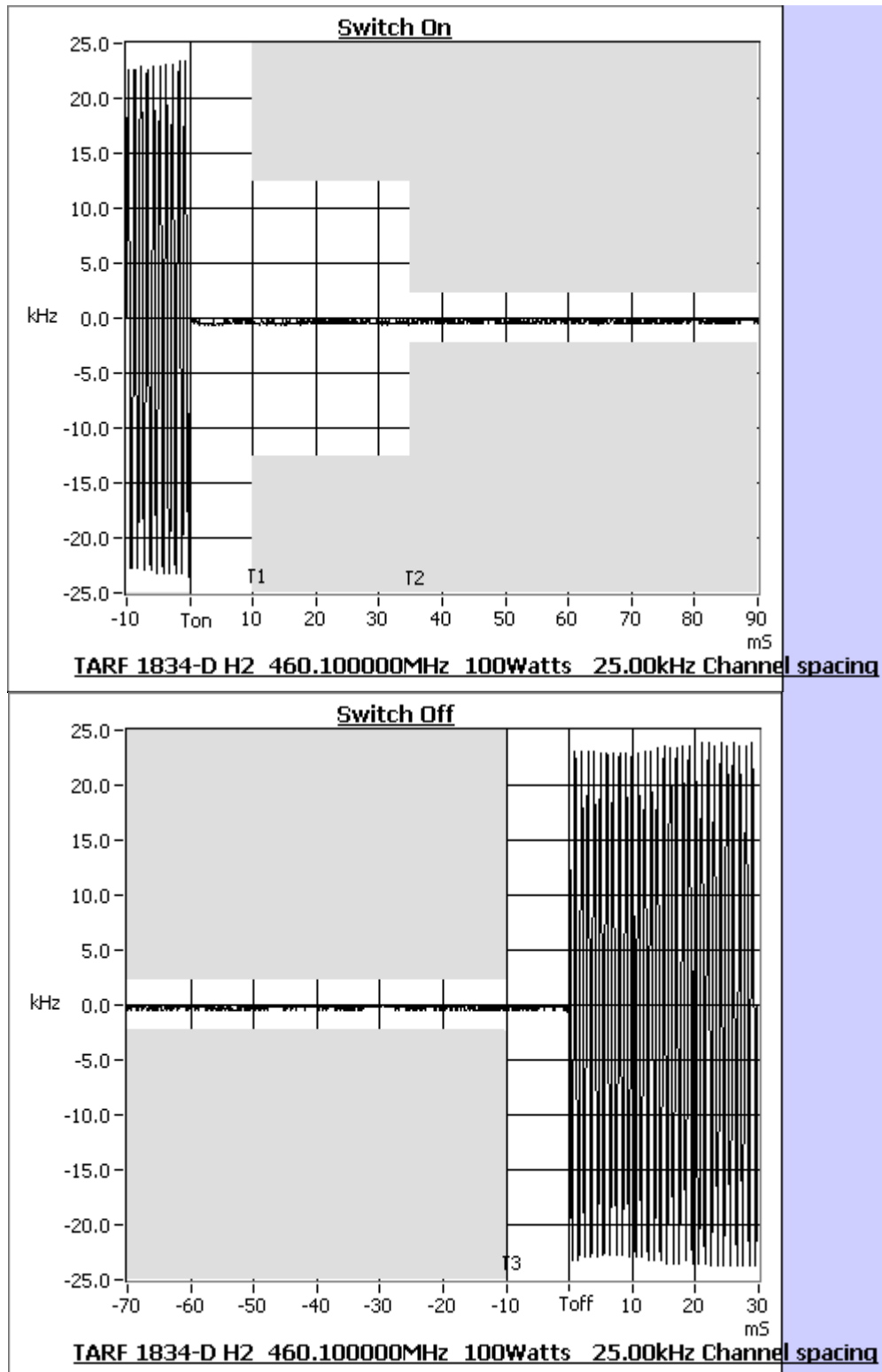
LIMIT:

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: 460.1 MHz 100 W 25.0 kHz Channel Spacing



TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 495.1 MHz 100 W 12.5 kHz Channel Spacing

