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FCC PART 90 TEST REPORT

APPLICANT	ADVANCED WIRELESS COMMUNICATIONS
	20809 KENSINGTON BLVD.
	LAKEVILLE MINNESOTA 55044 USA
FCC ID	Q9STB208
MODEL NUMBER	TB208
PRODUCT DESCRIPTION	FM UHF PTT RADIO TRANSCEIVER WITH FRS
DATE SAMPLE RECEIVED	8/7/2007
DATE TESTED	8/22/2007
TESTED BY	Richard Block
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	2770AUT7TestReport.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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ATTESTATIONS

The device under test does

- ☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

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.



Certificate # 0955-01

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

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.

Authorized by: Mario de Aranzeta
Signature: <Mario de Aranzeta>
Function: Engineer/Lab Supervisor
Date: 8/22/2007
Tested by: Richard Block
Signature: on file
Function: Test Technician

GENERAL INFORMATION

DUT Specification

The test results relate only to the items tested.	
DUT Description	FM UHF PTT RADIO RECEIVER
FCC ID	Q9STB208
Model Number	TB208
Operating Frequency	450.0250 – 469.9875 MHz
No. of Channels	22
Type of Emission	11K2F3E, 16K0F3E
Modulation	FM
DUT Power Source	<input type="checkbox"/> 110–120Vac/50– 60Hz
	<input type="checkbox"/> DC Power
	<input checked="" 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 type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input checked="" type="checkbox"/> Portable
Antenna	Internal
Antenna Connector	N/A

Test Condition:	The DUT was tested in the laboratory in an environment with normal temperature and humidity. The temperature was 26°C with a relative humidity of 50%.
Modifications:	None
Test Exercise:	The DUT was placed in continuous transmit mode of operation.
Applicable Standards:	ANSI/TIA 603-C:2004, FCC CFR 47 Part 90, 95A, 95B, ANSI C63.4:2003, IC RSS-119
No. of Channels	22

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TEST EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
3-Meter Semi- Anechoic Chamber	Panashield	N/A	N/A	LISTED 5/11/07	5/10/10
Antenna: Biconnical	Electro- Metrics	BIA-25	1171	CAL 6/20/07	6/20/09
Antenna: Log-Periodic	Electro- Metrics	LPA-25	1122	CAL 12/1/06	12/1/08
LISN	Electro- Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 3/15/07	3/15/09

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TEST PROCEDURES

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C:2004 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.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to 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.

Radiation Interference: The test procedure used was ANSI/TIA 603-C:2004 using an Agilent spectrum receiver with preselector. 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 was always > RBW. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

RF POWER OUTPUT

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

Test Requirements:

Method of Measurement:

RF power is measured as ERP as the antenna is permanently attached. The substitution method was used. With a nominal battery voltage, and the transmitter properly adjusted the RF output measures:

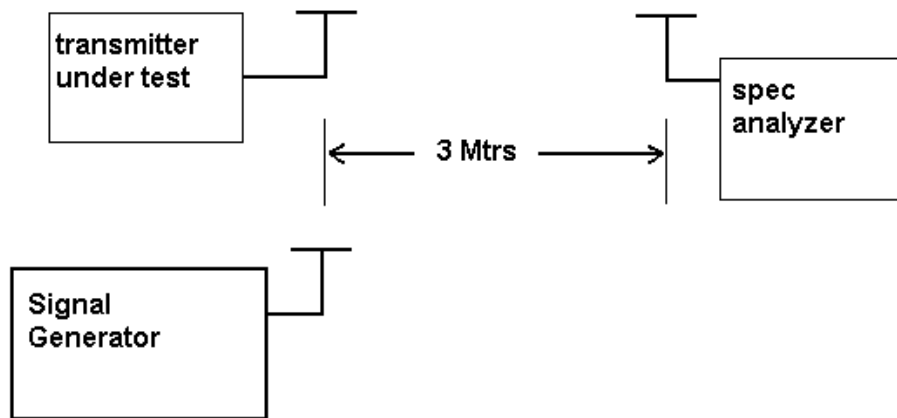
Test Data:

OUTPUT POWER:

HIGH – 0.513 Watts

LOW - 0.275 Watts

Test Setup Diagram:



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

FOR LOW POWER SETTING INPUT POWER: $(3.7V)(0.55A) = 2.04$ Watts

FOR HIGH POWER SETTING INPUT POWER: $(3.7V)(0.75A) = 2.78$ Watts

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OTHER MODULATION CHARACTERISTICS

