TUV Rheinland of North America

Emissions Test Report

EUT Name: UHF Data Transceiver

EUT Model: TX3B

FCC Part 90

Prepared for:

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Report/Issue Date: 20 December 2004
Report Number: 30462977.003

Statement of Compliance

Manufacturer:	Everyday Wireless LLC 2033 Penn Avenue West Lawn, PA 19609 (610) 678-2100
Requester / Applicant:	Joe Winkler
Name of Equipment:	UHF Data Transceiver Model No. TX3B
Type of Equipment:	Intentional Radiator
Class of Equipment:	N/A
Application of Regulations:	FCC Part 90
Test Dates:	9 December 2004 to 20 December 2004

Guidance Documents:

Emissions: FCC 47 CFR Part 90

Test Methods:

Emissions: ANSI/TIA-603-B-2002

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

20 December 2004

Date

NVLAP Signatory

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Part 90 based on the results of testing performed on *9 December* 2004 through *20 December* 2004 on the *UHF Data Transceiver* Model No. *TX3B* manufactured by Everyday Wireless LLC. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and

approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.4 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:1992, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a

sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The test system for radiated immunity is defined as the antenna, amplifier, cables, signal generator field probe and spectrum analyzer. The test system for conducted immunity is defined as the coupling/decoupling device, amplifier, cables, signal generator and spectrum analyzer. The test system for voltage variations and interruptions immunity is defined as the AC power source and the interruptions generator. The test system for electrical fast transient immunity is defined as the AC power output source and the fast transient generator. The test system for lightning surge immunity is defined as the AC power output source and the lightning surge generator. The test system for electrostatic discharge immunity is defined as the air and contact discharge generators. The test system for power frequency magnetic field immunity is defined as the AC voltage source. The test system for the damped oscillatory wave immunity is defined as the AC power output source and the oscillatory wave generator. The test system for harmonic current and voltage flicker test is defined as the AC power source and the detection devices. The conducted emissions test system has a combined standard uncertainty of ± 1.2 dB. The radiated emissions test system has a combined standard uncertainty of ± 1.6 dB. The radiated immunity test system has a combined standard uncertainty of ± 2.7 dB. The conducted immunity test system has a combined standard uncertainty of ± 1.5 dB. The voltage variations and interruptions immunity test system has a combined standard uncertainty of ± 4.3 dB. The electrical fast transients immunity test system has a combined standard uncertainty of ± 5.8 dB. The lightning surge immunity test system has a combined standard uncertainty of ± 8.0 dB. The electrostatic discharge immunity test system has a combined standard uncertainty of ± 4.1 dB. The power frequency magnetic field immunity test system has a combined standard uncertainty of ± 0.58 dB. The damped oscillatory wave immunity test system has a combined standard uncertainty of ± 8.7 dB. The harmonic current and voltage flicker test system has a combined standard uncertainty of ± 11.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:1999.

3 Test Report Information

3.1 2.1033 Application for Certification Information

2.1033 (c) TECHNICAL DESCRIPTION

2.1033 (3) User Manual – Included in the Exhibits.

2.1033 90.209

(4) Type of Emission: 11K3F1D For 12.5 kHz

For 25kHz & 12 kHz

Bn = 2M + 2DK

M = 9600 Bits per second

D = 850 kHz (Peak Deviation)

K = 1

Bn = 2(9600/2) + 2(825)(1) = 9600 + 1650 = 11.25k

ALLOWED AUTHORIZED BANDWIDTH = 20.00 kHz

For 12.5 kHz

ALLOWED AUTHORIZED BANDWIDTH = 11.25 kHz

2.1033 (5) Frequency Range: 450-470 MHz

(6) Power Range and Controls: There are NO user Power controls.

(7) Maximum Output Power Rating:
45 Watts, into a 50 ohm resistive load.

(8) DC Voltages and Current into Final Amplifier:
INPUT POWER: (12.0V)(8.08A) = 96.97 Watts

(9) Tune-up procedure. The tune-up procedure is given in the Exhibits.

2.1033 (10) A schematic diagram and a description of all circuitry and devices for determining and stabilizing frequency, for suppression of spurious radiation, and for limiting power is included in the Exhibits.

