TIMCO **ENGINEERING INC.**
849 NW State Road 45
Newberry, Florida 32669
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888.472.2424 F 352.472.2030 email: sid@timcoengr.com

Test Report

Product Name: DATA TRANSCEIVER

FCC ID: TBMRTX2-U2

Applicant:

D-TEK ELECTRONICS, INC.
1942 PELHAM AVENUE
LOS ANGELES CA 90025

Date Receipt: 4/1/2005

Date Tested: 5/5/2005

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APPLICANT: D-TEK ELECTRONICS, INC.

FCC ID: TBMRTX2-U2

TEST REPORT:

EXHIBITS CONTAINING:

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GENERAL INFORMATION REQUIRED
FOR CERTIFICATION OF A LICENSED TRANSMITTER

Part 2.1033(c)(1)(2) D-TEK ELECTRONICS, INC. will manufacture the FCC ID: TBMRTX2-U2 UHF TRANSCEIVER in quantity, for use under FCC RULES PART 90.

D-TEK ELECTRONICS, INC.
1942 PELHAM AVENUE
LOS ANGELES, CA 90025

Part 2.1033(c) TECHNICAL DESCRIPTION

Part 2.1033(c)(3) Instruction book. A draft copy of the instruction manual is included.

Part 2.1033(c) (4) Type of Emission: 11K2F2D
Part 90.209
Part 90.207

Bn = 2M + 2DK
M = 9600
D = 825
Bn = 2(9600/2)+2(825) = 11.25k

Part 90.217(b) Authorized Bandwidth 12.5 kHz

Part 2.1033(c)(5) Frequency Range: 440-470 MHz
Part 90.209 (b)(5)

Part 2.1033(c)(6)(7) Power Output shall not exceed 59 Watts into a 50 ohm
Part 90.205 resistive load. There are no user power controls.

Part 2.1033(c)(8) DC Voltages and Current into Final Amplifier:
POWER INPUT:

FINAL AMPLIFIER ONLY
INPUT POWER – HIGH: (12V)(0.68A) = 8.16 Watts
INPUT POWER – LOW: (12V)(0.45A) = 5.40 Watts

Part 2.1033(c)(9) Tune-up procedure. The tune-up procedure is included.

Part 2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included. The block diagram is included.

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Part 2.1033(c)(10): Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description.

Part 2.1033(c)(11) A photograph or drawing of the equipment identification label is included.

Part 2.1033(c)(12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are included.

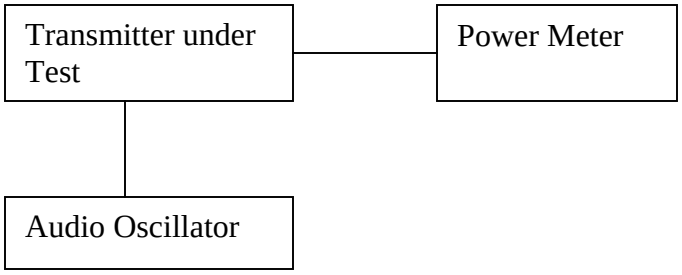
Part 2.1033(c)(13): For equipment employing digital modulation, a detailed description of the modulation technique. This UUT uses FSK to modulate the transmitter.

Part 2.1033(c)(14) The data required for 2.1046 through 2.1057 is submitted below.

Part 2.1046(a) RF POWER OUTPUT

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:

OUTPUT POWER: HIGH – 2.0 Watts
LOW - 0.5 Watts



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Part 2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE
The audio frequency response was measured in accordance with TIA/EIA Specification 603. 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.

NOT REQUIRED FOR DATA RADIOS

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.

NOT REQUIRED FOR DATA RADIOS

Part 2.1047(b) Audio input versus modulation
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.

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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 + 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.

