849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
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FCC PART 90

TEST REPORT

APPLICANT	KANEMATSU USA INC.
	543 WEST ALGONQUIN ROAD ARLINGTON HEIGHTS, ILLINOIS 60005 USA
FCC ID	IV9BSH16UH
IC Cert No.	IC: 5327A-bSH16UH
MODEL NUMBER	BSH16UH
PRODUCT DESCRIPTION	470 - 520 MHz UHF RADIO
DATE SAMPLE RECEIVED	12/24/2008
DATE TESTED	1/15/2009
TESTED BY	Joe Scoglio
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	3051AUT8TestReport.pdf
TEST RESULTS	☐ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

TABLE OF CONTENTS

ATTESTATIONS

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name: *Mario de Aranzeta*

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: January 22, 2009

REPORT SUMMARY

Disclaimer	The test results relate only to the items tested.
Purpose of Test	To demonstrate the DUT in compliance with FCC CFR 47, Part 90 requirements for two-way VHF/UHF radios. To demonstrate the DUT in compliance with IC RSS-119 requirements for two-way VHF/UHF radios.
Test Standards	ANSI/TIA 603-C: 2004, FCC CFR 47 Part 90 ANSI C63.4: 2003, RSS-119, FCC Pt 15.109
Related Approval	Receiver verified.

TEST ENVIRONMENT AND TEST SETUP

Test Facility	RF output power and radiated emission were conducted by Timco Engineering Inc. located at 849 NW State Road 45, Newberry, FL 32669 USA
Laboratory Test Condition	The temperature was 26ºC with a relative humidity of 50%.
Deviation from the standards	No deviation
Modification to the DUT	No modification was made.
Test Exercise (software etc.)	The DUT was placed in continuous transmitting mode of operation.
System Setup	Stand alone device.

DUT SPECIFICATION

DUT Description	470 – 520 MHz UHF RADIO
FCC ID	IV9BSH16UH
IC Cert. No.	IC: 5327A-bSH16UH
Model Number	BSH16UH
Operating Frequency	USA: 470 – 512 MHz Other Regions: 470 – 520 MHz
RF PowerOutput	4 Watts (conducted)
Type of Emission	16K0F3E/11K0F3E
Modulation	FM
DUT Power Source	☐ 110–120Vac/50– 60Hz
	☐ DC Power 12V
	☒ Battery Operated Exclusively (7.4 Vdc)
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☐ Mobile
	☒ Portable

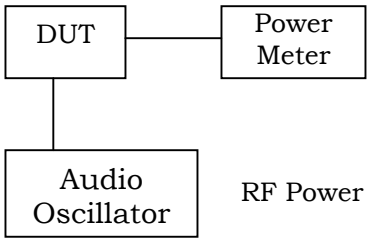
EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/07	12/7/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/07	12/7/09
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/07	12/8/09
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/07	12/8/09
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/07	4/29/09
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	CAL 12/29/08	12/29/10
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 7/16/07	7/16/09

TEST PROCEDURE

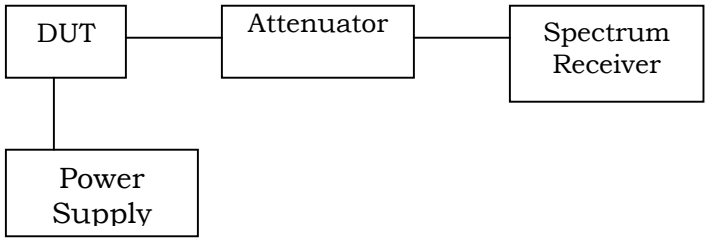
Power Line Conducted Interference
The procedure used was ANSI 63.4-2003 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

RF Power Output
The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:



RF Power Output Test Setup

Spurious Emissions At Antenna Terminals (Conducted)
The carrier was modulated 100%. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004



Radiation Interference
The test procedure used was ANSI/TIA-603-C: 2004 and ANSI C63.4-2003 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

Modulation Characteristic

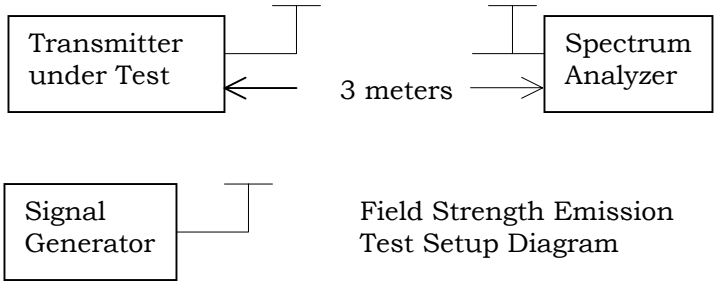
Audio frequency response
The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Low Pass Filter
The audio low pass filter for voice-modulated equipment was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Input versus modulation
The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Frequency Stability
The frequency stability was measured per ANSI/TIA 603-C: 2004.

Field Strength of Spurious Emissions
The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method.



