849 NW STATE ROAD 45
NEWBERRY, FL 32669 USA
PH: 888.472.2424 OR 352.472.5500
FAX: 352.472.2030
EMAIL: INFO@TIMCOENGR.COM
HTTP://WWW.TIMCOENGR.COM

FCC PART 90

TEST REPORT

APPLICANT	KP ELECTRONICS SYSTEMS, LTD.
	P.O. BOX 42
	TEFEN INDUSTRIAL PARK
	TEFEN, 24959, ISREAL
FCC ID	H78KPBSRU100D
PRODUCT DESCRIPTION	UHF RF MODEM
DATE SAMPLE RECEIVED	10/30/2006
DATE TESTED	11/1/2006
TESTED BY	NAM NGUYEN
APPROVED BY	MARIO DE ARANZETA
TIMCO REPORT NO.	3003UT6TestReport.doc
TOTAL PAGES	20
TEST RESULTS	☒ PASS ☐ FAIL

ACCREDITED
Certificate # 0955-01

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.

ACCREDITED
Certificate # 0955-01

Authorized by: Mario de Aranzeta

Signature: <*Mario de Aranzeta*>

Function: Engineer

Date: 10/30/2006

GENERAL INFORMATION

DUT SPECIFICATIONS

The test results relate only to the items tested.	
DUT Description	UHF RF MODEM
FCC ID	H78KPBSRU100D
Operating Frequency	450-470 MHz
No. of Channels	Single
Type of Emission	F1D
Modulation	DRCMSK
DUT Power Source	☐ 110–120Vac/50– 60Hz
	☒ DC Power
	☐ Battery Operated Exclusively
Test Item	☐ Prototype
	☒ Pre-Production
	☐ Production
Type of Equipment	☐ Fixed
	☒ Mobile
	☐ Portable
Test Condition	Lab Temperature - 26°C Humidity – 50%
Modifications to DUT	None
Test Description	DUT was placed in continuous transmit mode of operation.
Test Standards	ANSI/TIA 603-C:2004, FCC CFR 47 Part 90

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
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/05	4/29/07
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	CAL 12/29/04	12/29/06
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08

TEST PROCEDURE

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 peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10 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 C63.4-2003 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 above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

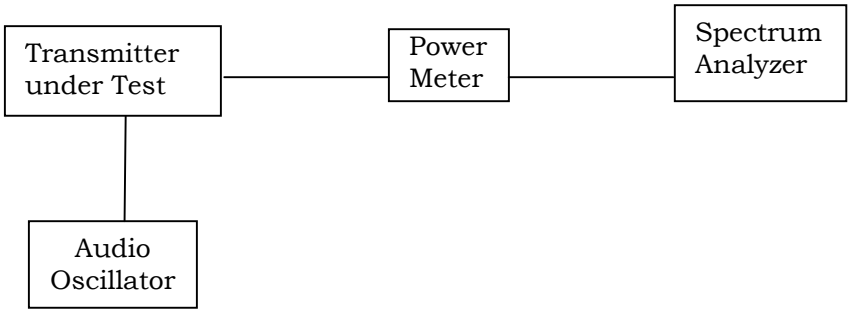
RF POWER OUTPUT

Rule Part No.: Part 2.1046(a), Part 90.210

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: 10 Watt

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

DC Voltage: 12.5Vdc DC Current: 3A
DC Power: 37.50 Watts

MODULATION CHARACTERISTICS

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

Test Requirements:

Method of Measurement:

Audio frequency response

Data radio. Not applicable.

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.

Data Radio. Not applicable.

AUDIO INPUT VERSUS MODULATION

Part 2.1047(a) For equipment employing modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulating input voltage shall be submitted. For devices employing phase a or frequency modulation deviation versus input voltage is required.

Data radio: The deviation is fixed in software and not changeable by the user.