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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

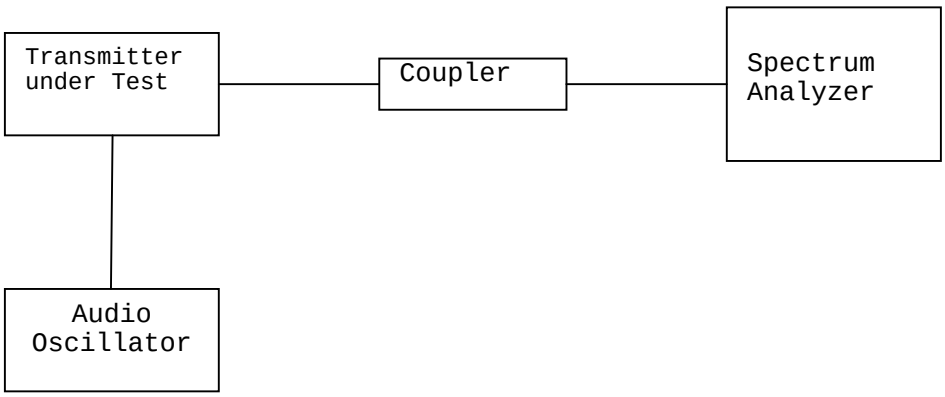
(3) than 4.6 kHz: At least 30 + 16.67(fd – 3.0 kHz) or 55 + 10 Log(P) or 65, whichever us the lesser attenuation.

(4) 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: TIA/EIA-603 para 2.2.11.

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



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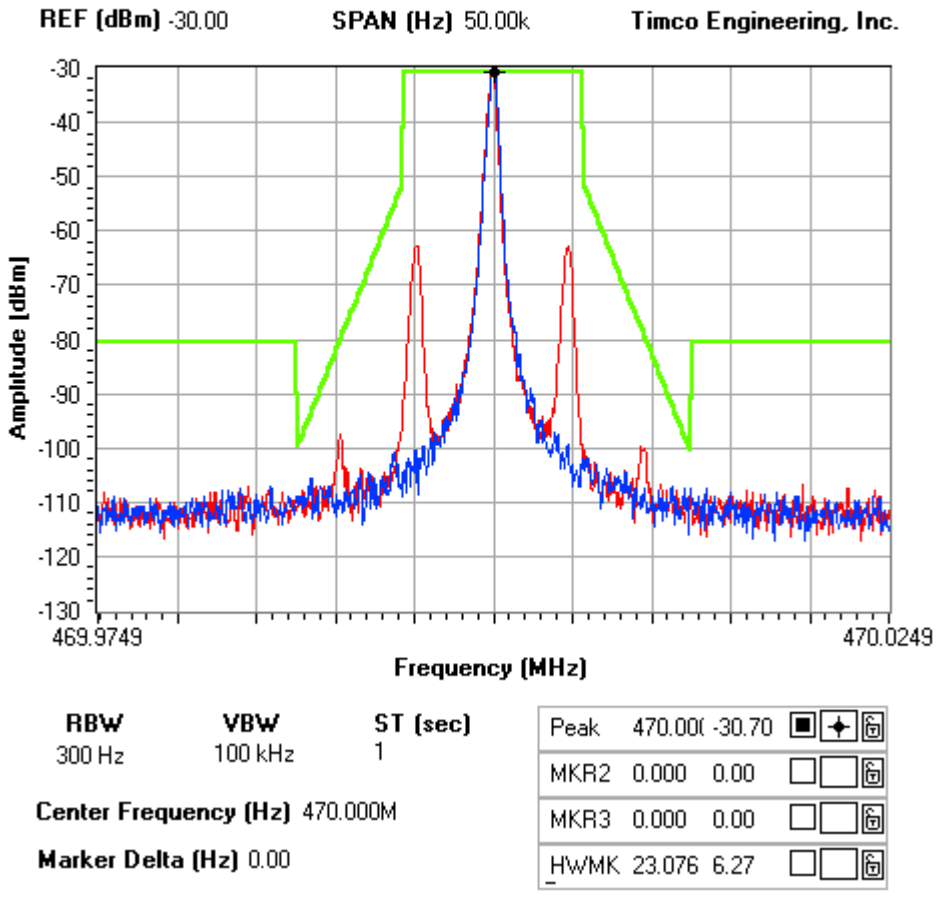
OCCUPIED BANDWIDTH PLOT