2.1033(c) (11) A photograph or drawing of the equipment identification label is shown in the Exhibits.

2.1033(c) (12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label locations are shown in the Exhibits.

2.1033(c) (13) For Equipment employing digital modulation, a detail description of the modulation technique. This UUT uses FSK to modulate the transmitter.

2.1033(c) (14) data required for 2.1046 to 2.1057. See Below.

3.2 2.1046 RF Power Output

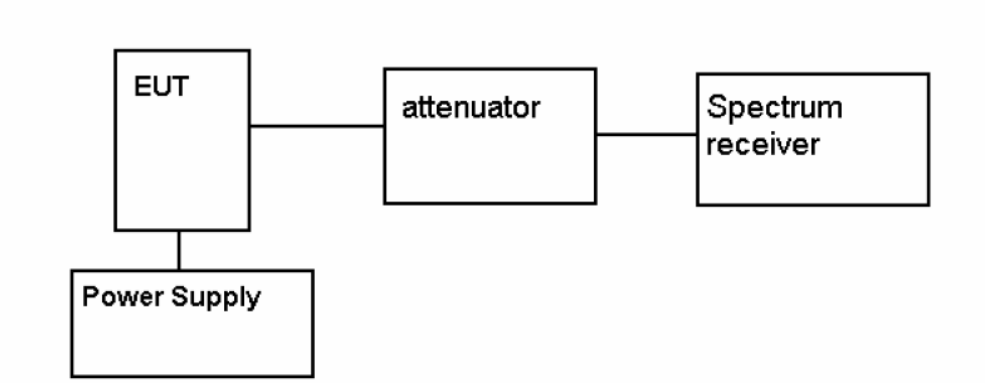
RF power output.

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

POWER OUTPUT

OUTPUT POWER: 45 Watts

METHOD OF MEASURING RF POWER OUTPUT



3.3 2.1047 Modulation Characteristics

NOT APPLICABLE, F1 type of emission.

3.4 90.210 Emission Mask

90.210 (c)

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 unmodulated 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 than 10kHz: 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.

90.210 (d) Emission Mask D – 12.5 kHz channel bandwidth 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.

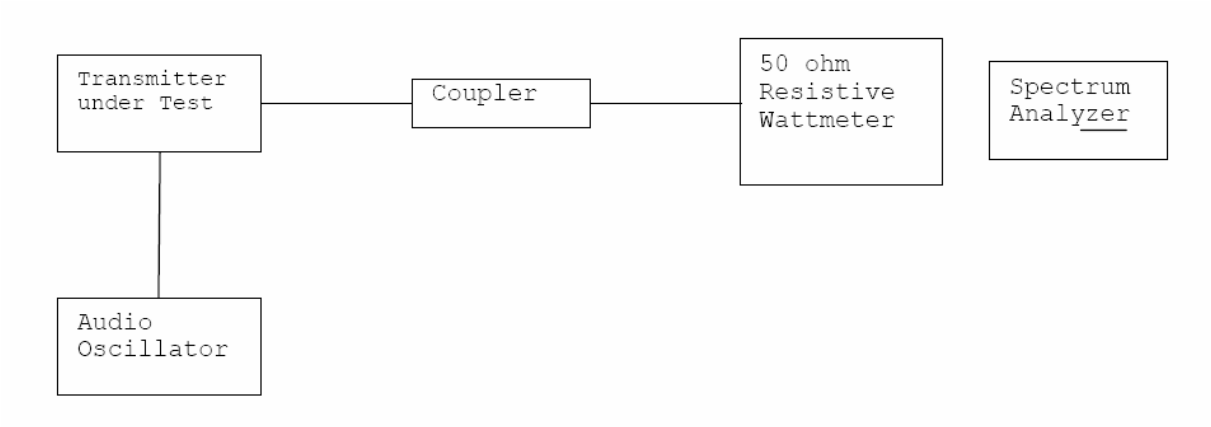
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