Field Strength Emission Test Setup Diagram

RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), Part 90

Test Requirements: Part 2.1046(a), Part 90

Test Data:

OUTPUT POWER: HIGH – 4.0 Watts
LOW - 1.0 Watts

Part 2.1033 (C)(8) DC Input into the final amplifier

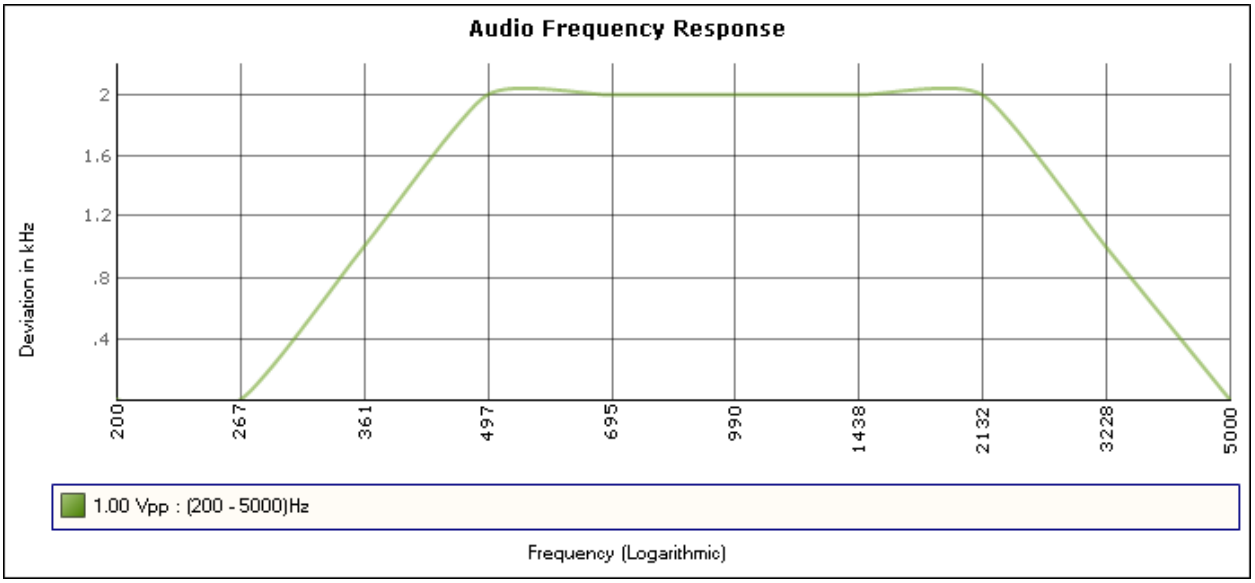
FOR LOW POWER SETTING INPUT POWER: (7.4V)(.89A) = 6.6 Watts
FOR HIGH POWER SETTING INPUT POWER: (7.4V)(1.62A) = 12.Watts

MODULATION CHARACTERISTICS

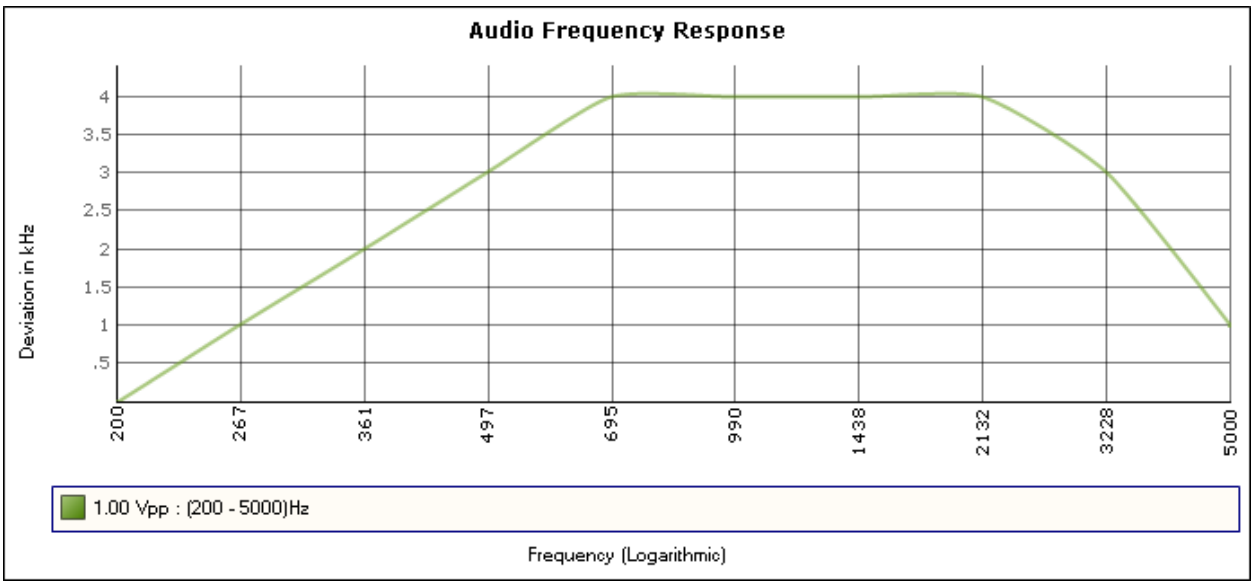
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