Part 90.210(c) 12.5kHz Channel Spacing

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

NOTES:
DIGITEK - RTX2 - U2 LINK MODULE
OCCUPIED BANDWIDTH PLOT

FCC 90.210 Mask D



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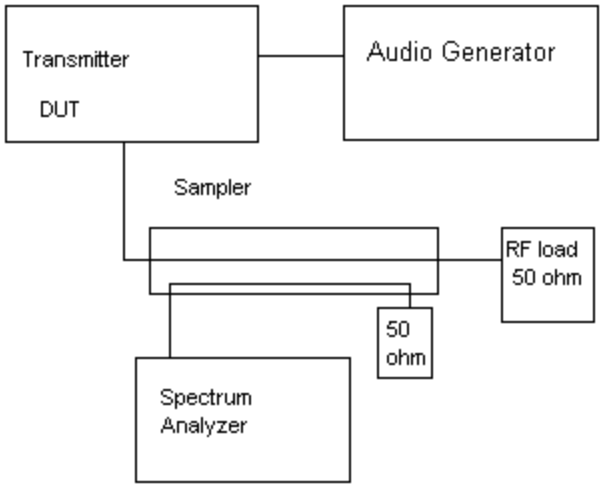
Radiotelephone transmitter with modulation limiter:

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT

Occupied BW Test Equipment Setup



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Part 2.1051(a) Spurious emissions at antenna terminals (conducted):

Data below shows the level of conducted spurious responses. 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 TIA/EIA-603.

FCC Limit for:
25kHz Channel Spacing = HIGH POWER: 50+10*LOG(2) = 53.10 dB
LOW POWER: 50+10*LOG(.5) = 47 dB

EMISSION FREQUENCY MHz – HIGH POWER	dB BELOW CARRIER – HIGH POWER	Db BELOW CARRIER – LOW POWER
440	0	0
880	81.4	85.5
1320	66.9	65.2
1760	57.1	58.5
2200	74.7	70.0
2640	71.1	73.3
3080	75.2	66.5
3520	83.4	65.1
3960	68.0	72.0
4400	72.9	63.2
470	0	0
940	83.1	64.1
1410	59.8	60.6
1880	64.7	56.9
2350	55.6	49.7
2820	80.6	87.4
3290	75.7	66.5
3760	73.1	72.6
4230	76.5	70.8
4700	71.7	68.3

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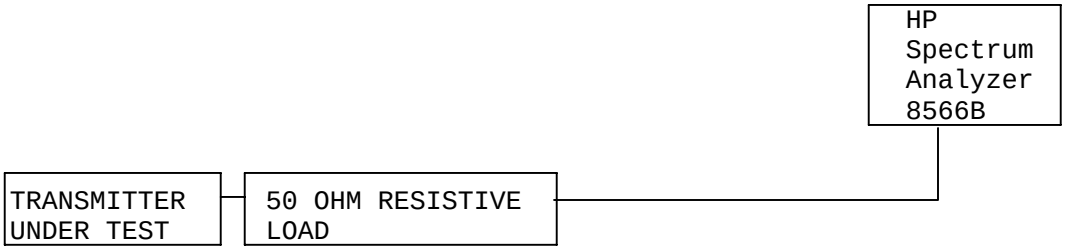
Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. The measurements were made at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

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NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: The FCC Limits for radiated emissions are:
HIGH POWER: 50+10*LOG(2) = 53.10 dB
LOW POWER: 50+10*LOG(.5) = 47 dB

