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FCC PART 90 TEST REPORT

APPLICANT	MIDLAND RADIO CORPORATION
	5900 PARRETTA DRIVE
	KANSAS CITY MO 64120 USA
FCC ID	MMA914100D
MODEL NUMBER	91-4100D
PRODUCT DESCRIPTION	100 WATT UHF BASE STATION
DATE SAMPLE RECEIVED	8/11/2008
DATE TESTED	8/15/2008
TESTED BY	Richard Block
APPROVED BY	Mario de Arenzeta
TIMCO REPORT NO.	1812AUT8TestReport.doc
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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STATEMENT OF COMPLIANCE

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.

I attest that the necessary measurements were made by me or under my supervision, at Timco Engineering, Inc. located at 849 N.W. State Road 45, Newberry, Florida 32669 USA.



Testing Certificate # 0955-01



Authorized by:

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

Date: 8/18/2008

GENERAL INFORMATION

DUT Specification

DUT Description	100W UHF BASE STATION
FCC ID	MMA914100D
Model Number	91-4100D
Operating Frequency	485-520 MHz
Type of Emission	11K0F3E, 11K0F2D, 11K0F1D, 11K0F1E, 16K0F3E
Modulation	FM
DUT Power Source	<input type="checkbox"/> 110-120Vac/50- 60Hz
	<input checked="" type="checkbox"/> DC Power 12V
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable
Test Conditions	The temperature was 26°C with a relative humidity of 50%.
Modification to the DUT	None
Test Exercise	The DUT was placed in continuous transmit mode.
Applicable Standards	ANSI/TIA 603-C:2004, FCC CFR 47 Part 90
Test Facility	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA.

Applicant: MIDLAND RADIO CORPORATION

FCC ID: MMA914100D

Report: X:\M\MidlandRadio_MMA\1812AUT8\1812AUT8TestReport.doc

TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/10/10
AC Voltmeter	HP	400FL	2213A14499	CAL 12/29/06	12/29/08
Coaxial Cable #64	Semflex Inc.	60637	Timco #64	CHAR 3/30/07	3/30/09
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	152	CAL 3/3/06	3/3/09
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 4/5/06	4/5/09
Frequency Counter	HP	5385A	2730A03025	CAL 7/6/07	7/6/09
Hygro-Thermometer	Extech	445703	0602	CAL 11/15/07	11/15/09
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/06	12/1/08
Measuring Tape-7.5M	Kraftixx	7.5M PROFI		CHAR 11/13/07	11/13/09
Modulation Analyzer	HP	8901A	3435A06868	CAL 5/9/07	5/9/09
Digital Multimeter	Fluke	FLUKE-77-3	79510405	CAL 5/14/07	5/14/09
System One	Audio Precision	System One	SYS1-45868	CHAR 2/27/08	2/27/10
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 11/30/07	11/30/09
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 11/30/07	11/30/09
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 11/30/07	11/30/09
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 11/30/07	11/30/09
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/08	4/25/10

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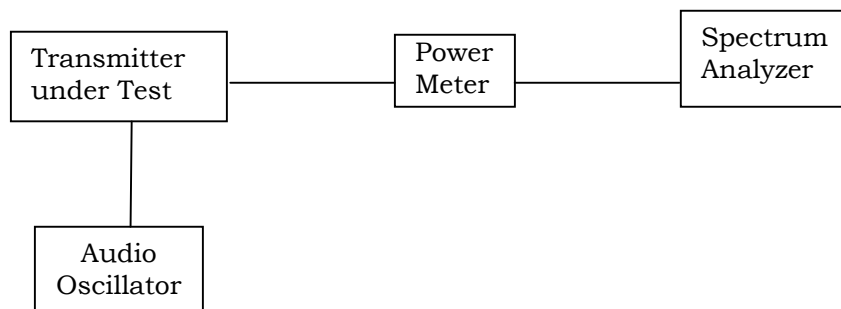
RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), 90.205

Test Requirements:

Method of Measurement: RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

Test Setup Diagram:



Test Data:

OUTPUT POWER: 100 Watts

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

$$(12.0V)(16.0A) = 192 \text{ Watts}$$

MODULATION CHARACTERISTICS

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

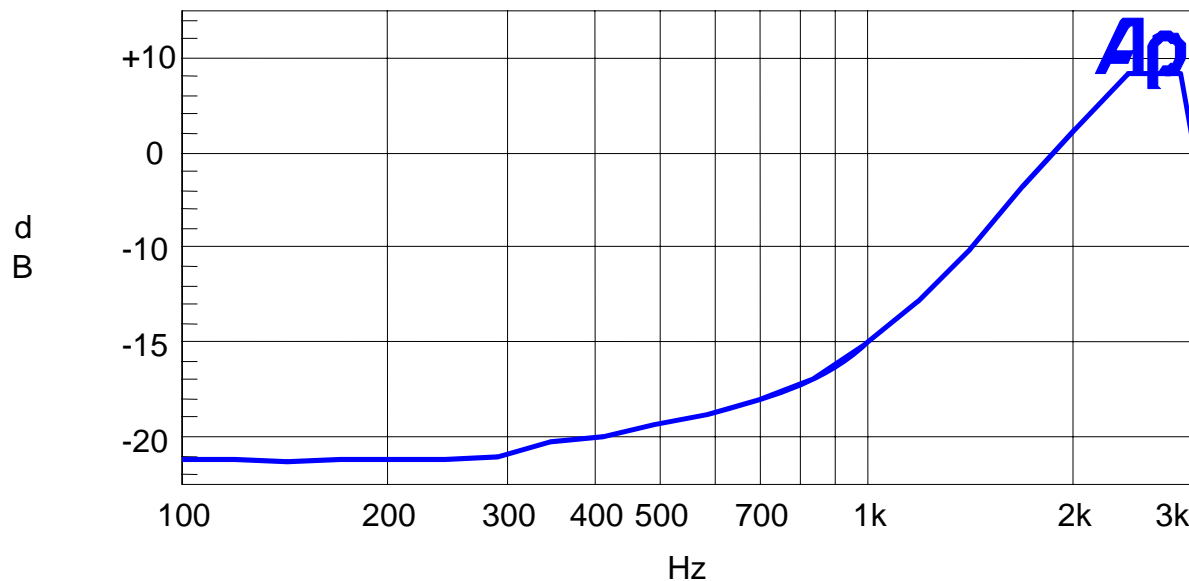
Test Requirements:

Method of Measurement:

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C:2004. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000 Hz shall be submitted. The audio frequency response curve is shown below.