OTHER MODULATION CHARACTERISTICS

Part 2.1033(c)
Part 2.1033(c) (4) Type of Emission: 11K2F1D
Part 90.209
Part 90.207 Bn = 2M + 2DK
M = B/2 = 9600/2
D = 800
K=1
Bn = 2(4800)+2(800) = 11.2k

OCCUPIED BANDWIDTH (PART 2.1049)

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.

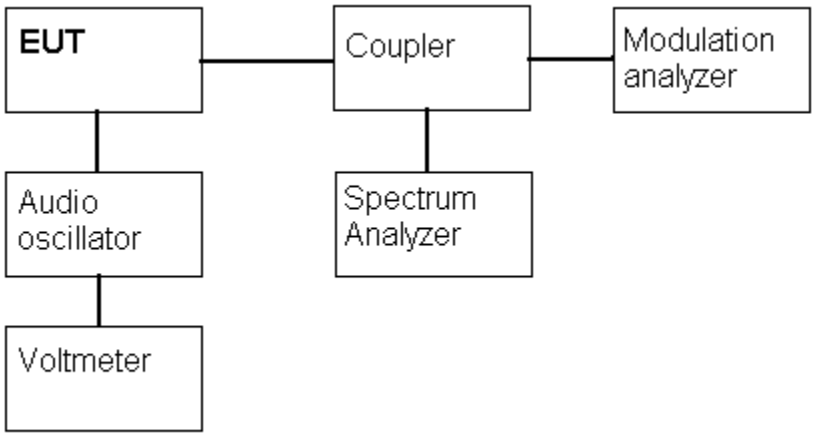
(2) On any frequency from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least 30 + 16.67(fd – 3.0 kHz) or 55 + 10 Log(P) or 65, whichever us the lesser attenuation.

(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 procedure: ANSI/TIA-603-C:2004 para 2.2.11.