LOW POWER

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
440.00	0	27.45	0	-0.45	0
880.00	V	-34.60	0	-0.71	62.31
1320.00	H	-32.60	1.02	4.23	56.39
1760.00	V	-29.40	1.09	5.16	52.33
2200.00	H	-44.80	1.17	5.91	67.06
2640.00	H	-40.40	1.24	6.86	61.78
3080.00	V	-28.80	1.32	7.21	49.91
3520.00	V	-38.10	1.39	7.55	58.94
3960.00	V	-46.90	1.46	7.6	67.76
4400.00	H	-50.30	1.54	8.37	70.47

HIGH POWER

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
440.00	0	33.46	0	-0.45	0
880.00	V	-36.90	0	-0.71	70.62
1320.00	V	-26.40	1.02	4.23	56.2
1760.00	V	-28.60	1.09	5.16	57.54
2200.00	V	-36.60	1.17	5.91	64.87
2640.00	V	-32.90	1.24	6.86	60.29
3080.00	H	-38.60	1.32	7.21	65.72
3520.00	V	-40.90	1.39	7.55	67.75
3960.00	V	-42.60	1.46	7.6	69.47
4400.00	V	-46.50	1.54	8.37	72.68

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NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: The FCC Limits for radiated emissions are:
HIGH POWER: 50+10*LOG(2) = 53.10 dB
LOW POWER: 50+10*LOG(.5) = 47 dB

LOW POWER

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
470.00	0	27.52	0	-0.53	0
940.00	V	-29.50	0	-1.03	57.52
1410.00	H	-36.20	1.08	4.59	59.68
1880.00	V	-38.20	1.18	5.25	61.12
2350.00	V	-30.00	1.27	6.33	51.93
2820.00	H	-42.50	1.33	7.01	63.81
3290.00	V	-35.50	1.38	7.38	56.49
3760.00	V	-45.10	1.43	7.6	65.92
4230.00	H	-49.50	1.47	7.93	70.03
4700.00	H	-48.20	1.54	8.01	68.72

HIGH POWER

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
470.00	0	33.54	0	-0.53	0
940.00	H	-45.90	0	-1.03	79.94
1410.00	H	-33.80	1.08	4.59	63.3
1880.00	H	-34.30	1.18	5.25	63.24
2350.00	V	-26.90	1.27	6.33	54.85
2820.00	V	-32.70	1.33	7.01	60.03
3290.00	V	-36.40	1.38	7.38	63.41
3760.00	H	-49.90	1.43	7.6	76.74
4230.00	V	-45.30	1.47	7.93	71.85
4700.00	V	-43.10	1.54	8.01	69.64

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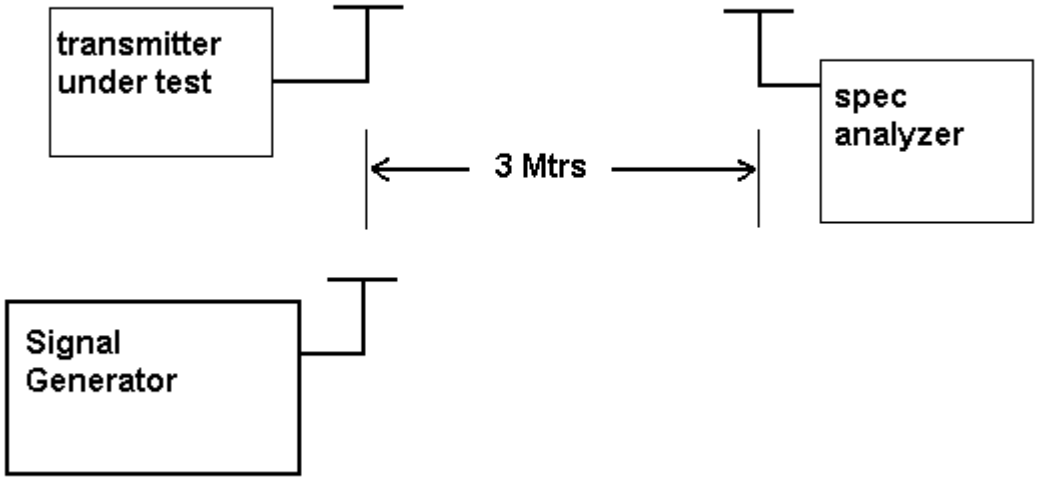
Method of Measuring Radiated Spurious Emissions



METHOD OF MEASUREMENTS: 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 TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

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Part 2.1055 Frequency stability:
Part 90.213(a)(1) 90.266(b)(3)

Frequency Stability Requirement: 2.5 ppm

Temperature range requirements: -30 to +50° C.