Audio Frequency Response



VOICE MODULATED COMMUNICATION EQUIPMENT

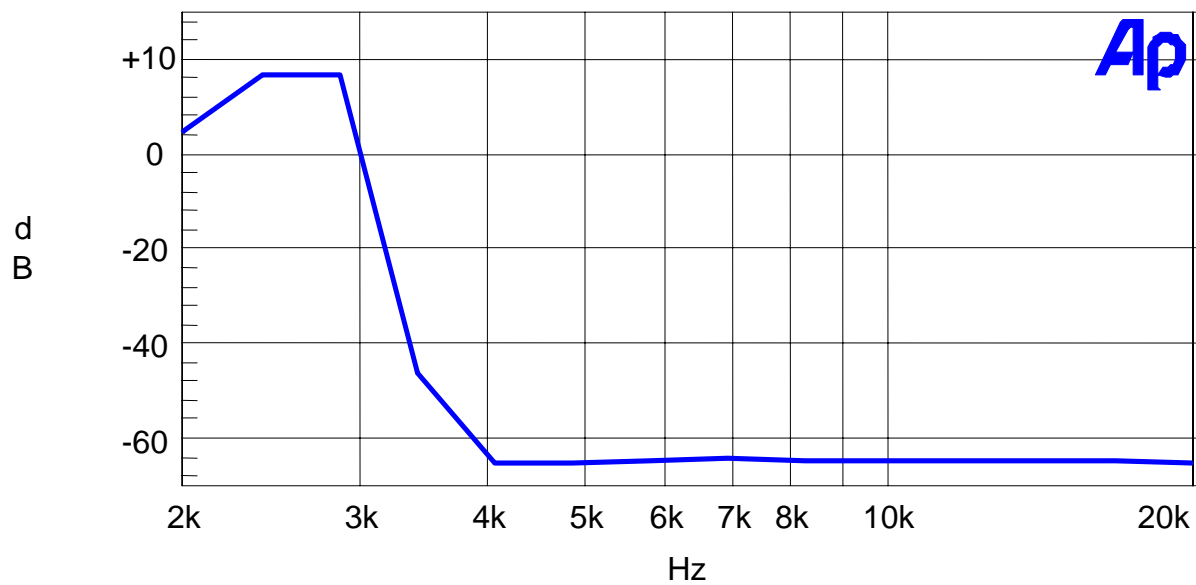
Rule Part No.: Part 2.1047(a)

Test Requirements:

Method of Measurement:

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 INPUT VERSUS MODULATION

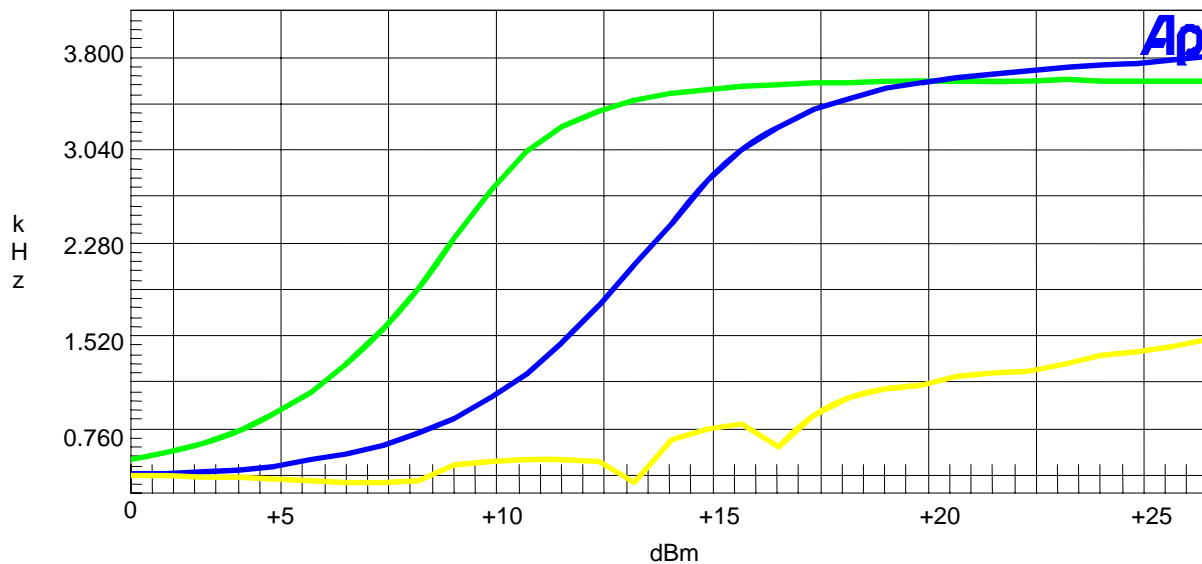
Rule Part No.: Part 2.1047(b) & 90

Test Requirements:

Method of Measurement: Modulation should not exceed 100%, The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C:2004. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

Test data:

Modulation Limiting Plot 25.0kHz
2.5 KHz (Green), 1.0 KHz (Blue), and 300 Hz (Yellow)