Radiotelephone Transmitter with Modulation Limiter

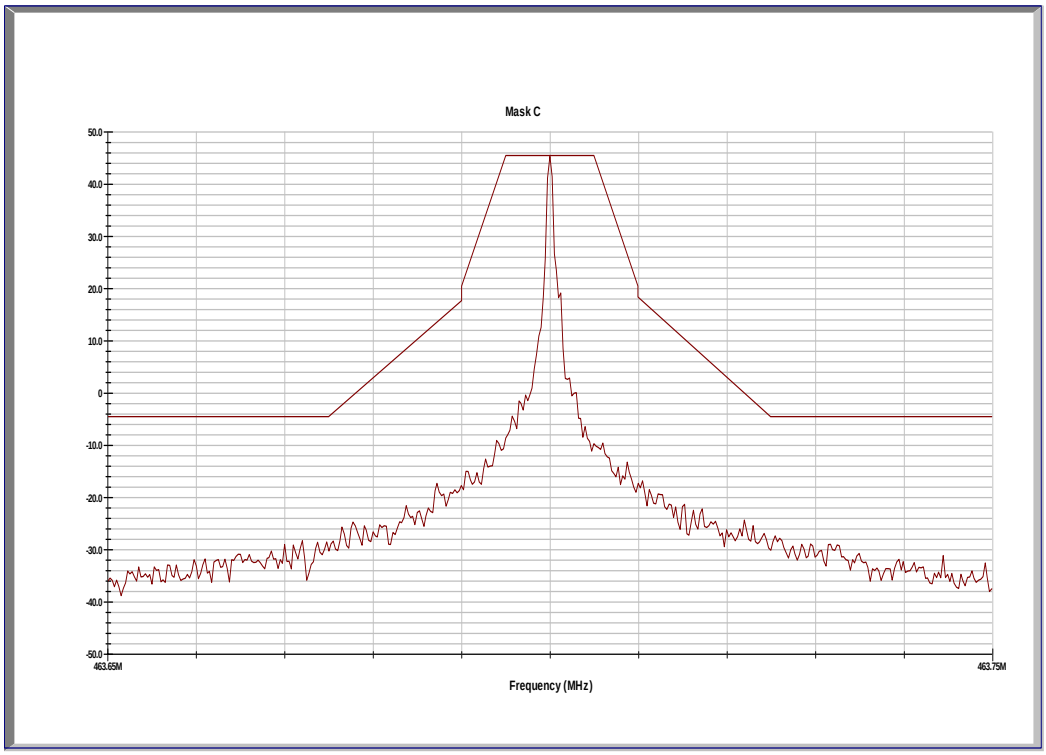
Test procedure: TIA/EIA-603 para 2.2.11, with the exception that various tones were used.