Test procedure diagram

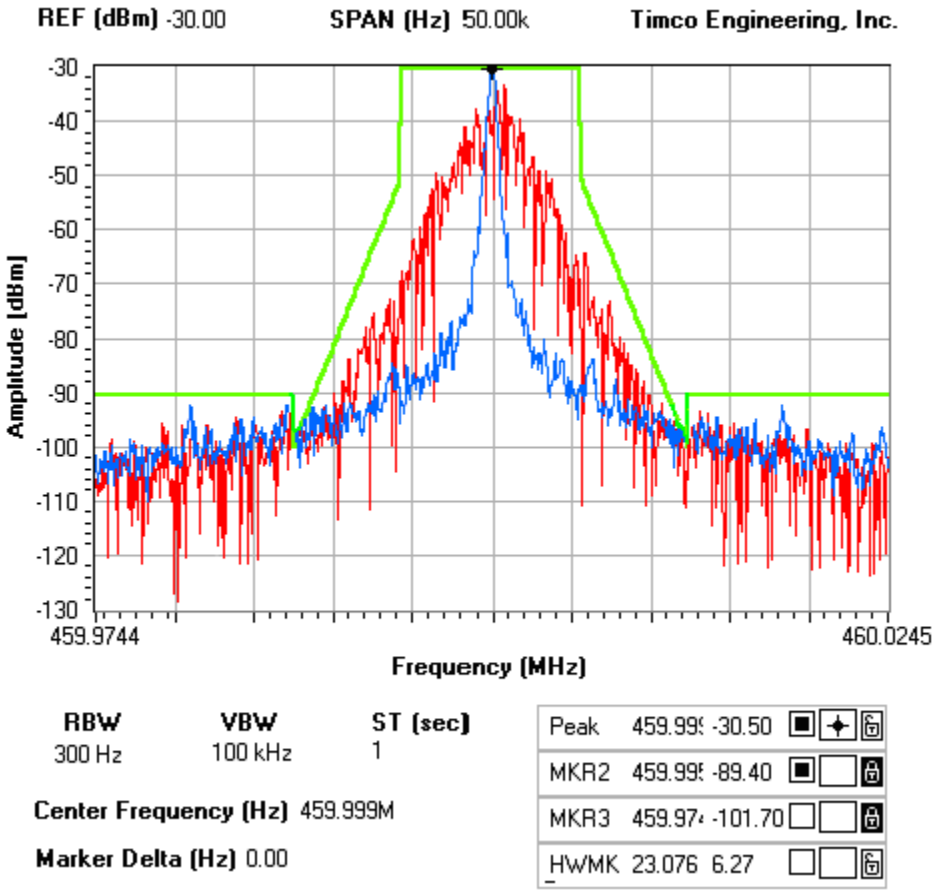
OCCUPIED BANDWIDTH MEASUREMENT

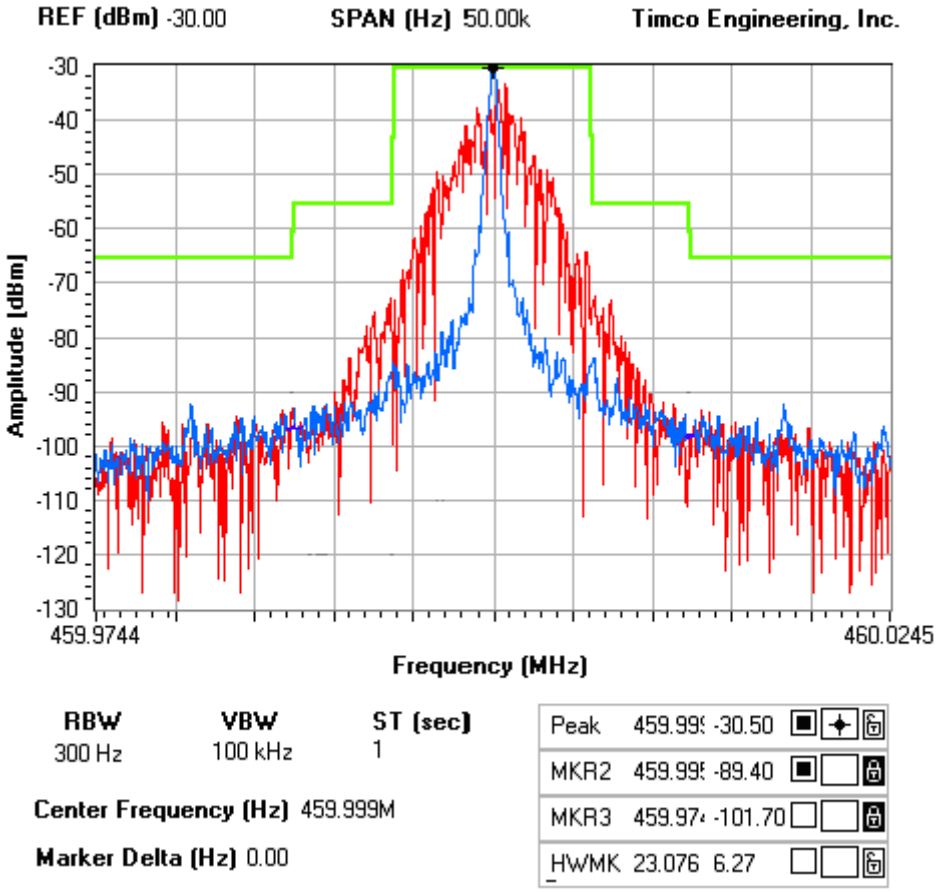


OCCUPIED BANDWIDTH

Part 90.210(c) 12.5 kHz Channel Spacing

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




REF (dBm) -30.00
SPAN (Hz) 50.00k
Timco Engineering, Inc.
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
Amplitude [dBm]
459.9744
460.0245
Frequency (MHz)
RBW
300 Hz
VBW
100 kHz
ST (sec)
1
Center Frequency (Hz) 459.999M
Marker Delta (Hz) 0.00
Peak 459.99 -30.50
MKR2 459.99 -89.40
MKR3 459.97 -101.70
HWMK 23.076 6.27