AUDIO FREQUENCY RESPONSE PLOT
NARRROW



AUDIO FREQUENCY RESPONSE PLOT
WIDE

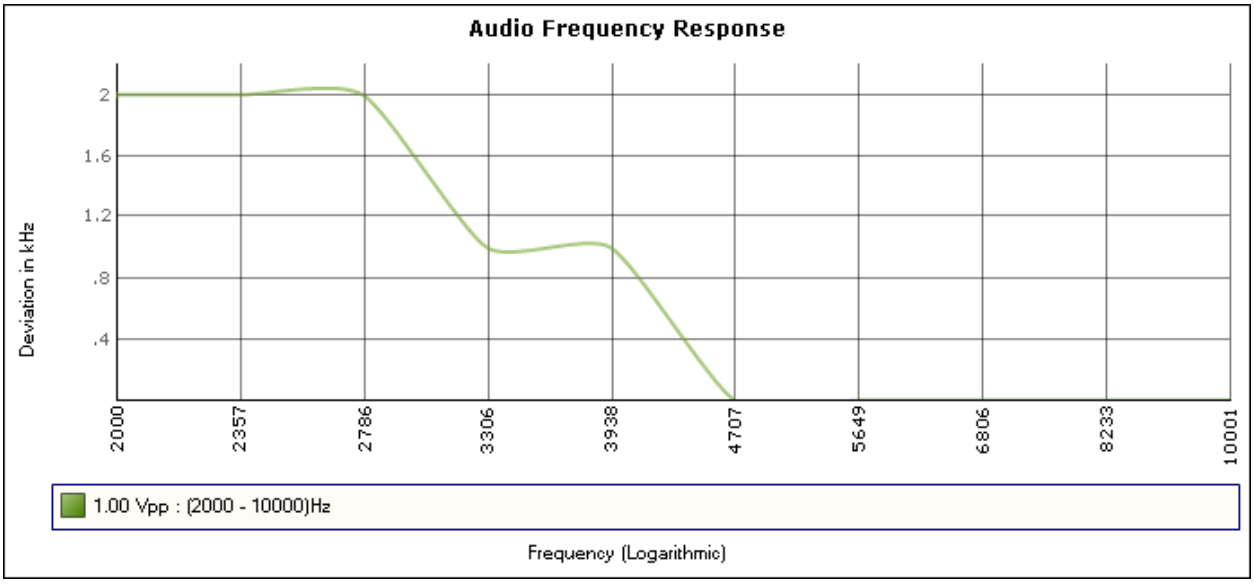


VOICE MODULATED COMMUNICATION EQUIPMENT

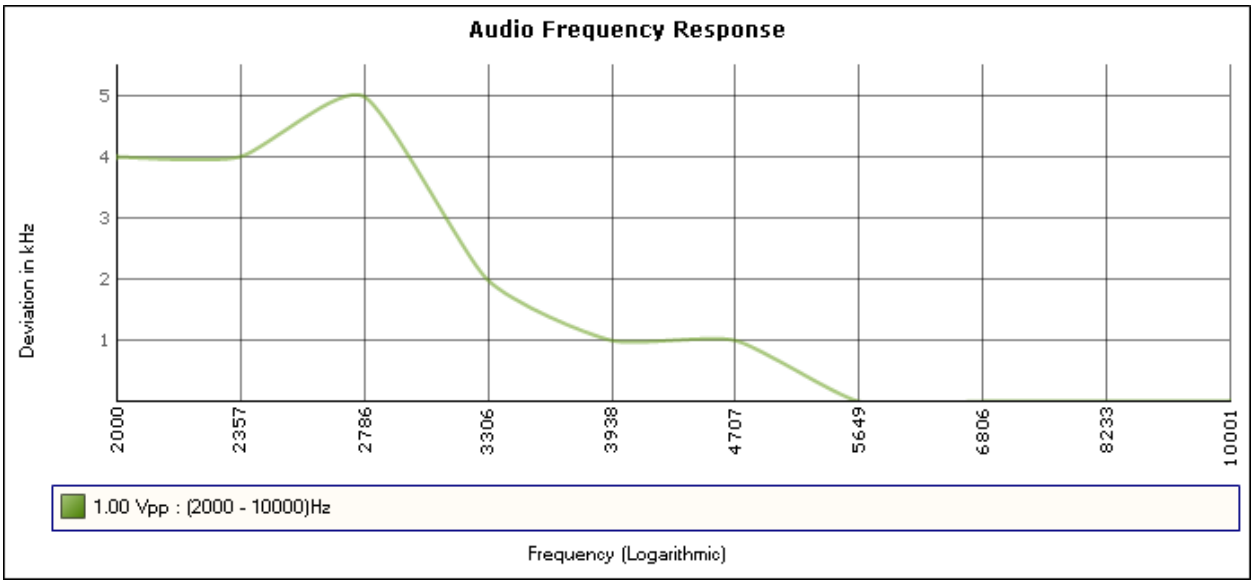
Part 2.1047(a): For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all the circuitry installed between the modulation limiter and the modulated stage shall be submitted.

AUDIO LOW PASS FILTER

AUDIO LOW PASS (NARROW)



AUDIO LOW PASS (WIDE)



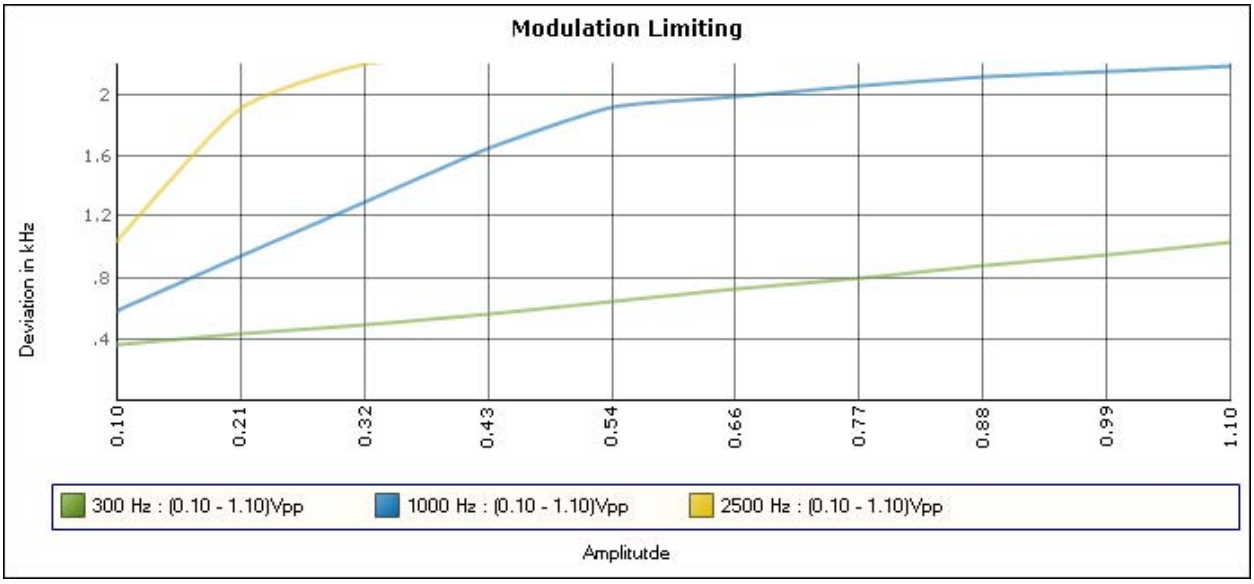
AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 90