Test procedure diagram

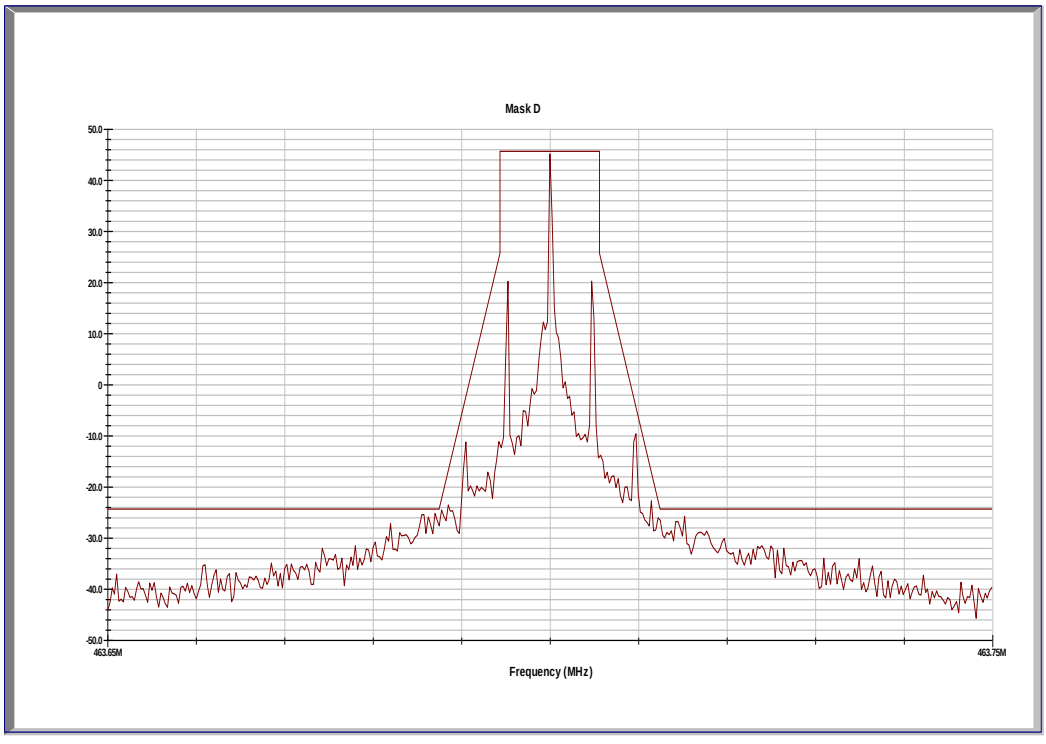
OCCUPIED BANDWIDTH AND MASK MEASUREMENT



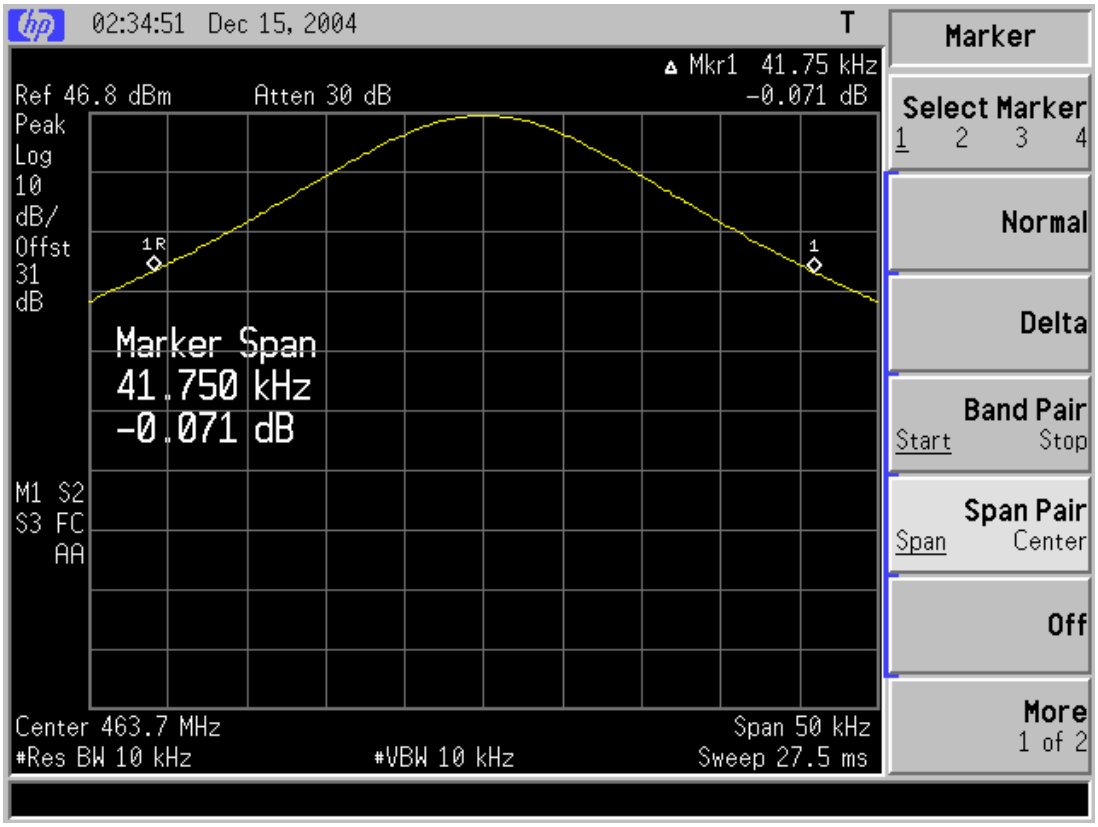
Emission Mask C PLOT 463.7MHz



Emission Mask D Plot 463.7 MHz



Occupied Bandwidth PLOT 463.7 MHz



3.5 2.1051 Spurious Emissions at Antenna Terminals

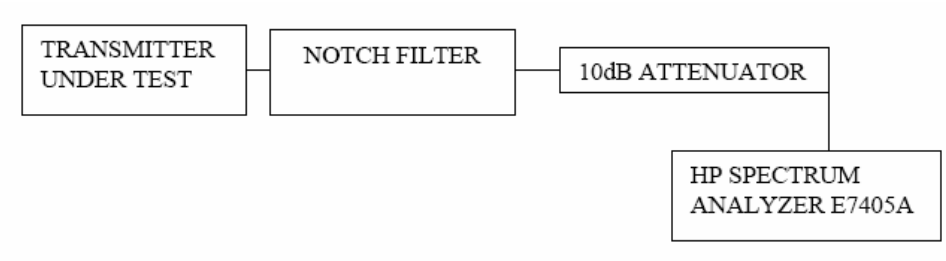
Data provided below shows the level of conducted spurious responses. The transmitter under test was programmed to generate a continuous wave (CW) carrier signal at peak power to measure carrier and harmonic conducted emissions. The output of the transmitter was connected to a standard load and from the standard load through a pre-selector filter of the HP model E7405A spectrum analyzer used. The spectrum was scanned from 0 to at least the 10^{th} harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be 50 + 10log (Po) dB below the mean power output of the transmitter.

For 12.5 kHz: 50 + 10log(45) = 66.53 dBc

EMISSION FREQUENCY MHz	dB BELOW CARRIER
450	N/a
900	108.13
1350	98.93
1800	110.57
2250	106.86
2700	104.12
3150	105.19
3600	106.8
4050	103.24
4500	102.76
463.7	N/a
927.4	106.87
1391.1	97.09
1854.8	113.56
2318.5	108.06
2782.2	108.23
3245.9	111.86
3709.6	105.61
4173.3	100.85
4637	97.37
470	N/a
940	109.04
1410	91.49
1880	116.73
2350	109.87
2820	111.62
3290	118.38
3760	114.96
4230	109.19
4700	92.18

Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The transmitter under test was programmed to generate a continuous wave (CW) carrier signal at peak power to measure carrier and