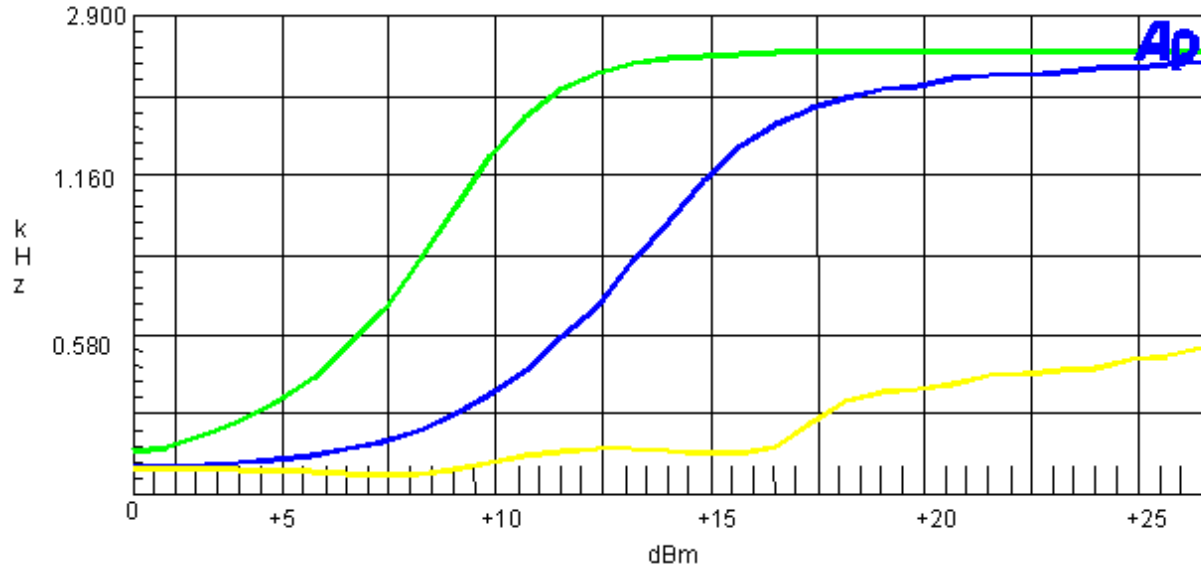


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Modulation Limiting Plot 12.5kHz
 2.5 KHz (Green), 1.0 KHz (Blue), and 300 Hz (Yellow)



OCCUPIED BANDWIDTH: Part 2.1049

Part 2.1049(c) Emission Bandwidth
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 $43 + 10\log(P)$ 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 (f_d in kHz) of more than 5 kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d/11)$ 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 $43+10 \log(P_o)$ 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 f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27 (f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.

OTHER MODULATION CHARACTERISTICS

Part 2.1033(c)

Part 2.1033(c) (4) Type of Emission: 11K0F1D , 11K0F2D, and 11K0F1E

Part 90.209

Part 90.207 $B_n = 2M + 2DK$

$$M = B/2 = 9600/2 = 4800$$

$$D = 800$$

$$K=1$$

$$B_n = 2(4800) + 2(700) = 11.0k$$

Part 2.1033(c) (4) Type of Emission: 11K0F3E

Part 90.209

Part 90.207 $B_n = 2M + 2DK$

$$M = 3000$$

$$D = 2500$$

$$K=1$$

$$B_n = 2(3000) + 2(2500) = 11.0k$$

Part 2.1033(c) (4) Type of Emission: 16K0F3E

Part 90.209

Part 90.207 $B_n = 2M + 2DK$

$$M = 3000$$

$$D = 3800$$

$$K=1$$

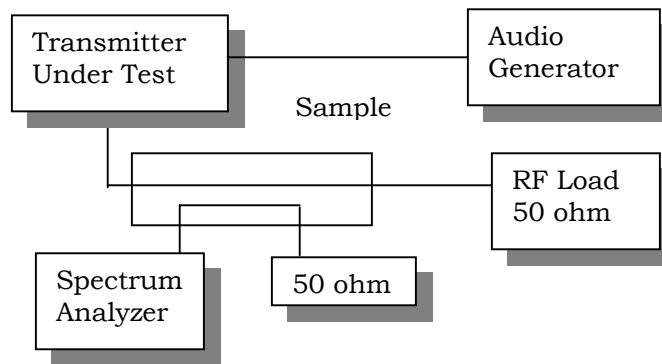
$$B_n = 2(3000) + 2(3800) = 13.6 k$$

OCCUPIED BANDWIDTH

Test Requirements:

Method of Measurement: ANSI/TIA 603-C:2004 para 2.2.11

Test Setup Diagram:

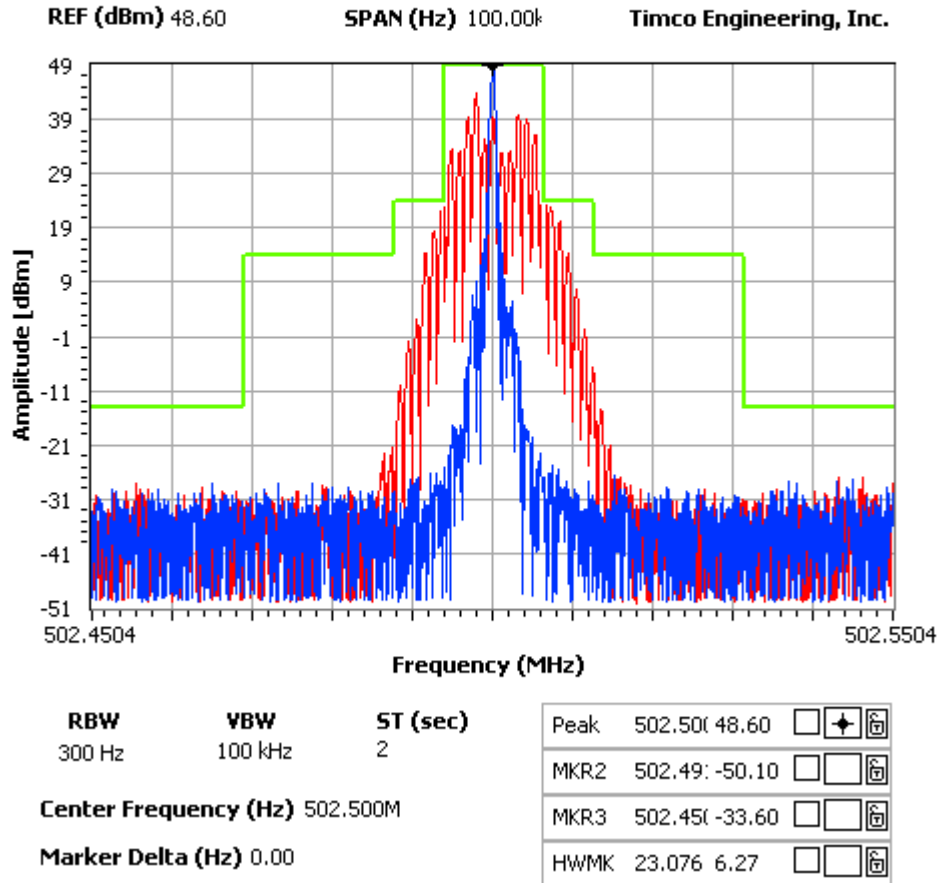


Test Data: See the plots below

NOTES:

OCCUPIED BANDWIDTH -- 25.0kHz
 MIDLAND RADIO CORPORATION -- FCC ID: MMA914100D

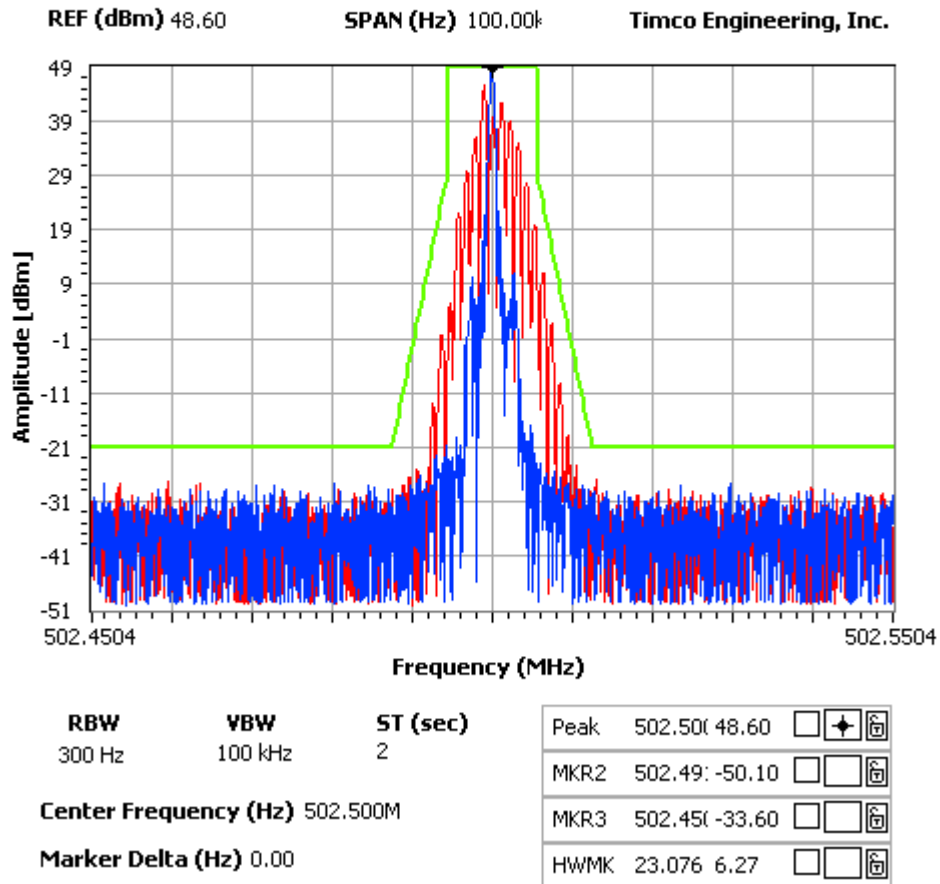
FCC 90.210 Mask B



NOTES:

OCCUPIED BANDWIDTH -- 12.5kHz
 MIDLAND RADIO CORPORATION -- FCC ID: MMA914100D

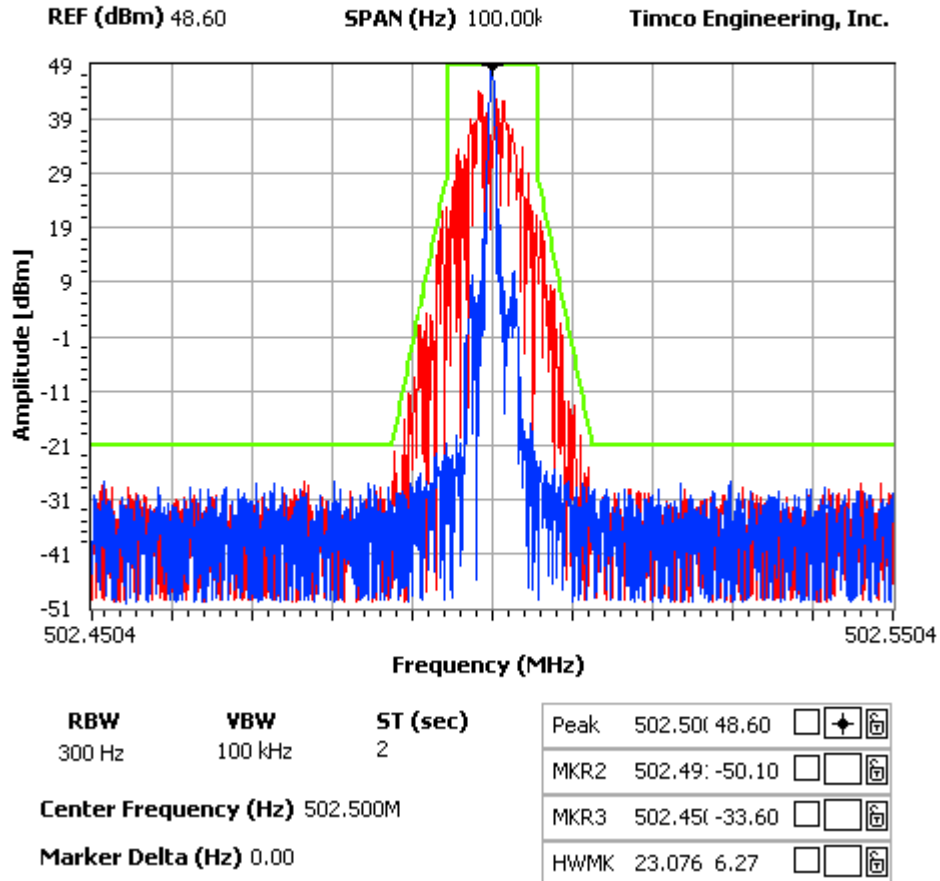
FCC 90.210 Mask D



NOTES:

OCCUPIED BANDWIDTH -- DIGITAL
 MIDLAND RADIO CORPORATION -- FCC ID: MMA914100D

FCC 90.210 Mask D



SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

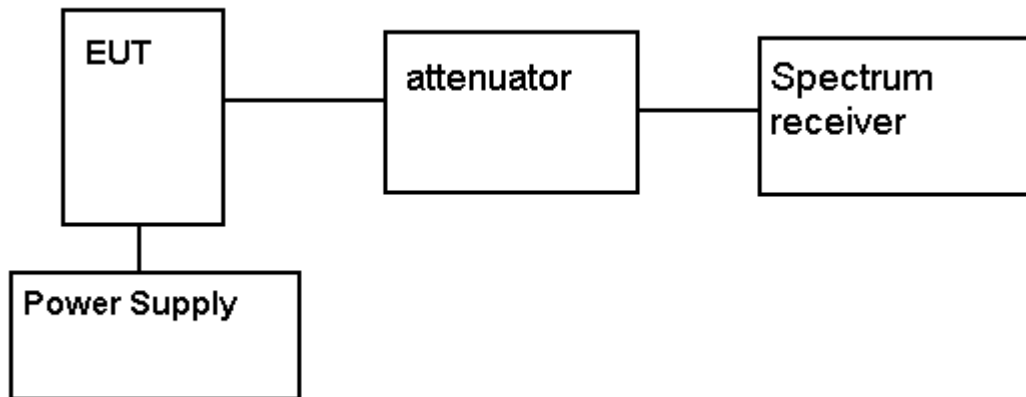
Requirements: 12.5 kHz Spacing = $50+10\log(100) = 70.0$ dB

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA-603-C:2004.

Test Data:

EF	dB below carrier		EF	dB below carrier		EF	dB below carrier
485.000	0.0		502.500	0.0		520.000	0.0
970.000	95.9		1005.000	93.1		1040.000	87.8
1455.000	102.8		1507.500	96.3		1560.000	104.1
1940.000	106.5		2010.000	105.5		2080.000	105.1
2425.000	103.8		2512.500	105.9		2600.000	107.3
2910.000	98.5		3015.000	103.9		3120.000	105.5
3395.000	105.3		3517.500	102.7		3640.000	100.7
3880.000	101.8		4020.000	97.7		4160.000	90.8
4365.000	103.5		4522.500	100.9		4680.000	105.5
4850.000	102.3		5025.000	102.6		5200.000	97.7

METHOD OF MEASURING CONDUCTED SPURIOUS EMISSIONS



METHOD OF MEASUREMENT: The procedure used was ANSI/TIA-603-C:2004. The measurements were made at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

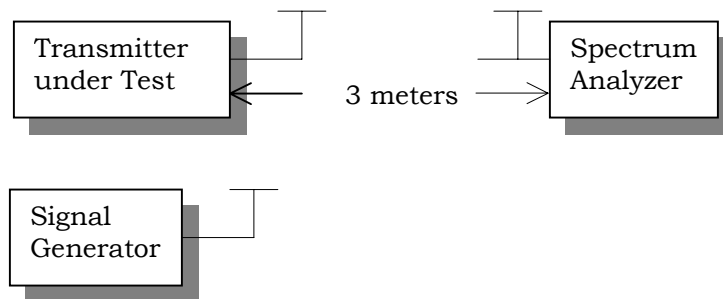
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

Method of Measurement: The tabulated data shows the results of the radiated field strength emissions test. 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. Measurements were made at the test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

Test Setup Diagram:



Test Data:

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
485.00	0	0.00
970.00	H	112.57
1455.00	V	96.73
1940.00	V	90.63
2425.00	V	93.03
2910.00	V	82.73
3395.00	H	94.02
3880.00	H	89.22
4365.00	H	89.69
4850.00	H	93.92

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
502.50	0	0
1005.00	H	101.02
1507.50	V	98.87
2010.00	V	91.56
2512.50	V	97.83
3015.00	V	89.80
3517.50	H	90.63
4020.00	H	95.42
4522.50	H	95.95
5025.00	H	91.14

Emission Frequency MHz	Ant. Polarity V/H	dB Below Carrier (dBc)
520.00	0	0
1040.00	V	93.62
1560.00	V	92.87
2080.00	V	98.56
2600.00	H	100.13
3120.00	H	96.80
3640.00	H	95.93
4160.00	H	94.22
4680.00	H	90.65
5200.00	H	89.64