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

Requirements: 12.5 kHz channel spacing

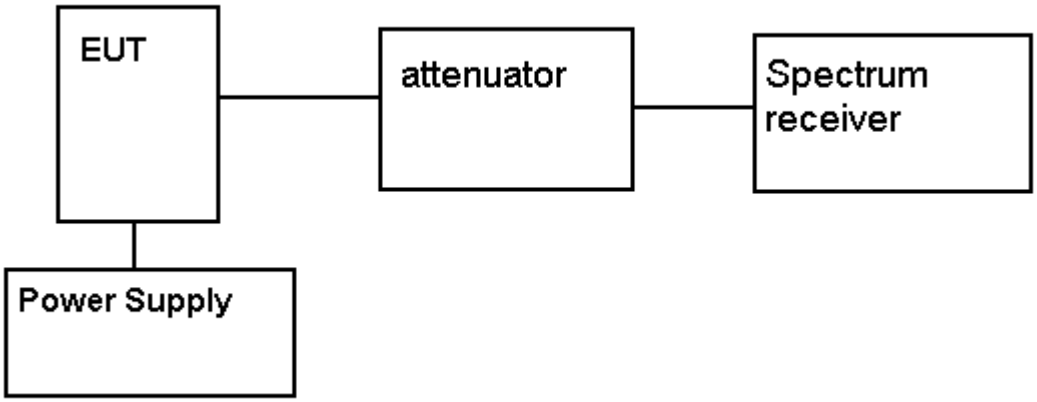
Method of Measurement: The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA-603.-C:2004

FCC Limit: 50+10log(10) = 60 dB

Test Data:

EF	dB below carrier	EF	dB below carrier	EF	dB below carrier
450	0	460	0	470	0
900	82.3	920	93.2	940	91.7
1350	85.6	1380	83.8	1410	83.3
1800	69.7	1840	67.7	1880	73.8
2250	70.3	2300	80.6	2350	77.0
2700	74.8	2760	74.9	2820	79.8
3150	72.9	3220	70.9	3290	99.3
3600	71.4	3680	68.2	3760	73.7
4050	60.5	4140	79.2	4230	71.5
4500	69.9	4600	90.5	4700	89.8

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.

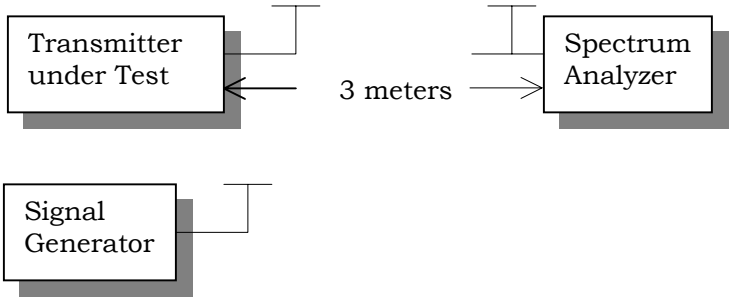
FIELD STRENGTH OF SPURIOUS EMISSIONS

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	dB Below Carrier (dBc)
450	0	0
900	V	94.
1350	V	96
1800	V	83
2250	V	80
2700	H	80
3150	H	80
3600	H	87
4050	H	85
4500	H	85

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
460	0	0
920	V	95
1380	V	96
1840	V	80
2300	H	79
2760	V	83
3220	V	80
3680	H	88
4140	H	81
4600	H	88

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
470	0	0
940	V	97.
1410	V	98
1880	V	81
2350	V	78
2820	H	83
3290	H	82
3760	H	90
4230	H	83
4700	H	89

FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 90.213

Requirements: Temperature range requirements: -30 to +50° C.
Voltage variation +, -15%
Mobile – 1.5 ppm fixed