harmonic conducted emissions. The output of the transmitter was connected to a standard load and from the standard load through a pre-selector filter of the HP model E7405A spectrum analyzer used. The spectrum was scanned from 0 to at least the 10^{th} harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

3.6 2.1053 Field Strength of Spurious Radiation

NAME OF TEST: RADIATED SPURIOUS EMISSIONS 450 MHz

REQUIREMENTS: Emissions must be 50 + 10log(Po) dB below the mean power output of the transmitter.

50 + 101og(45) = 66.53 dBc

DATA:

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
450.00		46.46			
900.00	V	-41.62	2.82	1.21	88.08
1350.00	V	-47.99	3.44	7.93	94.45
1800.00	V	-49.98	4.08	8.62	96.44
2250.00	V	-46.12	4.62	9.05	92.58
2700.00	V	-43.05	5.08	9.40	89.51
3150.00	V	-49.80	5.54	9.55	96.26
3600.00	H	-46.91	5.90	9.80	93.37
4050.00	V	-43.48	6.27	9.57	89.94
4500.00	H	-53.39	6.62	11.10	99.85

NAME OF TEST: RADIATED SPURIOUS EMISSIONS 463.7 MHz

REQUIREMENTS: Emissions must be 50 + 10log(Po) dB below the mean power output of the transmitter.

50 + 101og(45) = 66.53 dBc

DATA:

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
463.70		46.41			
927.40	V	-41.23	2.82	1.23	87.64
1391.10	V	-49.70	3.51	8.09	96.11
1854.80	V	-55.76	4.15	8.64	102.17
2318.50	H	-42.97	4.71	9.15	89.38
2782.20	V	-43.56	5.12	9.46	89.97
3245.90	H	-49.36	5.59	9.65	95.77
3709.60	H	-47.25	6.03	9.69	93.66
4173.30	H	-50.16	6.30	9.99	96.57
4637.00	H	-52.10	6.75	10.96	98.51