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FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 90.213

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation +, -15%
±1.5 PPM

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

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		502.500344
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	502.500235	-0.22
-20	502.500212	-0.26
-10	502.500275	-0.14
0	502.500386	0.08
+10	502.500407	0.13
+20	502.500516	0.34
+30	502.500525	0.36
+40	502.500452	0.21
+50	502.500429	0.17

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	Frequency (MHz)	Frequency Stability (PPM)
-15%	502.500517	0.34
0	502.500516	0.34
+15%	502.500518	0.35

TRANSIENT FREQUENCY RESPONSE

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

Time Intervals	Maximum frequency difference	150-174 MHz	421-512 MHz
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

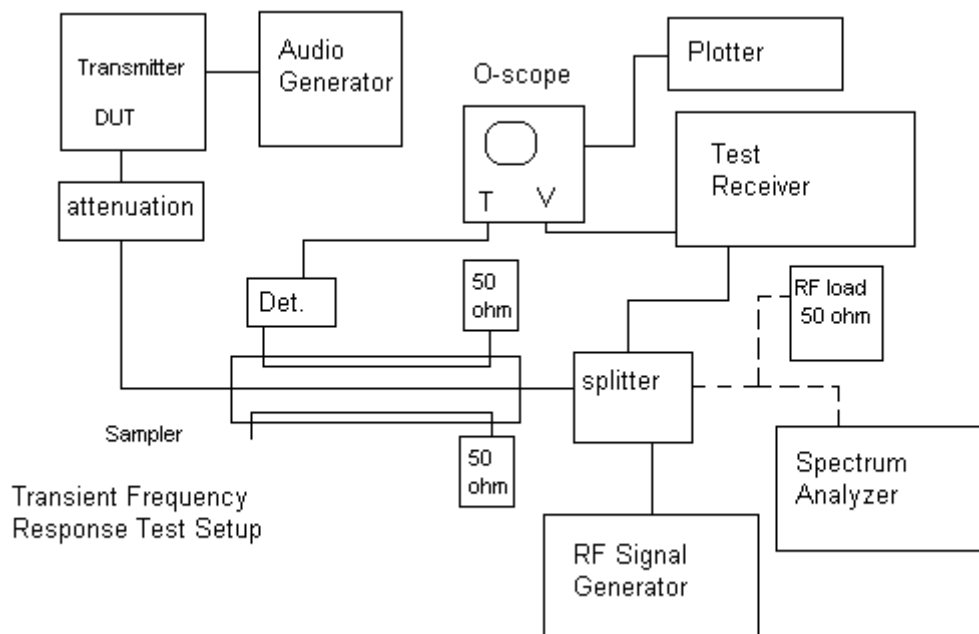
Time Intervals	Maximum frequency difference	150-174 MHz	421-512 MHz
t_1^4	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3^4	± 12.5 kHz	5.0 ms	10.0 ms

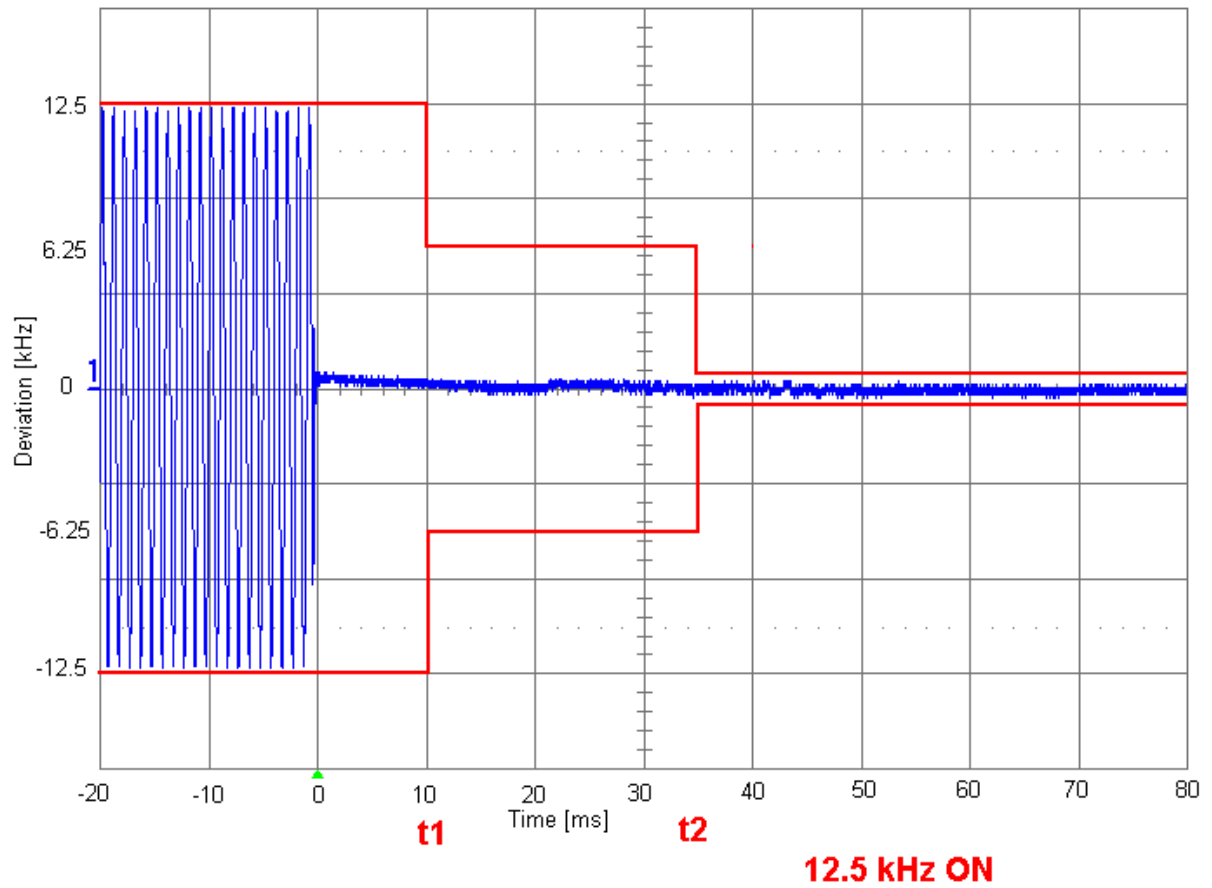
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