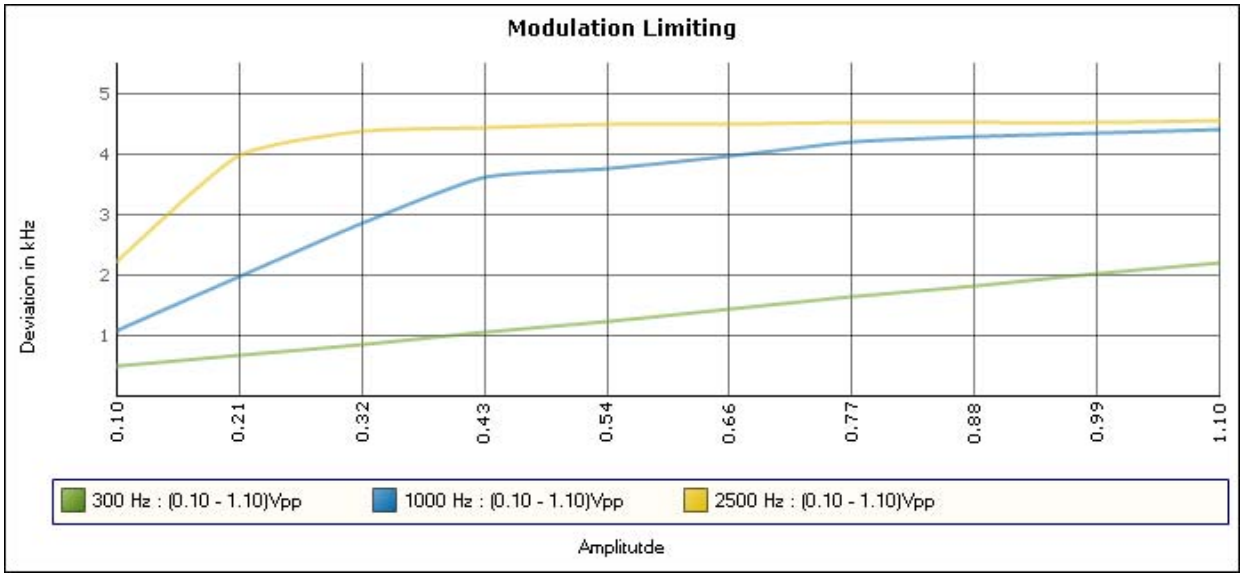
Test Requirements:

Test data:

Modulation Limiting Plot
NARROW



Modulation Limiting Plot
WIDE



OTHER MODULATION CHARACTERISTICS

Part 2.1033(c) (4) Type of Emission: 11K2F3E
Part 90.209
Part 90.207 Bn = 2M + 2DK
M = 3000
D = 2100
K=1
Bn = 2(3000)+2(2100) = 10.2k

Part 2.1033(c) (4) Type of Emission: 16K0F3E
Part 90.209
Part 90.207 Bn = 2M + 2DK
M = 3000
D = 4700
K=1
Bn = 2(3000)+2(4700) = 15.4k

OCCUPIED BANDWIDTH

Rule Part No.: Part 2.1049(c)

Part 90.210(b) 25kHz Channel Spacing
Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least 43 + 10log(P)dB.

Part 90.210(c) 12.5kHz Channel Spacing Not Equipped with a Low Pass Filter
For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the un-modulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz but not more than10 kHz: At least 83 log (fd/5) dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least 29 log(fd2/11)dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least 43+10 log(Po)dB.

Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment
For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 5.625 kHz removed from f0: Zero dB.
(2) On any frequency from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27 (fd - 2.88 kHz) dB.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10log(P) dB or 70 dB, whichever is the lesser attenuation.