NAME OF TEST: RADIATED SPURIOUS EMISSIONS 470 MHz

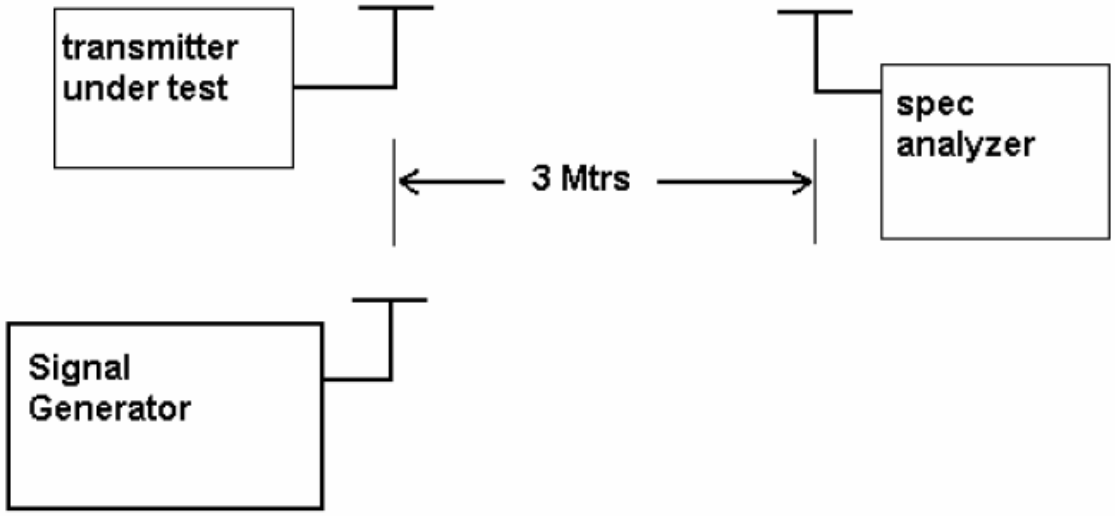
REQUIREMENTS: Emissions must be 50 + 10log(Po) dB below the mean power output of the transmitter.

50 + 101og(45) = 66.53 dBc

DATA:

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
470.00		46.32			
940.00	H	-37.41	2.86	1.06	83.73
1410.00	V	-49.17	3.54	8.16	95.49
1880.00	H	-57.52	4.20	8.65	103.84
2350.00	H	-38.19	4.77	9.19	84.51
2820.00	V	-39.31	5.21	9.46	85.63
3290.00	V	-49.63	5.58	9.69	95.95
3760.00	H	-50.48	5.99	9.64	96.80
4230.00	H	-46.44	6.46	10.18	92.76
4700.00	V	-50.44	6.88	10.90	96.76

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.

3.7 2.1055 Frequency Stability

90.213(a)(1)
Temperature and voltage tests were performed to verify that the frequency remains within the .00015%, 1.5 ppm specification limit, for 25 kHz spacing & 0.00025% for 12.5 KHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25° C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30°C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst-case number was recorded for temperature plotting. This procedure was repeated in 10° increments up to + 50 degrees C. Readings were also taken at 85 and 115 percent of the nominal value at the primary side of the supply.

MEASUREMENT DATA:

	Frequency observed (MHz)			ppm		
Temp. (deg. C)	**450.000000**	**463.700000**	**470.000000**	**450.0000**	**463.7000**	**470.0000**
-30	449.999479	463.699458	469.999603	-1.16	-1.17	-0.84
-20	449.999600	463.699888	469.999532	-0.89	-0.24	-1.00
-10	449.999892	463.699888	469.999780	-0.24	-0.24	-0.47
0	449.999990	463.699995	469.999966	-0.02	-0.01	-0.07
10	450.000003	463.699995	470.000013	0.01	-0.01	0.03
20	449.999970	463.699970	469.999965	-0.07	-0.06	-0.07
30	449.999992	463.699995	470.000003	-0.02	-0.01	0.01
40	450.000029	463.700051	470.000045	0.06	0.11	0.10
50	450.000043	463.700056	470.000067	0.10	0.12	0.14

85 and 115 % of nominal	Frequency observed (MHz)			ppm		
	450.000000	**463.700000**	**470.000000**	**450.0000**	**463.7000**	**470.0000**
102	449.999987	463.699973	470.000013	-0.03	-0.06	0.03
138	449.999991	463.699982	470.000008	-0.02	-0.04	0.02

3.8 90.214 Transient Frequency Behavior

REQUIREMENTS: In the 450-500MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 12.5kHz Channels:

Time Interval	Maximum Frequency	Portable Radios 450-500 MHz
t1	+ 12.5 kHz	10.0 ms
t2	+ 6.25 kHz	25.0 ms
t3,t4	+ 12.5 kHz	10.0 ms

TEST PROCEDURE: 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.