Part 2.1033(c) (4) Type of Emission: 11K2F3E

Part 90.209

Part 90.207 $B_n = 2M + 2DK$

$M = 3000$

$D = 2500$

$K=1$

$B_n = 2(3000) + 2(2500) = 11k$

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

Part 90.209

Part 90.207 $B_n = 2M + 2DK$

$M = 3000$

$D = 4700$

$K=1$

$B_n = 2(3000) + 2(4700) = 15.4k$

MODULATION CHARACTERISTICS

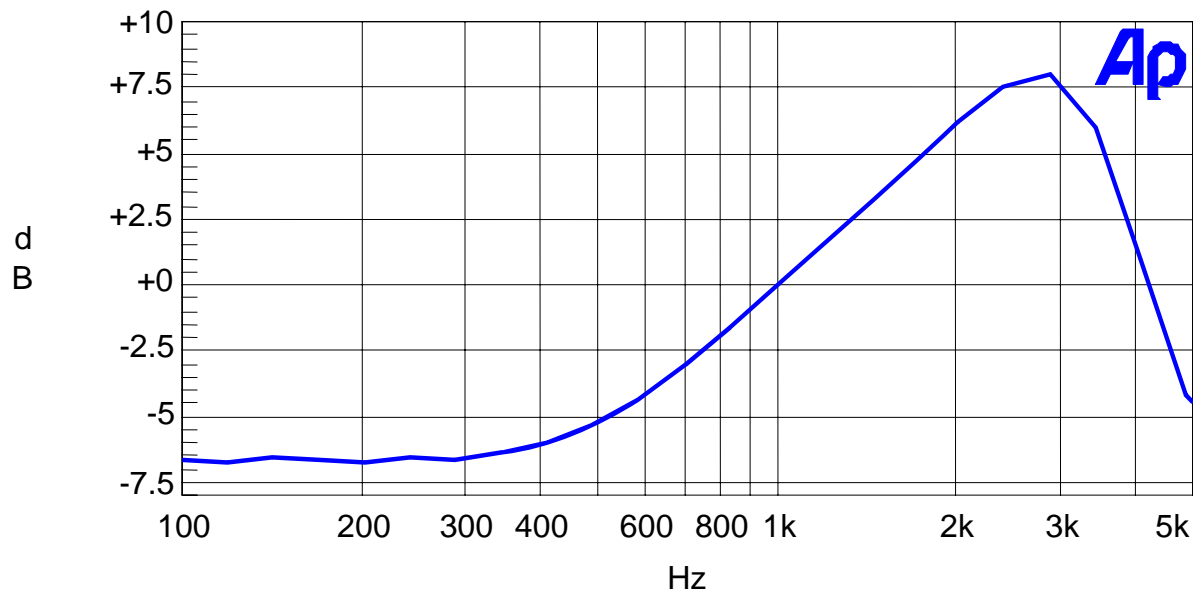
Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted. The audio frequency response curve is shown below.

AUDIO FREQUENCY RESPONSE PLOT -- 12.5kHz

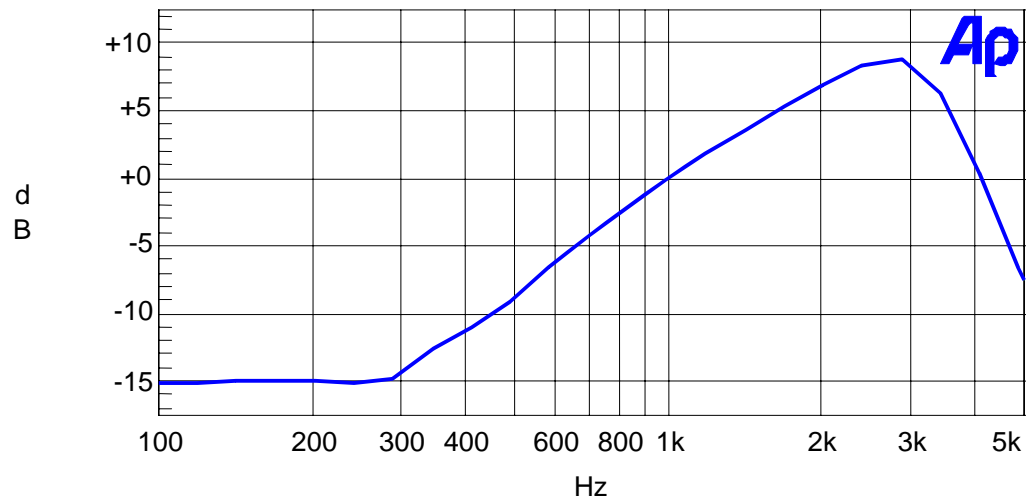


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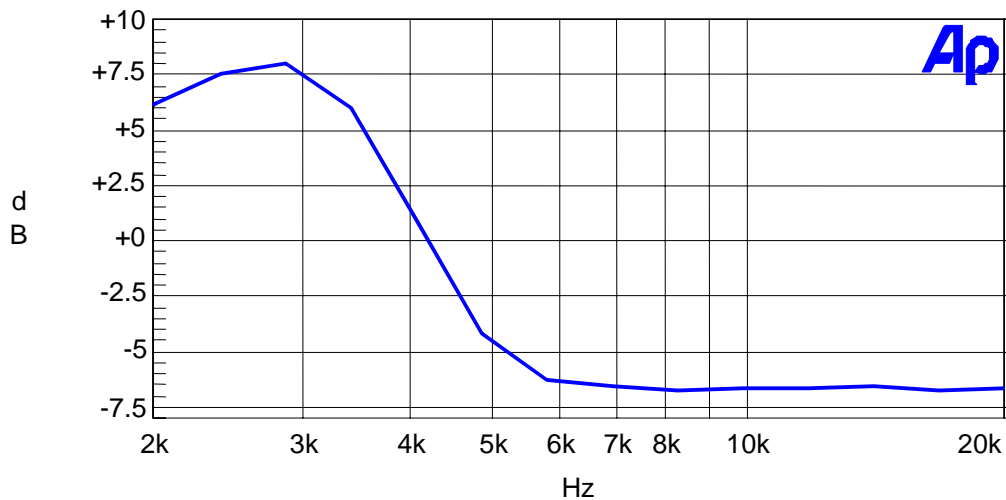
AUDIO FREQUENCY RESPONSE PLOT -- 25kHz