Voltage Variation +,- 15%.

Measurement procedure per TIA/EIA 603.

MEASUREMENT DATA:

Ref. Freq.
469.999896

TEMPERATURE °C	FREQUENCY MHz	PPM
-30C	469.999876	-0.04
-20C	469.999932	0.08
-10C	470.000103	0.44
0C	469.999986	0.19
10C	470.000036	0.30
20C	469.999991	0.20
30C	469.999930	0.07
40C	469.999941	0.10
50C	470.000008	0.24

Batt. Volts	Batt. Data	PPM
-15%	469.999990	0.20
+15%	470.000000	0.22

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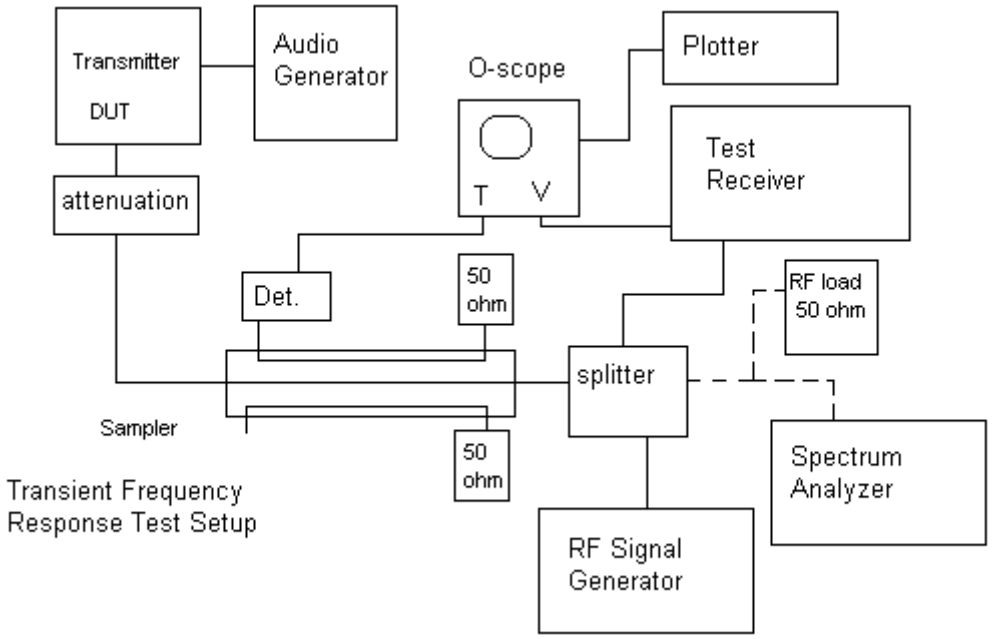
Part 2.1055(a)(1) **Frequency stability:**
Part 90.214 Transient Frequency Behavior

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

TEST PROCEEDURE: TIA/EIA TS603 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.