Time Intervals	Maximum frequency difference	150-174 MHz	421-512 MHz
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

TEST PROCEDURE: ANSI/TIA 603-C:2004 PARA 2.2.19, the levels were set as follows:

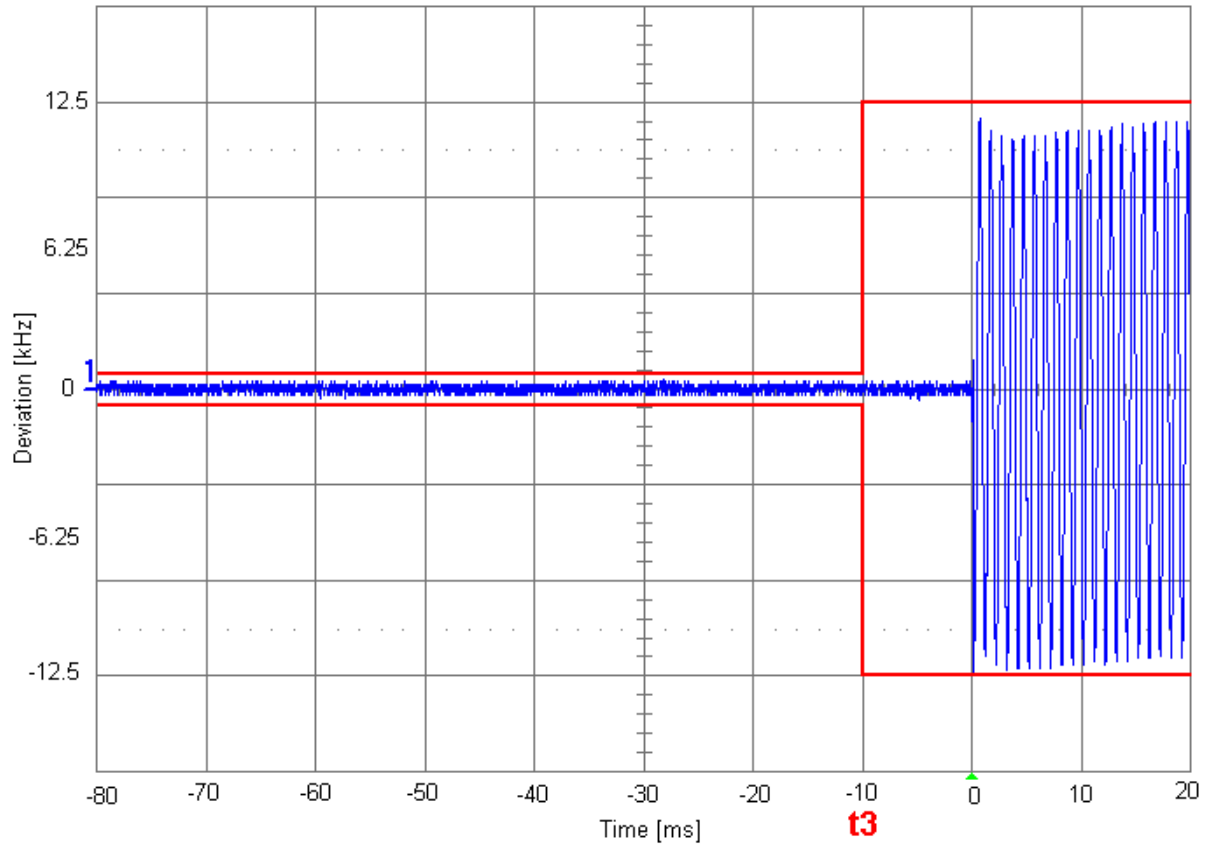
1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.
4. With the levels set as above the transient frequency behavior was observed & recorded.