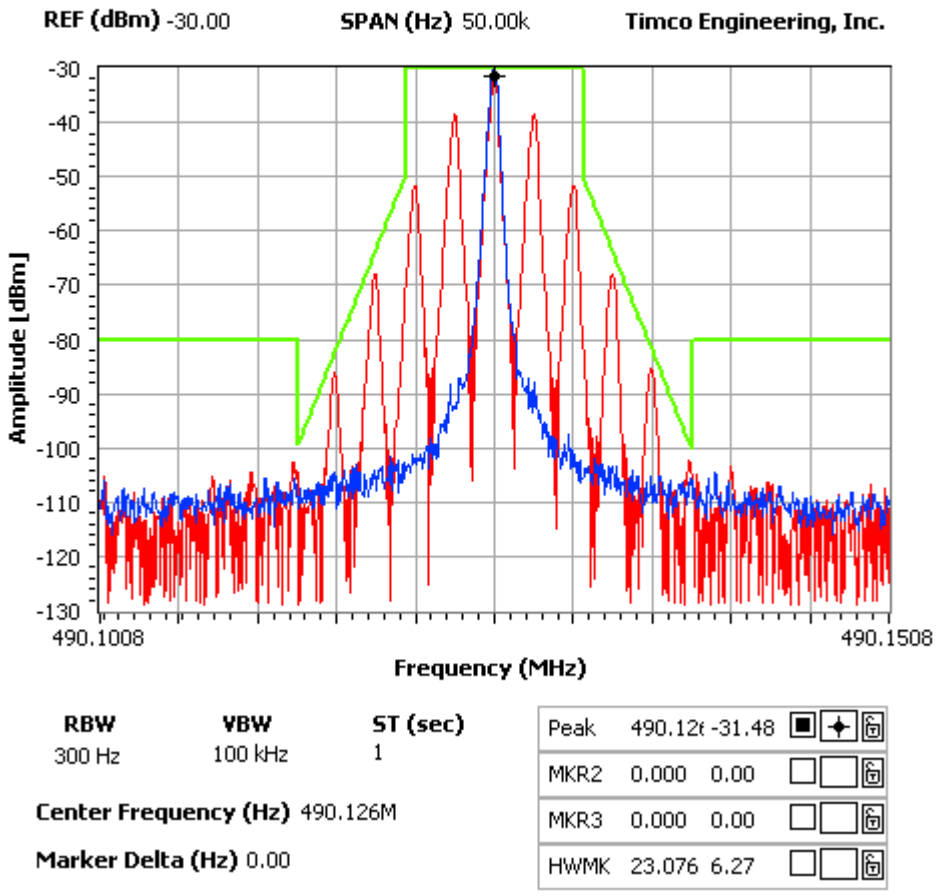
Part 90.210(e) Emission Mask E – 6.25 kHz channel BW equipment
For transmitters designed to operate with a 6.25 kHz bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f0 to 3.0 kHz removed from f0: Zero dB.
(2) On any frequency from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd – 3.0 kHz) or 55 + 10 Log(P) or 65, whichever us the lesser attenuation.
(3) On any frequency removed from the center of the authorized bandwidth by more than 4.6kHz: At least 55 + 10log(P) dB or 65 dB, whichever is the lesser attenuation.

Test Data: See the plots below

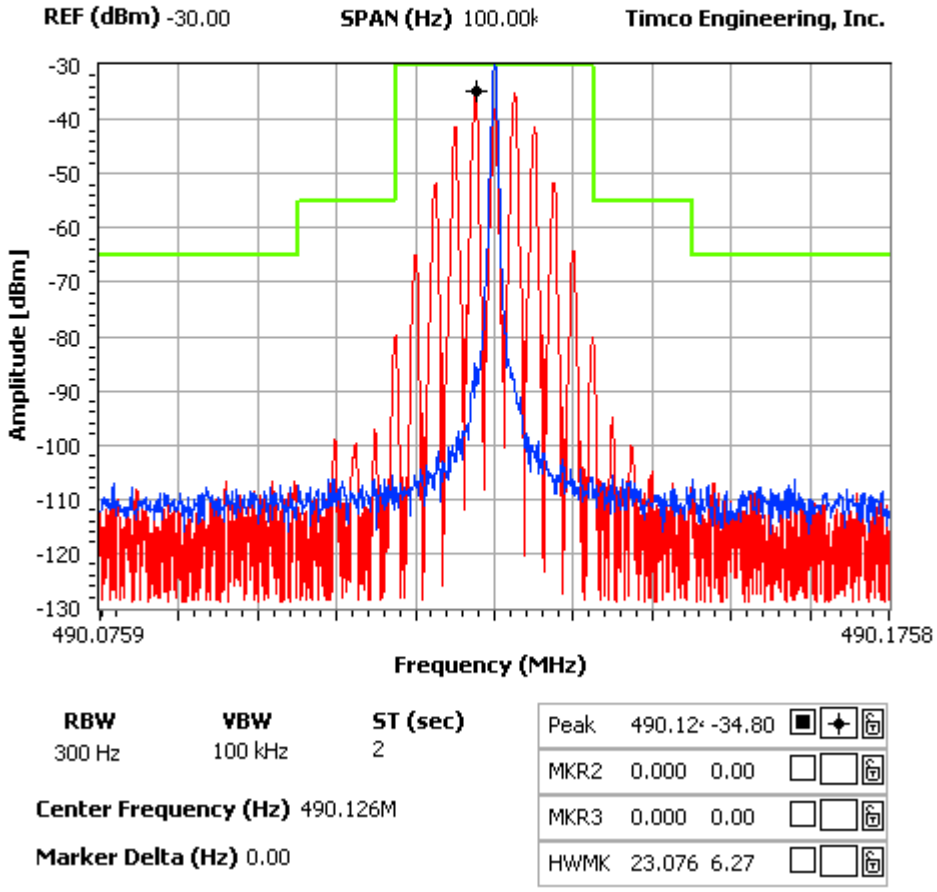
Part 90.210(d) Emission Mask D - 12.5 kHz channel

NOTES:
Occupied Bandwidth Narrow



NOTES:

Occupied Bandwidth Wide



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 12.5kHz Channel Spacing = 50+10log(4) = 56 dBc
12.5 kHz Channel Spacing = 50+10log(1) = 50 dBc

Test Data:

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
470.1	470.1	0		470.1	470.1	0
470.1	940.2	91.6		470.1	940.2	96.7
470.1	1410.4	98.4		470.1	1410.4	90
470.1	1880.5	95.9		470.1	1880.5	88.4
470.1	2350.6	104.7		470.1	2350.6	107.7
470.1	2820.7	112		470.1	2820.7	108.1
470.1	3290.8	103.4		470.1	3290.8	108.3
470.1	3761.0	95.6		470.1	3761.0	95.8
470.1	4231.1	101.9		470.1	4231.1	102.7
470.1	4701.2	110.5		470.1		

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
490.1	490.1	0		490.1	490.1	0
490.1	980.2	90.2		490.1	980.2	93.8
490.1	1470.3	94.5		490.1	1470.3	100.5
490.1	1960.5	96.4		490.1	1960.5	99.3
490.1	2450.6	109.8		490.1	2450.6	103.9
490.1	2940.7	103.2		490.1	2940.7	106.4
490.1	3434.9	104.2		490.1	3434.9	101.5
490.1	3921.0	92.7		490.1	3921.0	100.5
490.1	4411.1	103.9		490.1	4411.1	102.3
490.1	4901.3	102.2				

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
511.8	511.8	0		511.8	511.8	0
511.8	1023.7	90.9		511.8	1023.7	83.9
511.8	1535.6	89.5		511.8	1535.6	95.6
511.8	2047.5	93		511.8	2047.5	94.2
511.8	2559.3	93.7		511.8	2559.3	100
511.8	3071.2	100.5		511.8	3071.2	106.4
511.8	3583.1	88.7		511.8	3583.1	100.1
511.8	4095.0	93.7		511.8	4095.0	92.2
511.8	4606.9	93.8		511.8	4606.9	110
511.8	5118.8	112.6				

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: 12.5kHz Channel Spacing = 50+10log(4) = 56 dBc
12.5 kHz Channel Spacing = 50+10log(1) = 50 dBc

Test Data:

HI POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
470.10	V	118	79.80	0
940.20	V	29.7	72.00	80.99
1410.30	V	24.6	75.00	84.50
1880.50	H	17.4	72.40	88.52
2350.60	V	27.2	72.90	78.22
2820.70	V	16.7	72.50	87.72
3290.90	V	19.3	69.50	81.83
3761.00	V	12.5	68.70	87.69
4231.10	H	14.2	68.40	85.44
4701.30	H	10.5	67.40	88.14

LOW POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
470.10	V	112.9	79.80	0
940.20	V	31	72.00	74.59
1410.30	H	19.3	75.60	85.30
1880.50	V	16.3	72.60	84.72
2350.60	H	12.5	74.80	89.72
2820.70	H	7.6	74.10	93.32
3290.90	V	8.4	69.50	87.63
3761.00	V	7	68.70	88.09

HI POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
490.10	V	117.2	77.50	0
980.20	V	32.5	71.10	79.03
1470.30	V	24.3	72.50	83.69
1960.50	V	17.7	67.30	84.59
2450.60	V	27.5	69.10	75.49
2940.70	V	20	70.80	84.19
3430.90	V	21.4	69.40	81.08
3921.00	V	12.8	67.60	87.78
4411.10	H	15.8	68.20	85.05
4901.30	H	9.1	67.00	90.78

LOW POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
490.10	V	111.5	77.50	0
980.20	V	37.4	71.10	68.43
1470.30	V	20.3	72.50	81.99
1960.50	V	15.6	67.30	80.99
2450.60	H	12.5	71.90	87.59
2940.70	V	7.9	70.80	90.59
3430.90	V	7	69.40	89.78
3921.00	V	7.2	67.60	87.68

HI POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
511.80	V	116.6	76.70	0
1023.70	V	38.9	75.40	73.77
1535.60	V	25.7	72.60	82.32
2047.50	V	20.8	66.50	80.71
2559.40	V	21.3	69.20	81.68
3071.20	V	14.2	69.30	88.55
3583.10	H	15.7	70.20	87.68
4095.00	V	13.4	68.50	88.17
4606.90	V	8.4	65.70	90.10

LOW POWER

Emission Frequency MHz	Ant. Polarity	EUT Signal Reading	Signal Generator Reading	dB Below Carrier (dBc)
511.80	V	108.4	76.70	0
1023.70	V	36.1	75.40	68.37
1535.60	V	22.1	72.60	77.72
2047.50	H	18	70.00	78.81
2559.40	V	16	69.20	78.78
3071.20	V	9.7	69.30	84.85
3583.10	V	12.7	69.00	81.28
4095.00	H	13.1	69.00	80.77

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 90.213

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%
±2.5 PPM

Method of Measurements: ANSI/TIA 603-C: 2004.

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	490.125488	-0.47
-20	490.125441	-0.56
-10	490.125455	-0.53
0	490.125499	-0.44
+10	490.125563	-0.31
+20	490.125668	-0.10
+30	490.125746	0.06
+40	490.125786	0.14
+50	490.125848	0.27

Assigned Frequency (Ref. Frequency) (MHz)		
Battery %	Frequency (MHz)	Frequency Stability (PPM)
-15%	490.125743	0.05
0	490.125717	
+15%	490.125739	0.04