Transient Frequency Response Test Setup

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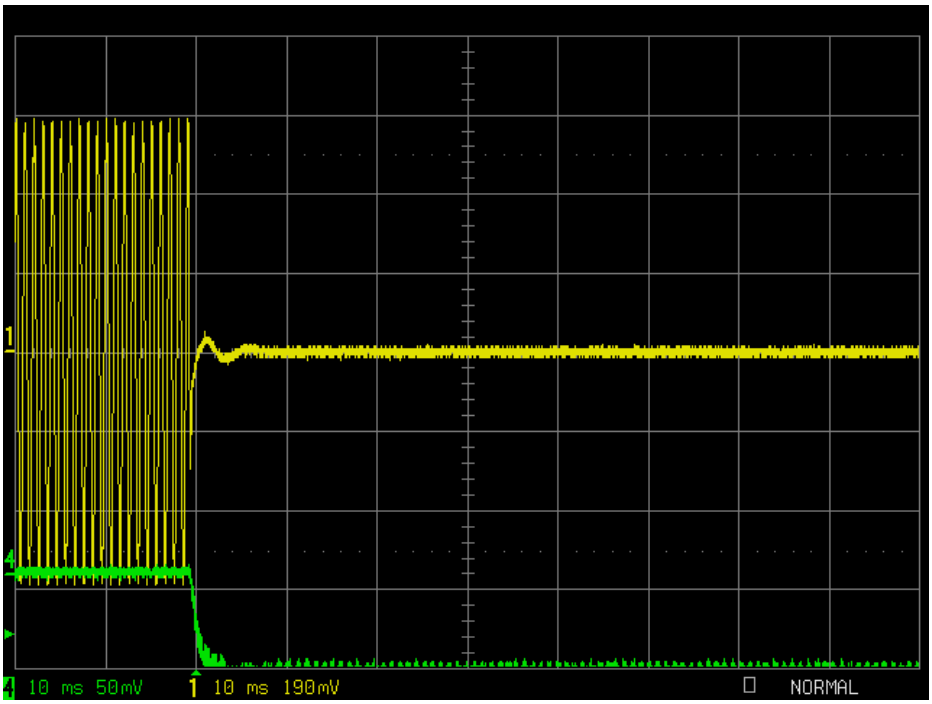
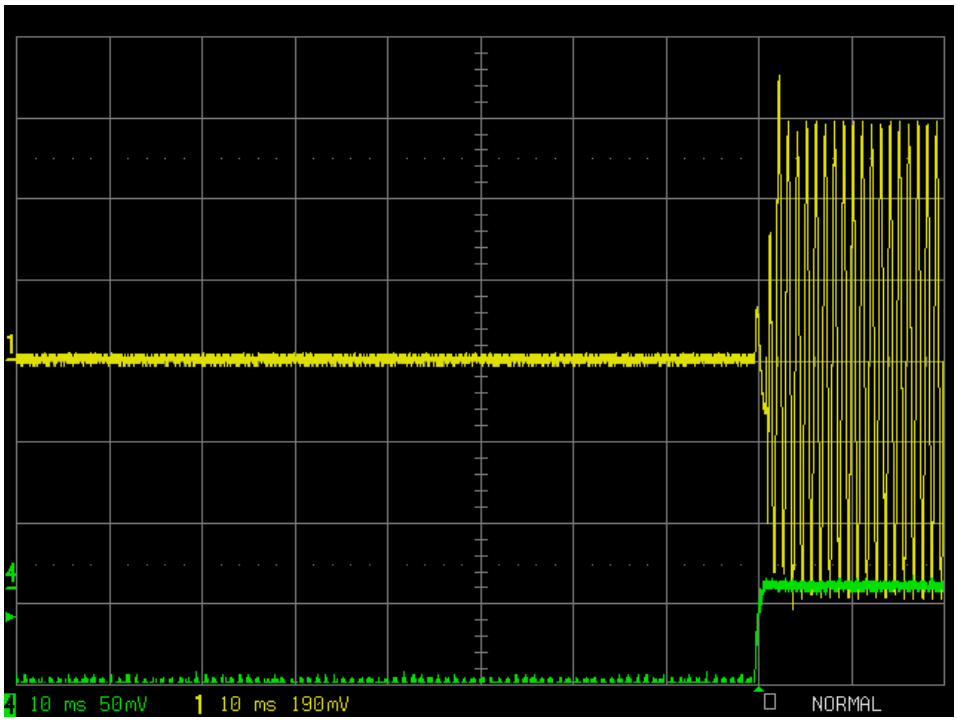
TRANSIENT FREQUENCY RESPONSE PLOTS – HIGH POWER