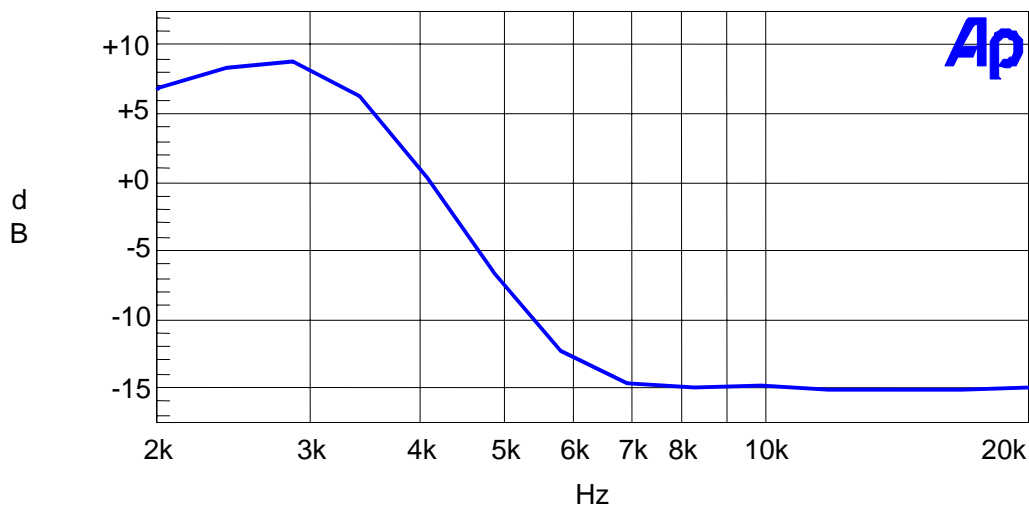
VOICE MODULATED COMMUNICATION EQUIPMENT

Part 2.1047(a) Voice modulated communication equipment: 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 PLOT -- 12.5kHz



AUDIO LOW PASS FILTER PLOT -- 25kHz



AUDIO INPUT VERSUS MODULATION

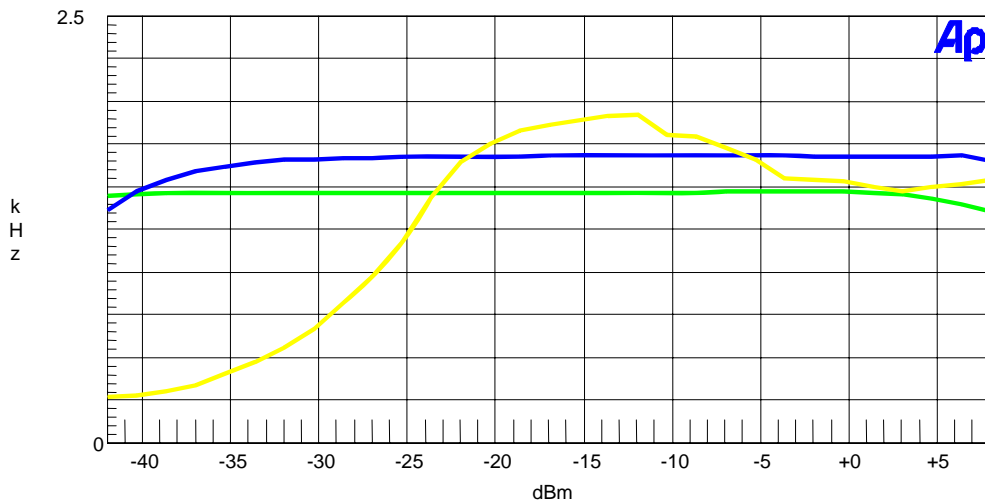
Rule Part No.: Part 2.1047(b) & 90

Test Requirements: Modulation cannot exceed 100%

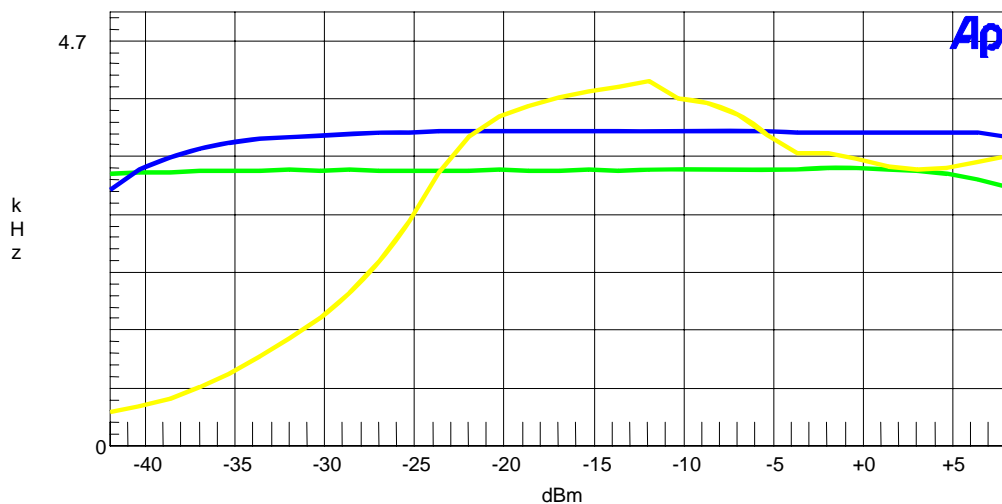
Method of Measurement: , The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

Test data:

MODULATION LIMITING PLOT -- 12.5kHz



MODULATION LIMITING PLOT -- 25kHz



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Part 2.1049 Occupied bandwidth:

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 $29 \log(f_d^2/11)$ 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.