FREQUENCY	495.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	0.6	N/A
t ₂	0.3	N/A
t ₃	N/A	-0.6
t ₂ → t ₃ ppm	0.9	
ERROR LIMIT (t ₂ → t ₃) ppm	1.5	

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	

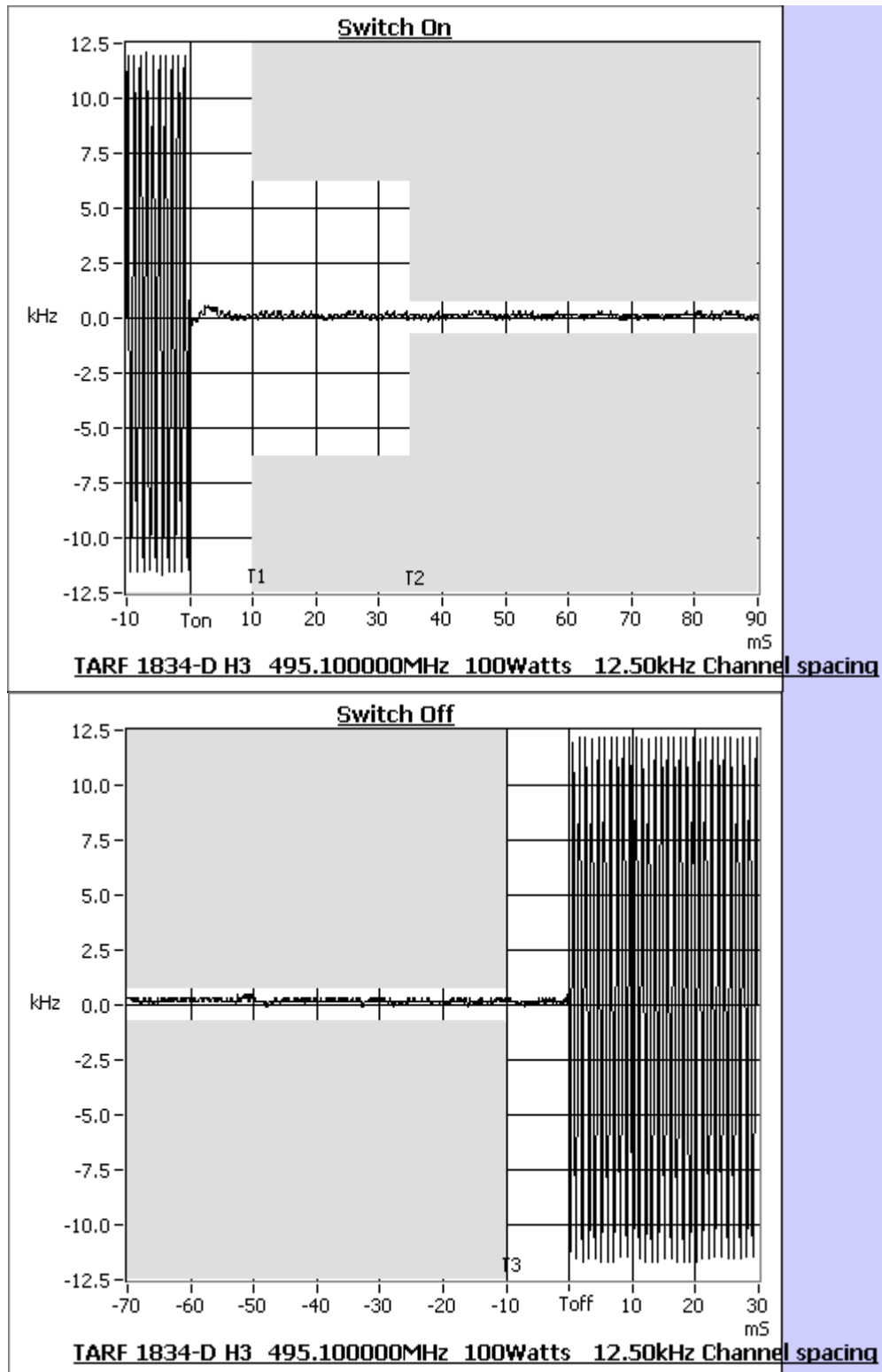
LIMIT:

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: 495.1 MHz 100 W 12.5 kHz Channel Spacing



TRANSIENT FREQUENCY BEHAVIOUR

SPECIFICATION: FCC 47 CFR 90.214

Tx FREQUENCY: 495.1 MHz 100 W 25.0 kHz Channel Spacing

FREQUENCY	495.1 MHz @ 100 W Tx	
TRANSIENT RESPONSE PERIOD	CARRIER PEAK VARIATION FROM NORMAL	
	Key ON (kHz)	Key OFF (kHz)
t ₁	-1.1	N/A
t ₂	0.4	N/A
t ₃	N/A	0.6
t ₂ → t ₃ ppm	0.7	
ERROR LIMIT (t ₂ → 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	

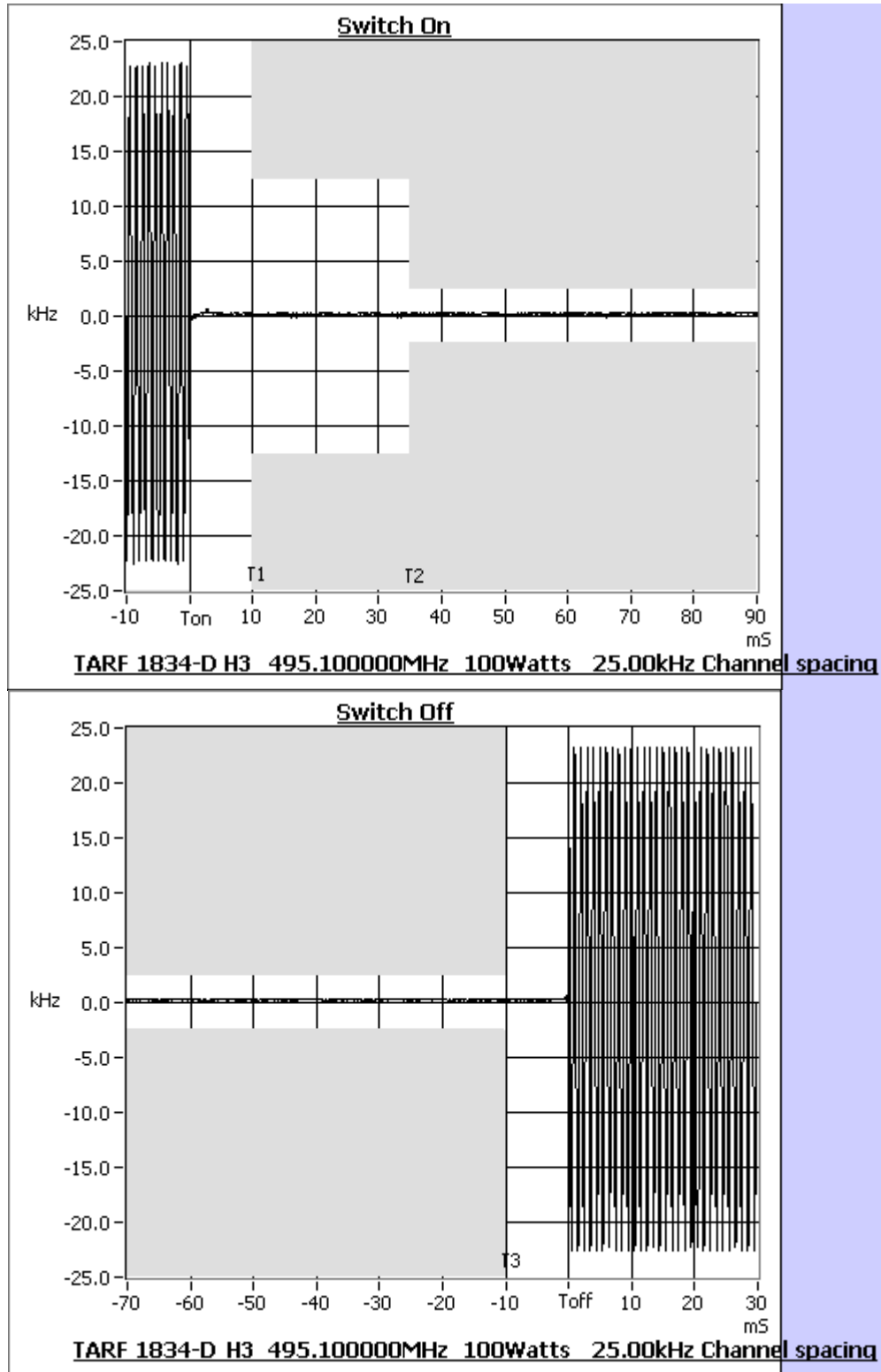
LIMIT:

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: 495.1 MHz 100 W 25.0 kHz Channel Spacing



TEST EQUIPMENT USED

No#	Equipment	Manufacturer	Model No	Serial No#	Tait ID	Cal Due
1	Signal Generator	Hewlett Packard	HP8642B (Opt 001)	2512A00176	E3064	18-Feb-05
2	Signal Generator	Hewlett Packard	HP8648A	3430U00344	E3579	15-Nov-04
3	Signal Generator	Agilent	E4422B	GB40050320	E3788	22-Nov-04
4	Signal Generator	Hewlett Packard	HP8648C	3443U00543	E3558	11-Sep-05
5	Signal Generator	Rohde & Schwarz	SMY01	841736/019	E3553	29-Oct-04
			1062.5502.11			
11	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	2441A00393	E3073	11-Sep-05
13	Audio Analyser	Hewlett Packard	HP8903A	2308A02597	E3074	15-Nov-04
20	Power Supply	Hewlett Packard	HP6032A	2441A-0041Z	E3075	15-Nov-04
21	Power Supply	Rohde & Schwarz	NGS M32/10	Fnr 434	E3556	14-Jun-05
			192.0810.31			
22	Oscilloscope	Tektronics	TDS340	B013611	E3585	25-Nov-04
24	Environ. Chamber	Contherm	Spatial Cal	E3397	E3397	04-Mar-05
24	Environ. Chamber	Contherm	Temp Control	E3397	E3397	04-Mar-05
62	RF Attenuator 150W	Weinschel	57-10-34	LB590	E3674	20-Jul-05
65	RF Attenuator 50W	Weinschel	24-20-44	AW1266	E3562	28-Jun-05
66	RF Attenuator 25W	Weinschel	33-20-33	BD5871	E3673	14-Jul-05
67	RF Attenuator 150W	Weinschel	40-20-33	CJ405	E3733	28-Jun-05
	Treva					
82	3m Coax Cable BLUE)	Suhner	Sucoflex 104A	25033/4A	E3694	30-Oct-04
83	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25006/4A	E3693	30-Oct-04
84	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25005/4A	E3692	15-Jul-05
85	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25004/4A	E3691	15-Jul-05
86	1m Coax Cable (BLUE)	Suhner	Sucoflex 104A	25003/4A	E3690	13-Aug-05
87	Audio Analyser	Hewlett Packard	HP8903B	2818A04275	E3710	25-Nov-04
100	Oscilloscope	Tektronics	TDS380	B017095	E3782	16-Nov-04
111	Modulation Analyser	Hewlett Packard	HP8901B (Opt 002)	3704A05837	E3786	15-Nov-04
114	Signal Generator	Rohde & Schwarz	SML03		E4050	28-Nov-04
			1090.3000.13			
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	Weinschel	40-20-23	MF817	E4082	17-May-05
	Treva					
123	Spectrum Analyser	Agilent	E4445A	MY42510072	E4139	23-Apr-05
135	Attenuator	Weinschel	67-30-33	BR0531	E4280	13-Aug-05

APPENDIX A

TEST SETUP DETAILS

Testing is performed using the Teltest Radio **EVAL**uation system (TREVA), which is configured as shown below. The Spectrum Analyser is connected to the EUT via the attenuator network for Conducted Emissions testing, and Occupied Bandwidth.