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

Test Data:

Ref. Frequency (MHz)	450.000000
Temperature (°C)	**Frequency Stability (PPM)**
-30	1.36
-20	1.44
-10	1.48
0	1.23
+10	0.98
+20	0.14
+30	-0.57
+40	-1.04
+50	-1.08

% Battery	**Frequency Stability (PPM)**
-15%	0.09
0	
+15%	0.20

TRANSIENT FREQUENCY RESPONSE

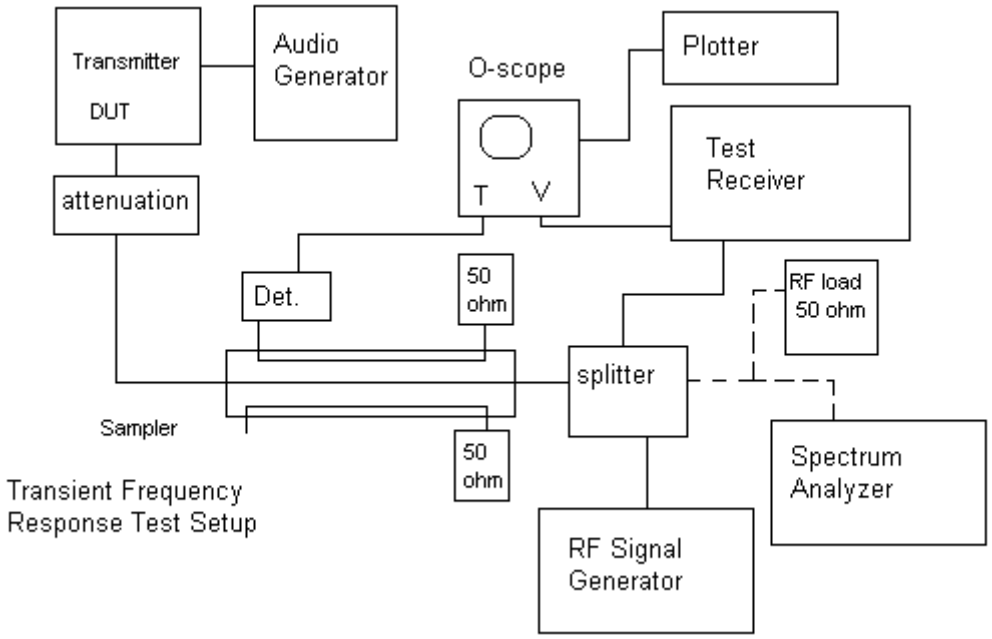
Part 90.214

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:

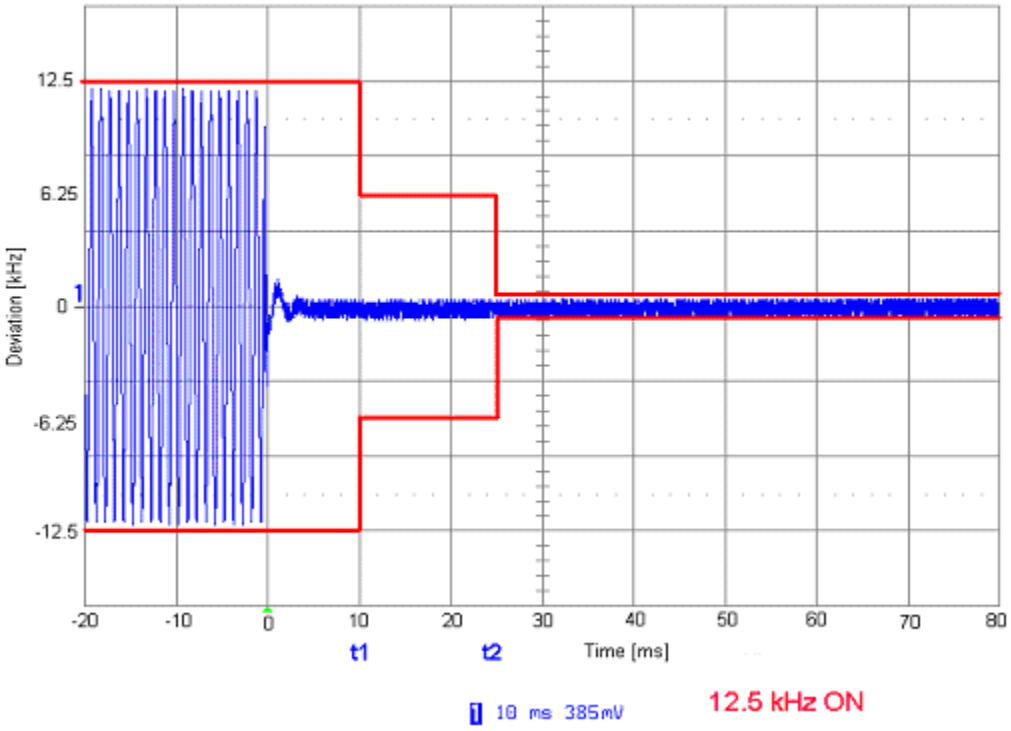
Time Intervals	Maximum frequency difference	All equipment	
		150-174 MHz	421-512 MHz
Transient frequency behavior for equipment designed to operate on 25 kHz channels			
t_1[4]	±25.0 kHz	5.0 ms	10.0 ms
t_2	±12.5 kHz	20.0 ms	25.0 ms
t_3[4]	±25.0 kHz	5.0 ms	10.0 ms
Transient frequency behavior for equipment 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

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

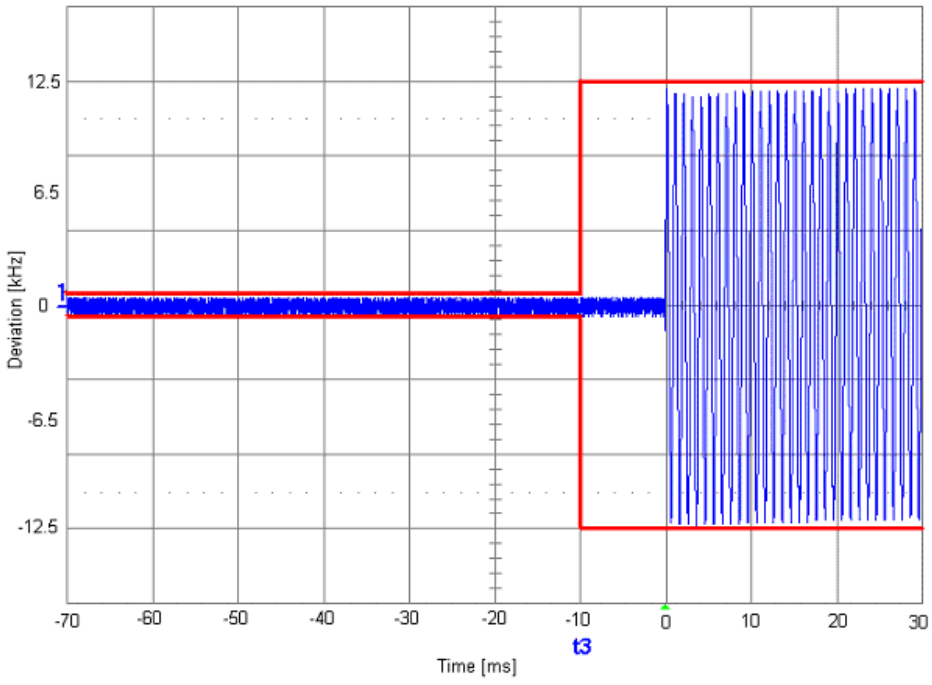
1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained 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.



Transient Frequency Response Test Setup



12.5 kHz ON



12.5 kHz OFF