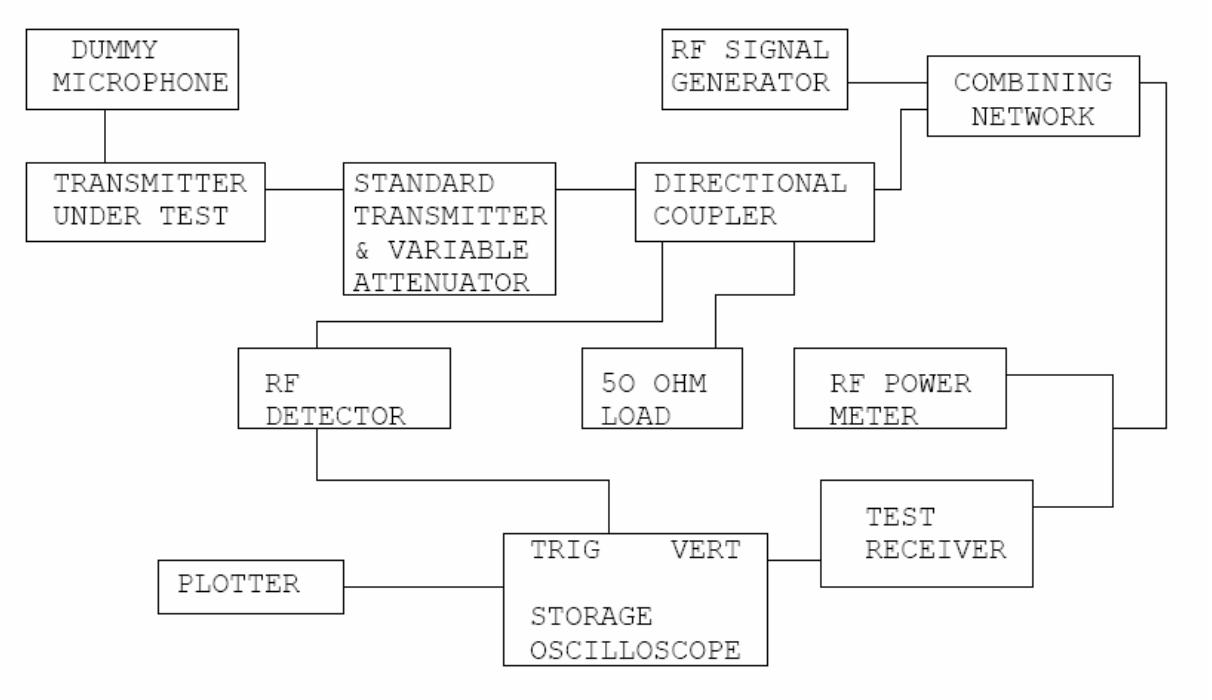
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.

3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.