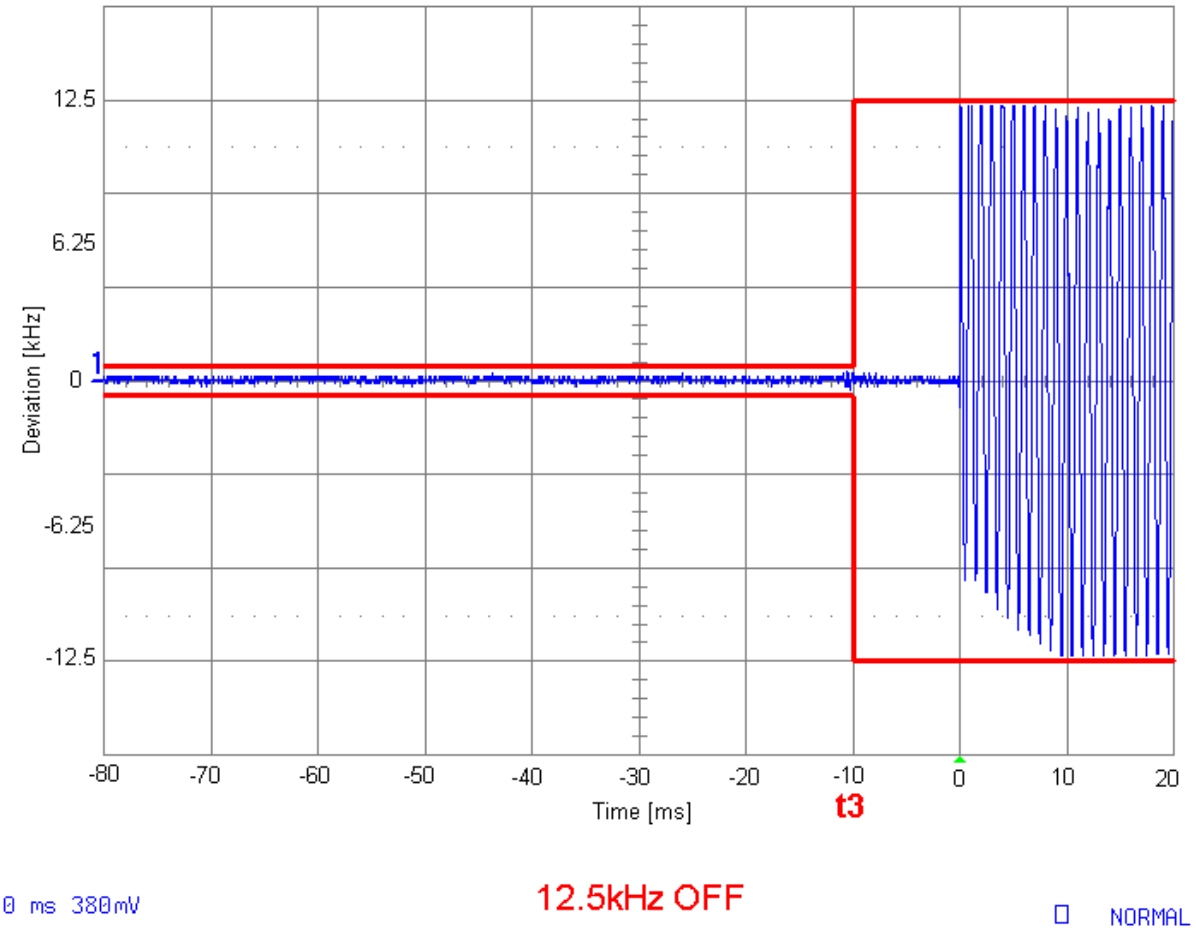
TRANSIENT FREQUENCY BEHAVIOR

Part 90.214 Transient Frequency Behavior

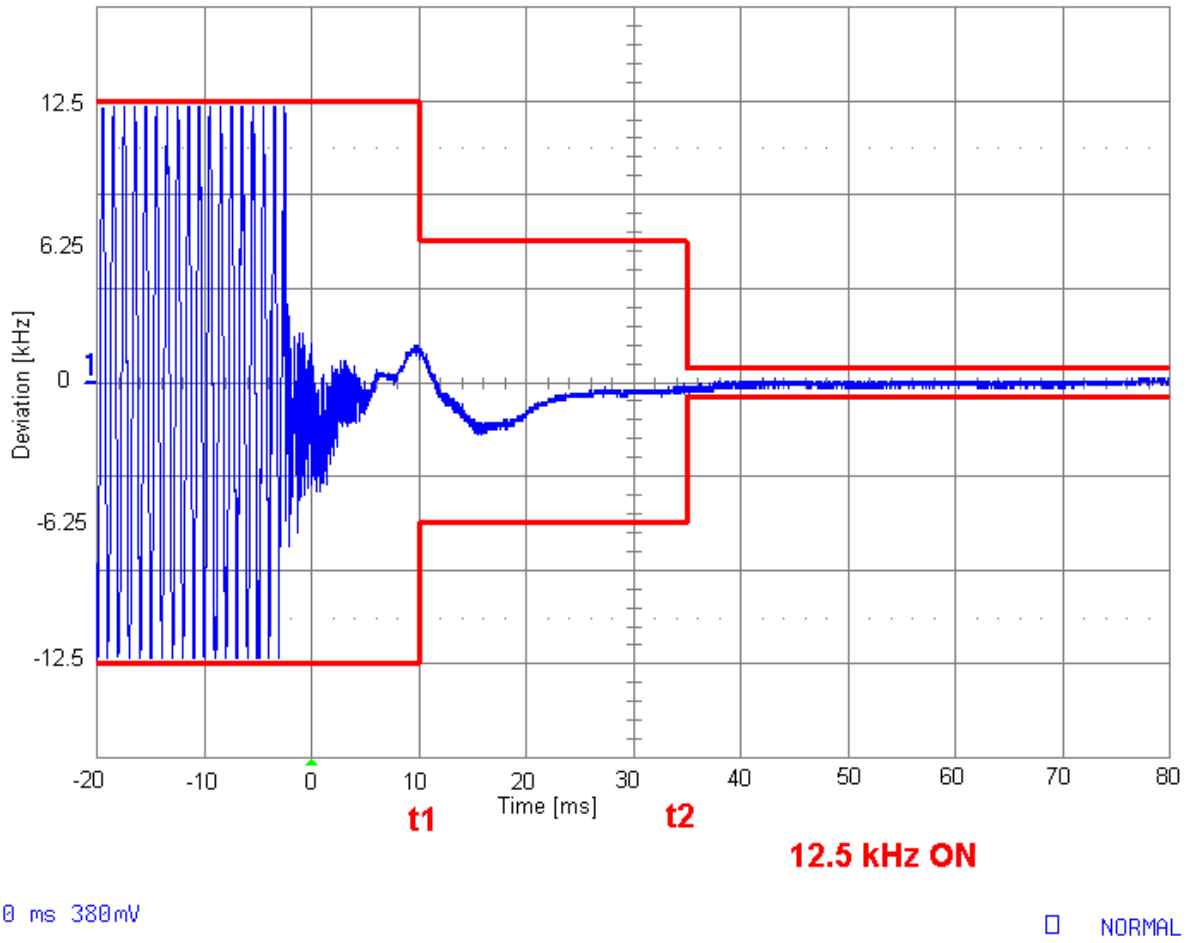
REQUIREMENTS: Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1[4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3[4]	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1[4]	±12.5 kHz	5.0 ms	10.0 ms
t_2	±6.25 kHz	20.0 ms	25.0 ms
t_3[4]	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1[4]	±6.25 kHz	5.0 ms	10.0 ms
t_2	±3.125 kHz	20.0 ms	25.0 ms
t_3[4]	±6.25 kHz	5.0 ms	10.0 ms