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:

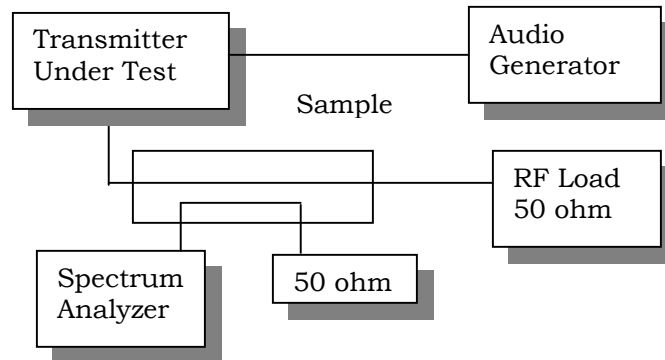
- (1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least $30 + 16.67(f_d - 3.0 \text{ kHz})$ or $55 + 10 \log(P)$ or 65, whichever is the lesser attenuation.
- (3) On any frequency removed from the center of the authorized bandwidth by more than 4.6kHz: At least $55 + 10\log(P)$ dB or 65 dB, whichever is the lesser attenuation.

OCCUPIED BANDWIDTH

Test procedure: ANSI/TIA-603-C:2004 para 2.2.11.
Test setup diagram

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

Test Setup Diagram:



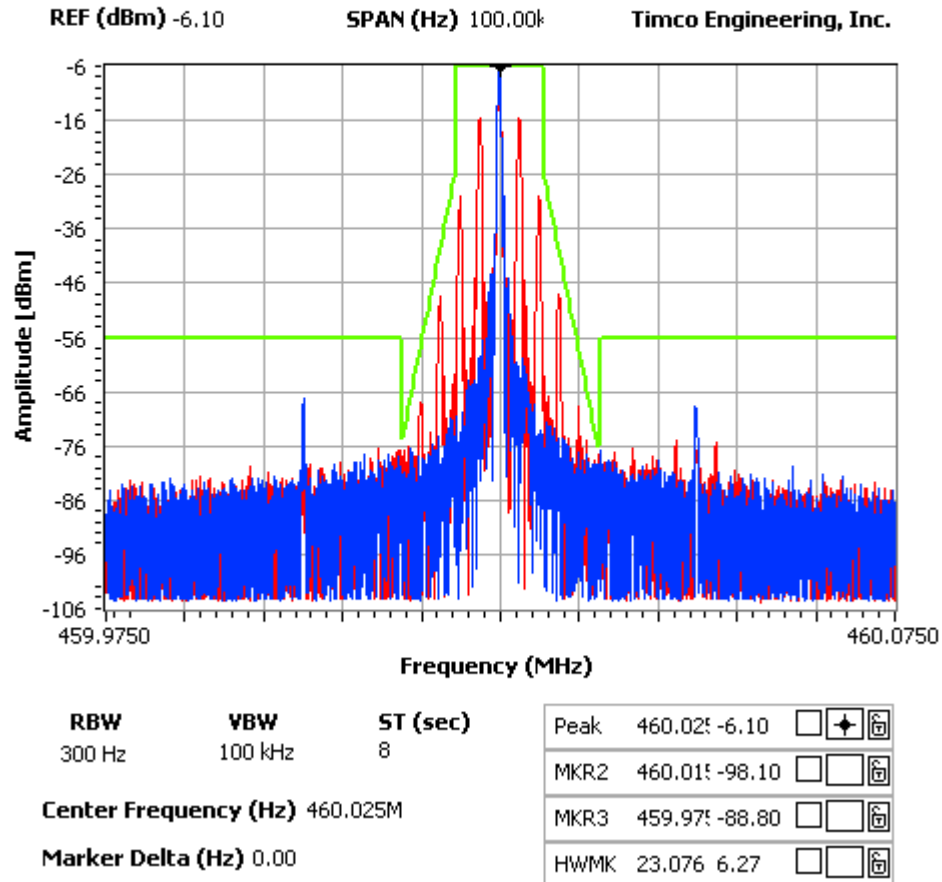
Test Data: See the plots below

12.5 kHz -- AUDIO

NOTES:

OCCUPIED BANDWIDTH -- 12.5kHz
ADVANCED WIRELESS

FCC 90.210 Mask D

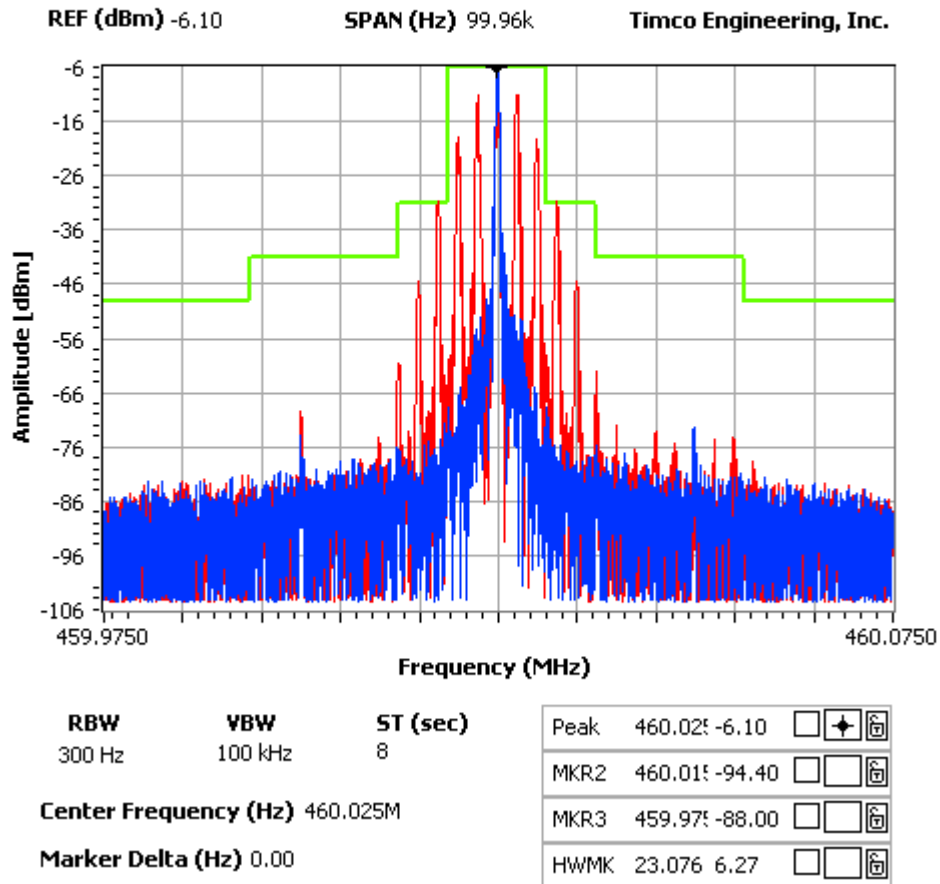


25 kHz -- AUDIO

NOTES:

OCCUPIED BANDWIDTH -- 25kHz
ADVANCED WIRELESS

FCC 90.210 Mask B





SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Test Data: N/A (Internal Antenna)

FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

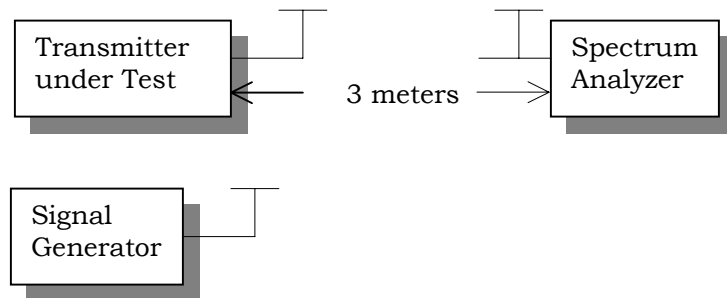
Requirements:

High: $50 + 10\log(.513) = 47.1 \text{ dBc}$

Low: $50 + 10\log(.275) = 44.4 \text{ dBc}$

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 STANDARD 603:2004 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:

BUSINESS BAND - High: .513W			LOW : 0.275W			
Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)		Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
450.0250	0	0.00		450.0250	0	0.00
900.0500	H	78.35		900.0500	H	76.25
1350.0750	V	75.47		1350.0750	V	74.87
1800.1000	V	75.61		1800.1000	H	75.61
2250.1250	H	85.93		2250.1250	H	81.73
2700.1500	V	78.04		2700.1500	V	76.34
3150.1750	H	75.06		3150.1750	V	69.66
3600.2000	H	78.53		3600.2000	V	68.83
4050.2250	H	83.07		4050.2250	V	77.57
4500.2500	V	79.20		4500.2500	H	78.60

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BUSINESS BAND – High: .513W
LOW : 0.275W

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)		Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
460.0250	0	0.00		460.0250	0	0.00
920.0500	V	71.93		920.0500	H	78.43
1380.0750	V	80.54		1380.0750	H	78.84
1840.1000	H	78.06		1840.1000	V	77.86
2300.1250	V	81.76		2300.1250	V	82.36
2760.1500	V	78.76		2760.1500	V	76.56
3220.1750	V	67.97		3220.1750	V	69.87
3680.2000	H	79.33		3680.2000	H	76.03
4140.2250	H	80.98		4140.2250	V	78.78
4600.2500	V	82.28		4600.2500	V	79.18

BUSINESS BAND – High: .513W
LOW : 0.275W

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)		Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
469.9875	0	0.00		469.9875	0	0.00
939.9750	H	63.63		939.9750	H	61.83
1409.9625	V	82.94		1409.9625	V	79.64
1879.9500	V	76.06		1879.9500	H	73.16
2349.9375	V	83.06		2349.9375	V	80.86
2819.9250	H	72.06		2819.9250	H	70.56
3289.9125	V	64.87		3289.9125	V	63.77
3759.9000	V	79.03		3759.9000	V	75.13
4229.8875	H	81.08		4229.8875	H	77.18
4699.8750	H	82.78		4699.8750	H	76.18

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FIELD STRENGTH OF SPURIOUS EMISSIONS - RX

Rules Part No.: 15.109

Requirements:

Frequency	Limits
30 – 88	40.0 dB μ V/m measured @ 3 meters
80 – 216	43.5 dB μ V/m measured @ 3 meters
216 – 960	46.0 dB μ V/m measured @ 3 meters
Above 960	54.0 dB μ V/m measured @ 3 meters

Test Procedure: The procedure used was ANSI C63.4-2003. The frequency was scanned from 30 MHz to 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The DUT was measured in three (3) orthogonal planes as necessary.

Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Margin dB
450.0	428.64	5.2	V	1.23	16.09	22.52	23.48
450.0	428.64	9.7	H	1.23	16.46	27.39	18.61
450.0	867.20	3.5	V	1.93	22.40	27.83	18.17
450.0	867.20	5.3	H	1.93	22.94	30.17	15.83
450.0	1,285.90	13.3	H	2.33	27.81	43.44	10.56
450.0	1,285.90	15.6	V	2.33	27.81	45.74	8.26
450.0	1,714.50	14.2	H	2.67	29.49	46.36	7.64
450.0	1,714.50	14.3	V	2.67	29.49	46.46	7.54
450.0	2,143.20	7.1	H	3.00	31.60	41.70	12.30
450.0	2,143.20	8.2	V	3.00	31.60	42.80	11.20
460.0	438.65	6.9	V	1.24	16.27	24.41	21.59
460.0	438.65	11.3	H	1.24	16.76	29.30	16.70
460.0	877.30	3.0	V	1.94	22.40	27.34	18.66
460.0	877.30	5.1	H	1.94	23.22	30.26	15.74
460.0	1,315.90	12.9	V	2.35	27.87	43.12	10.88
460.0	1,315.90	13.2	H	2.35	27.87	43.42	10.58
460.0	1,754.60	13.9	V	2.70	29.73	46.33	7.67
460.0	1,754.60	14.1	H	2.70	29.73	46.53	7.47
460.0	2,193.20	6.9	V	3.04	31.74	41.68	12.32
460.0	2,193.20	7.5	H	3.04	31.74	42.28	11.72
462.7	441.34	7.6	V	1.24	16.34	25.18	20.82
462.7	441.34	15.1	H	1.24	16.81	33.15	12.85
462.7	882.60	3.3	V	1.94	22.45	27.69	18.31
462.7	882.60	3.7	H	1.94	23.30	28.94	17.06
462.7	1,324.00	14.0	V	2.36	27.88	44.24	9.76

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RX TEST DATA CONTD.,

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
462.7	1,324.00	14.8	H	2.36	27.88	45.04	8.96
462.7	1,765.30	14.7	V	2.71	29.79	47.20	6.80
462.7	1,765.30	15.0	H	2.71	29.79	47.50	6.50
462.7	2,206.70	11.1	V	3.04	31.78	45.92	8.08
462.7	2,206.70	13.6	H	3.04	31.78	48.42	5.58
467.6	446.16	8.9	V	1.25	16.48	26.63	19.37
467.6	446.16	12.5	H	1.25	16.86	30.61	15.39
467.6	892.30	3.8	H	1.95	23.30	29.05	16.95
467.6	892.30	6.1	V	1.95	22.62	30.67	15.33
467.6	1,338.40	13.8	H	2.37	27.91	44.08	9.92
467.6	1,338.40	14.2	V	2.37	27.91	44.48	9.52
467.6	1,784.60	14.5	H	2.73	29.91	47.14	6.86
467.6	1,784.60	14.5	V	2.73	29.91	47.14	6.86
467.6	2,230.80	7.5	V	3.06	31.85	42.41	11.59
467.6	2,230.80	8.2	H	3.06	31.85	43.11	10.89
470.0	448.60	5.6	V	1.25	16.56	23.41	22.59
470.0	448.60	10.5	H	1.25	16.89	28.64	17.36
470.0	897.10	4.5	V	1.95	22.67	29.12	16.88
470.0	897.10	4.9	H	1.95	23.30	30.15	15.85
470.0	1,345.70	13.4	V	2.38	27.92	43.70	10.30
470.0	1,345.70	13.6	H	2.38	27.92	43.90	10.10
470.0	1,794.30	14.1	V	2.74	29.97	46.81	7.19
470.0	1,794.30	14.7	H	2.74	29.97	47.41	6.59
470.0	2,242.90	7.3	V	3.07	31.88	42.25	11.75
470.0	2,242.90	7.5	H	3.07	31.88	42.45	11.55

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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%
±2.5 PPM

Method of Measurements: TIA/EIA 603.

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		460.025
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	460.024274	-1.76
-20	460.024850	-0.51
-10	460.025312	0.50
0	460.025535	0.98
+10	460.025567	1.05
+20	460.025333	0.54
+30	460.025164	0.18
+40	460.025109	0.06
+50	460.025494	0.89

% Battery	Frequency (MHz)	Frequency Stability (PPM)
-15%	460.024941	-0.31
0	460.025083	0.00

FREQUENCY STABILITY (cont'd):

Part 90.214 Transient Frequency Behavior

REQUIREMENTS: Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain their 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

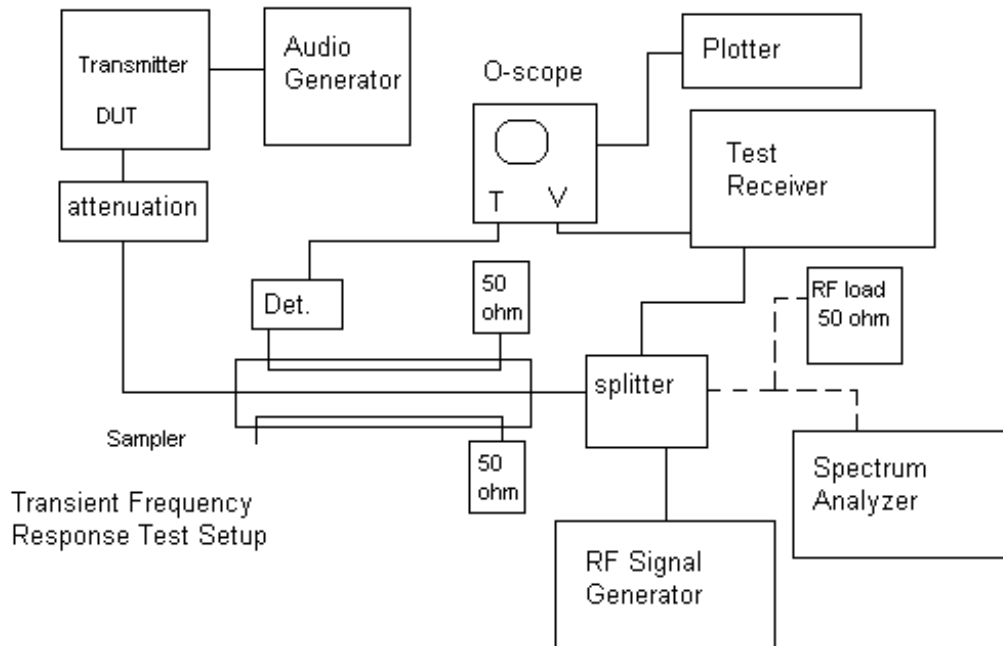
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