10 ms 375mV

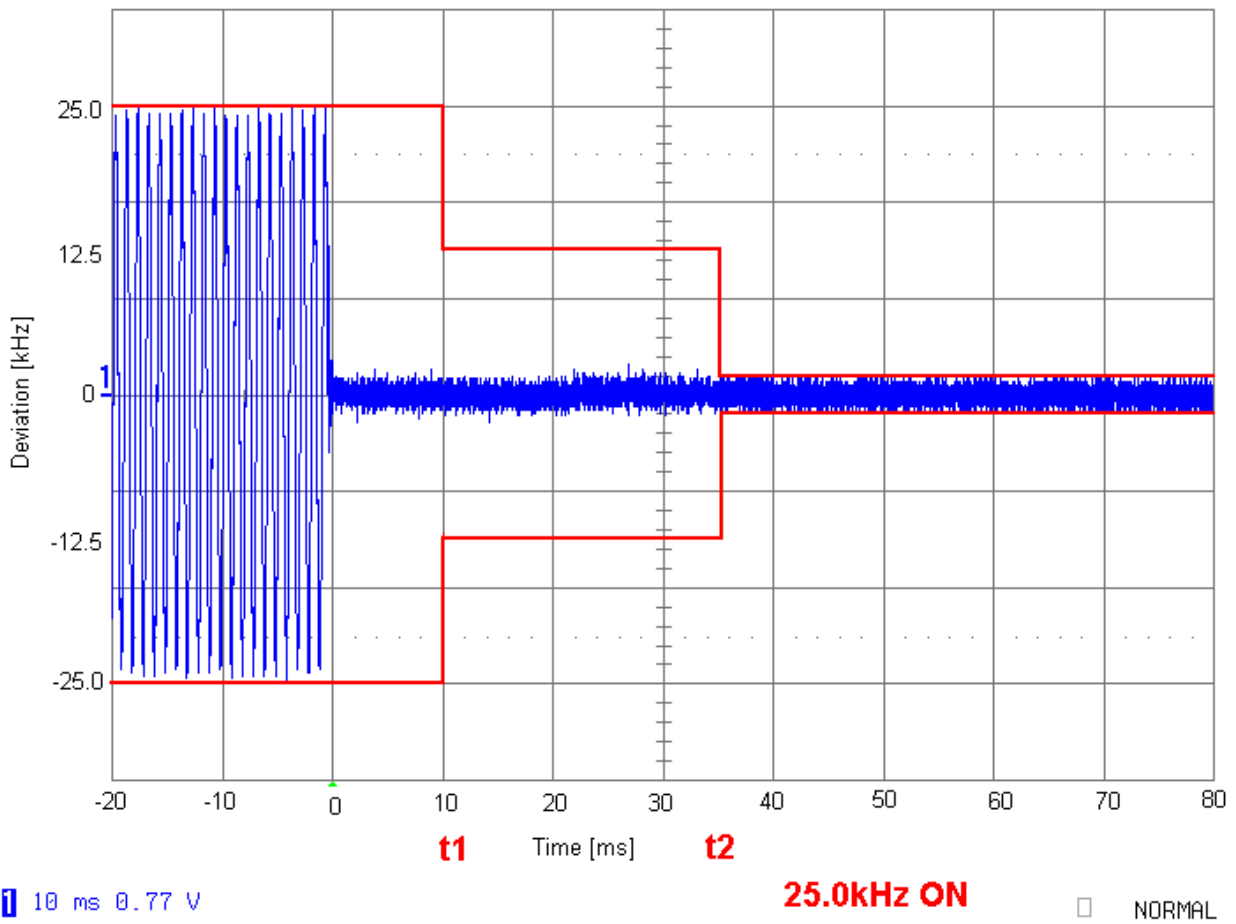
NORMAL

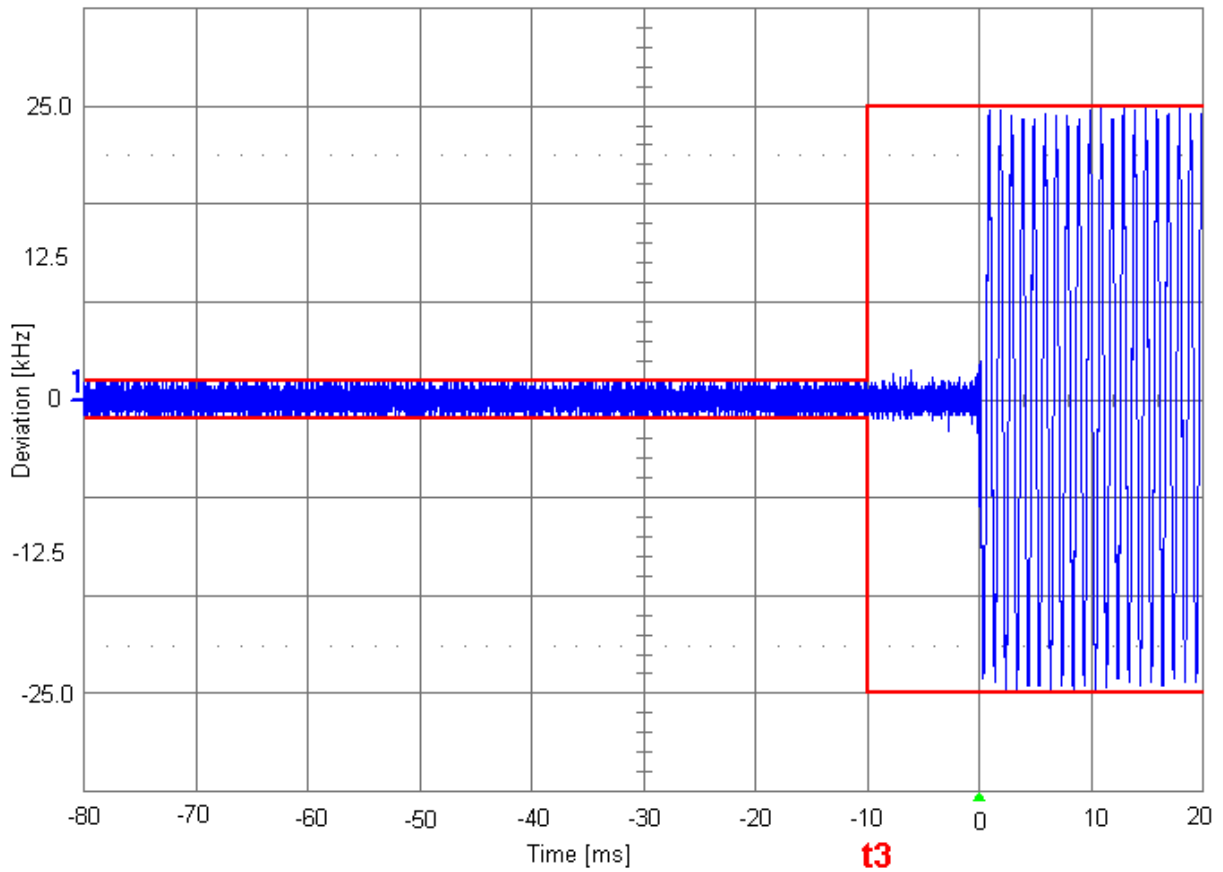


10 ms 395mV

12.5kHz OFF

NORMAL





10 ms 0.77 V

25.0kHz OFF

NORMAL

TEST SET UP PHOTO