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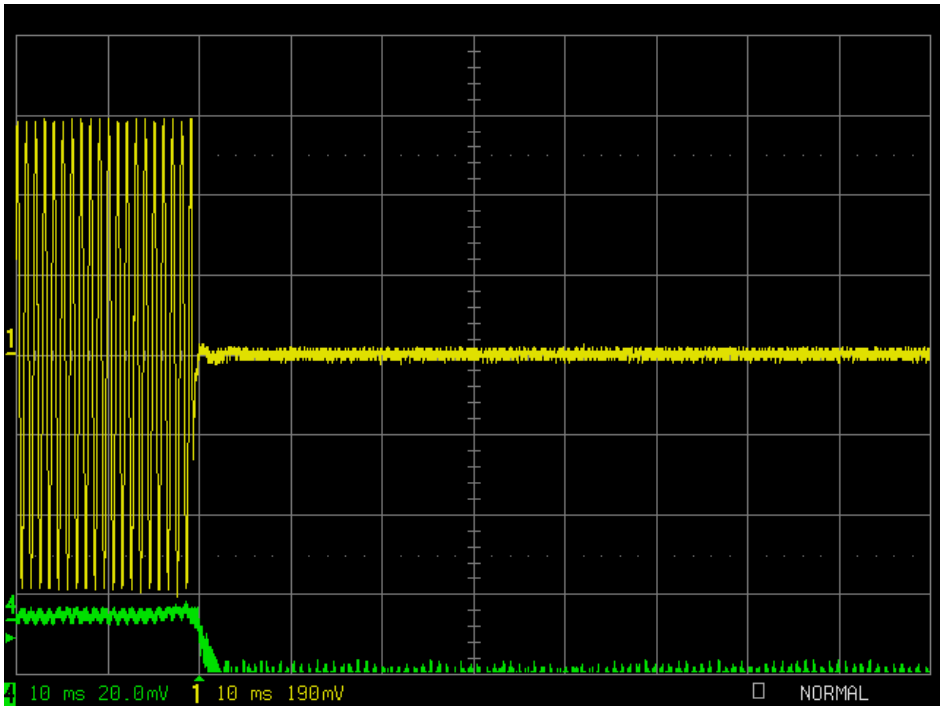
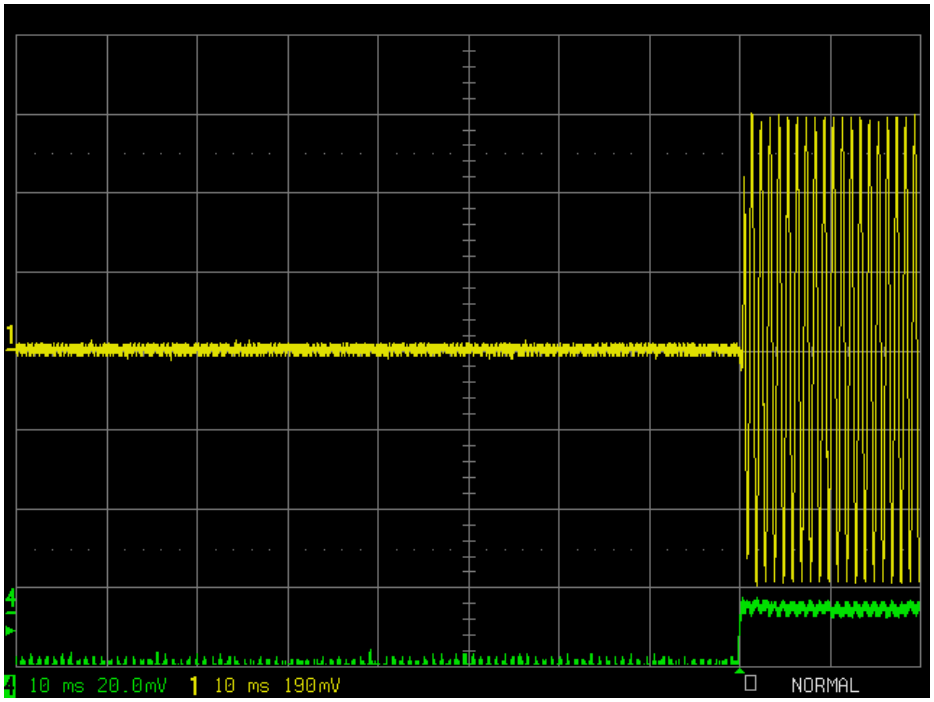
TRANSIENT FREQUENCY RESPONSE PLOTS –LOW POWER