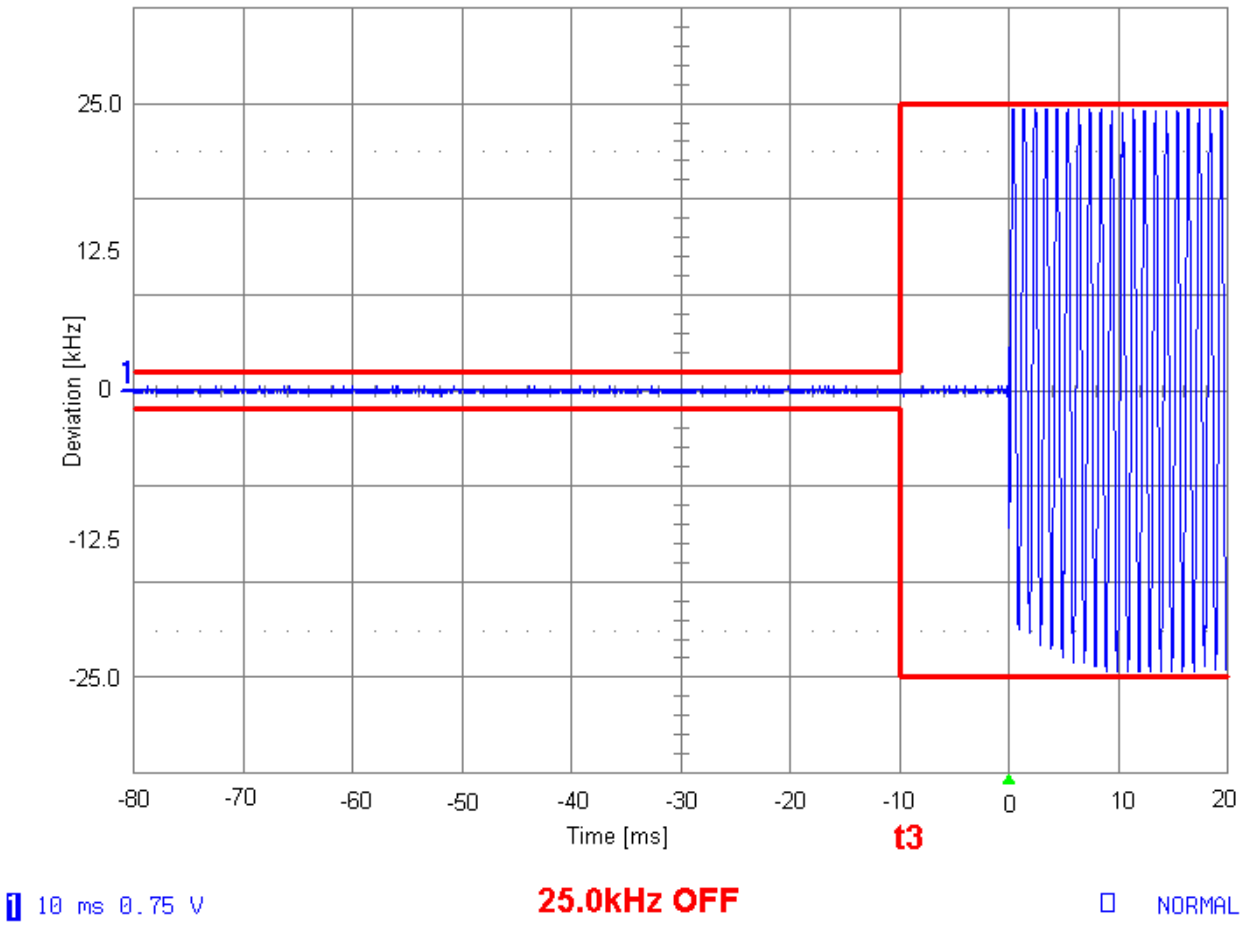
Transient Freq Response Narrow OFF



Transient Freq Response Narrow ON



Transient Freq Response Wide OFF



Transient Freq Response Wide ON