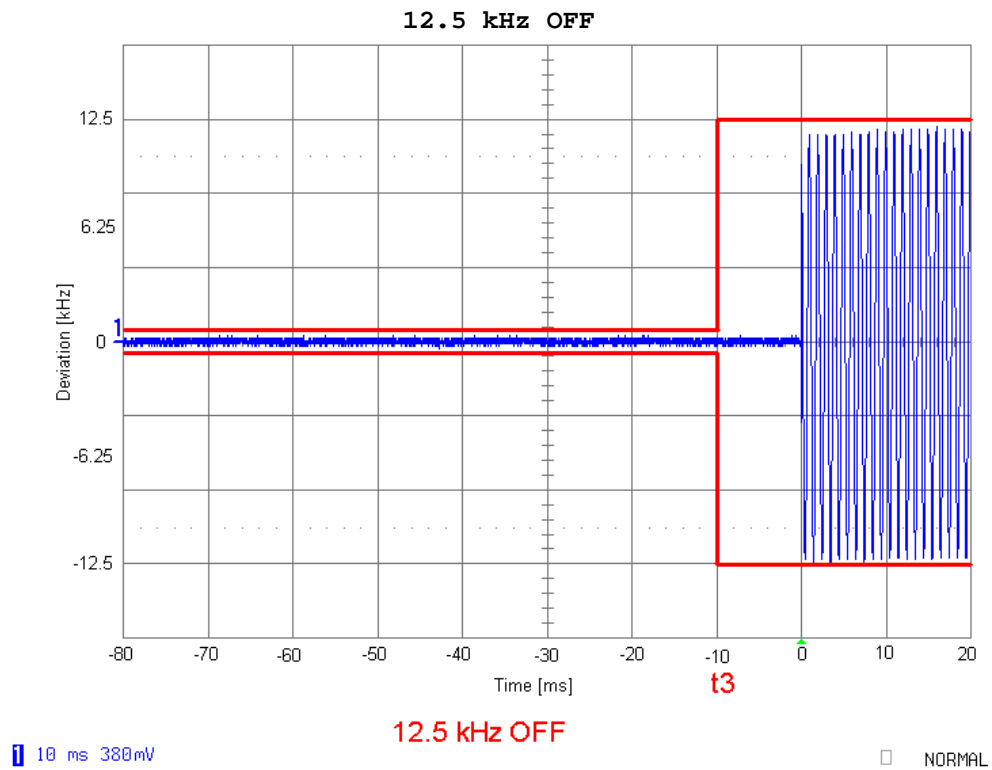
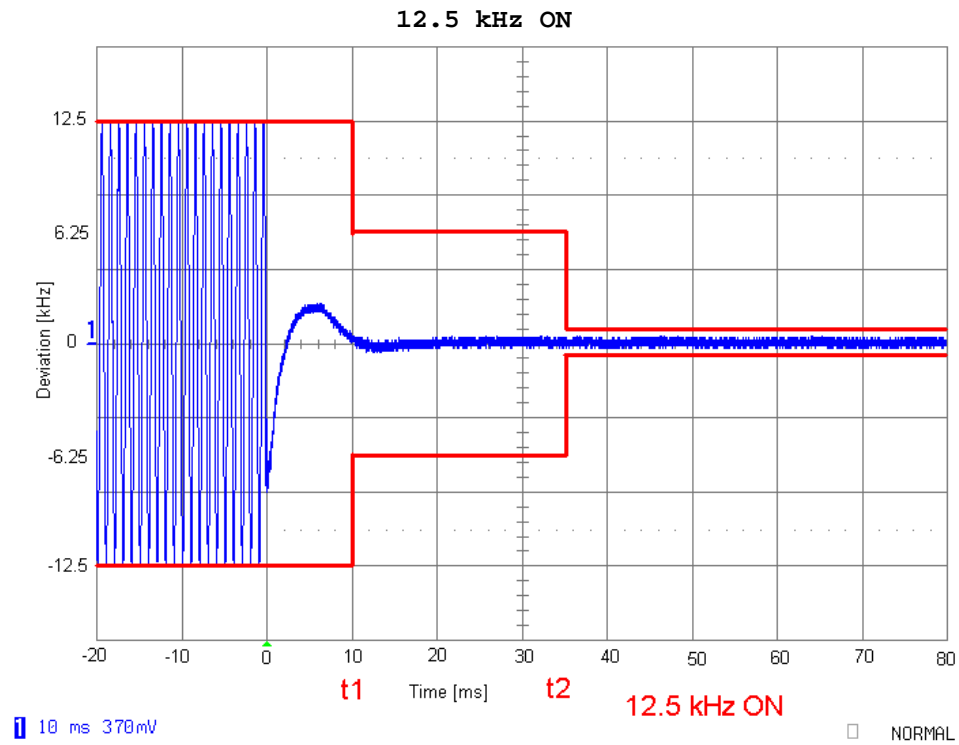
t_1^4	± 6.25 kHz	5.0 ms	10.0 ms
t_2	± 3.125 kHz	20.0 ms	25.0 ms
t_3^4	± 6.25 kHz	5.0 ms	10.0 ms