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MPE Calculation

For a 2 Watt transmitter operated at a 50% duty cycle. Using a 3 dBi gain antenna gives us the following:

$W := 2$ power in Watts $D := 1$ Duty Factor in decimal % (1=100%)

$E := 15.0$ exposure time in minutes $U := 30$ (use 6 for controlled and 30 for uncontrolled)

$$Wexp := W \cdot D \cdot \left(\frac{E}{U}\right) \qquad PC := \frac{E}{U}$$

$PC = 0.5$ percent on time

$Wexp = 1$ Watts

$Po := 1000$ mWatts $dBd := .85$ antenna gain $f := 460$ Frequency in MHz

$G := dBd + 2.15$ gain in dBi $G = 3$

$Gn := 10^{\frac{G}{10}}$ gain numeric $S := \frac{f}{1500}$ controlled exposure

300 for controlled

1500 for uncontrolled

$Gn = 1.995$ $S = 0.307$

$$R := \sqrt{\frac{(Po \cdot Gn)}{(4 \cdot \pi \cdot S)}} \qquad Rinches := \frac{R}{2.54}$$

$R = 22.754$ distance in centimeters required for compliance

$Rinches = 8.958$

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EMC Equipment List

Device	Manufacturer	Model	Due Date or Status
3-Meter OATS	TEI	N/A	1/12/06
3/10-Meter OATS	TEI	N/A	3/26/07
Tan Tower Spectrum Analyzer	HP	8566B Opt 462	9/23/05
Tan Tower RF Preselector	HP	85685A	9/23/05
Tan Tower Quasi-Peak Adapter	HP	85650A	9/23/05
Tan Tower Preamplifier	HP	8449B-H02	9/23/05
Blue Tower Spectrum Analyzer	HP	8568B	4/13/07
Blue Tower RF Preselector	HP	85685A	4/13/07
Blue Tower Quasi-Peak Adapter	HP	85650A	4/13/07
Silver Tower Spectrum Analyzer	HP	8566B Opt 462	12/8/06
Silver Tower RF Preselector	HP	85685A	4/27/06
Silver Tower Quasi-Peak Adapter	HP	85650A	12/8/06
Silver Tower Preamplifier	HP	8449B	3/22/06
Biconnical Antenna	Electro-Metrics	BIA-25	4/29/07
Biconnical Antenna	Eaton	94455-1	8/17/06
Biconnical Antenna	Eaton	94455-1	3/18/05
Log-Periodic Antenna	Electro-Metrics	LPA-25	8/26/06
Log-Periodic Antenna	Electro-Metrics	LPA-30	out for cal
Log-Periodic Antenna	Eaton	96005	5/8/05
Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	3/21/04
Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	9/26/05
Double-Ridged Horn Antenna	Electro-Metrics	RGA-180	12/29/06
Horn Antenna *(at 3 meters)	Electro-Metrics	EM-6961	3/31/05
Horn Antenna *(at 10 meters)	Electro-Metrics	EM-6961	6/4/05
Harmonic Mixer with Horn Antenna	Oleson Microwave Labs	M08HW/A	4/25/05