FREQUENCY STABILITY (cont'd)

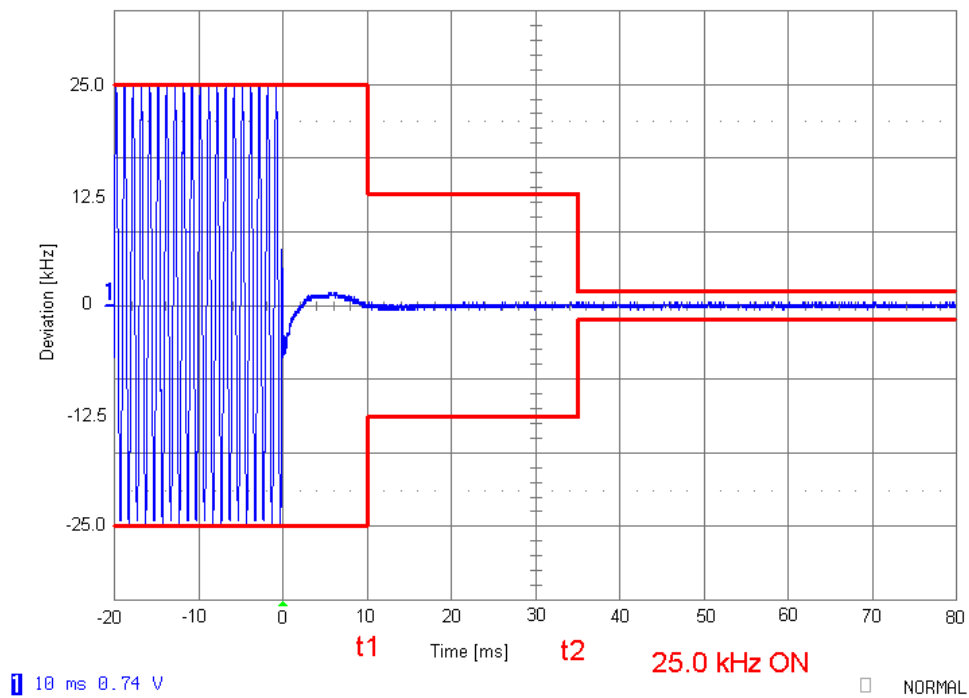
TEST PROCEEDURE: ANSI/TIA 603-C:2004 the levels were set as follows;

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.

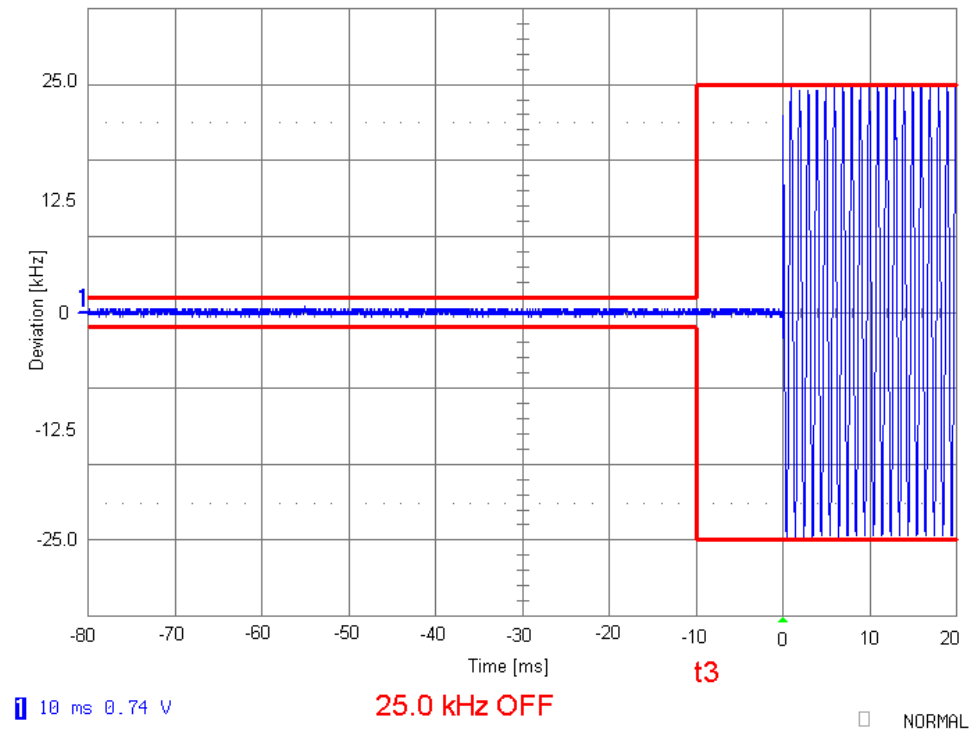




25 kHz ON



25 kHz OFF



Applicant: ADVANCED WIRELESS COMMUNICATIONS

FCC ID: Q9STB208

Report: A\AdvancedWireless\2770AUT7\2770AUT7TestReport.doc

TEST SETUP PHOTOGRAPH