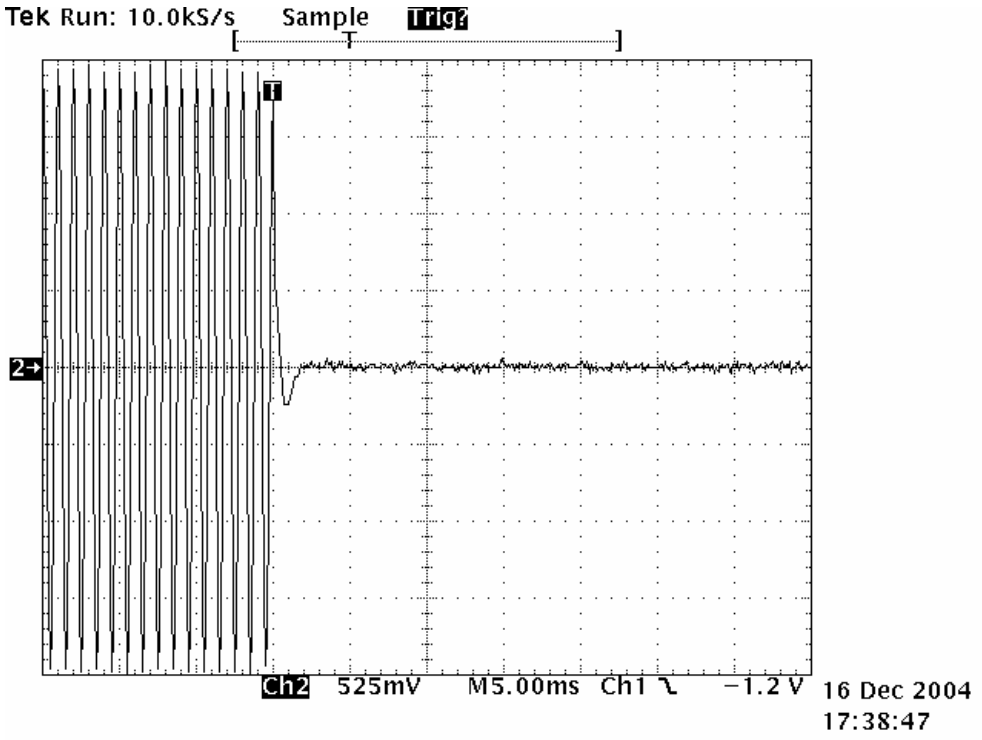
4. With the levels set as above the transient frequency behavior was observed & recorded.

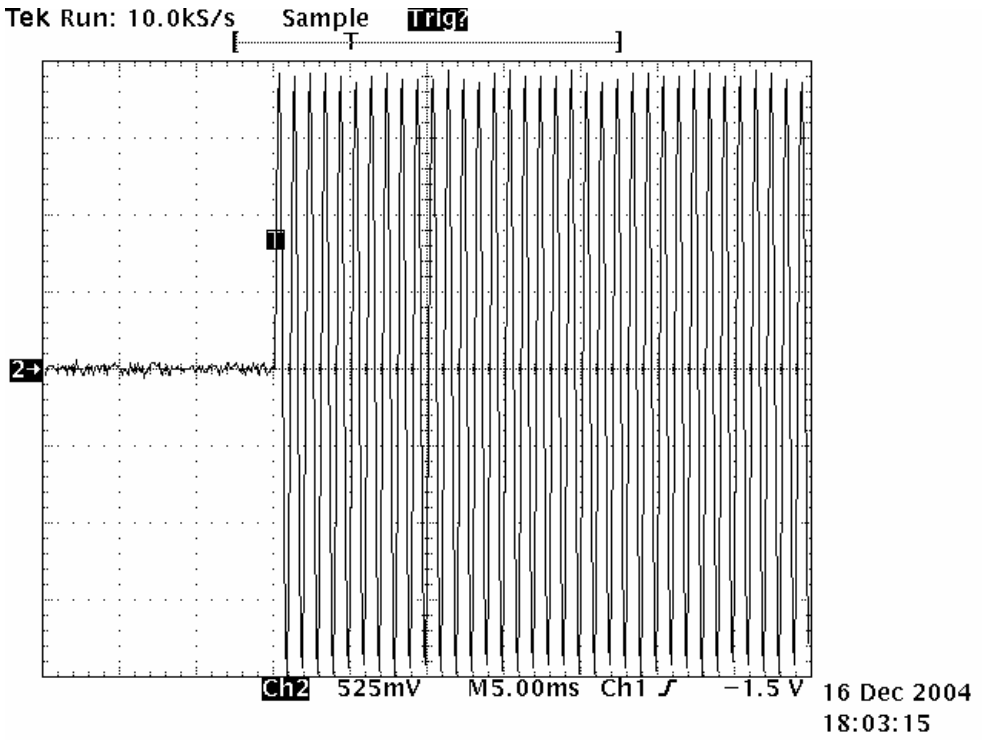
90.214 Transient Frequency Behavior

(Continued)



TRANSIENT FREQUENCY RESPONSE GRAPH – 12.5 (463.7MHz)





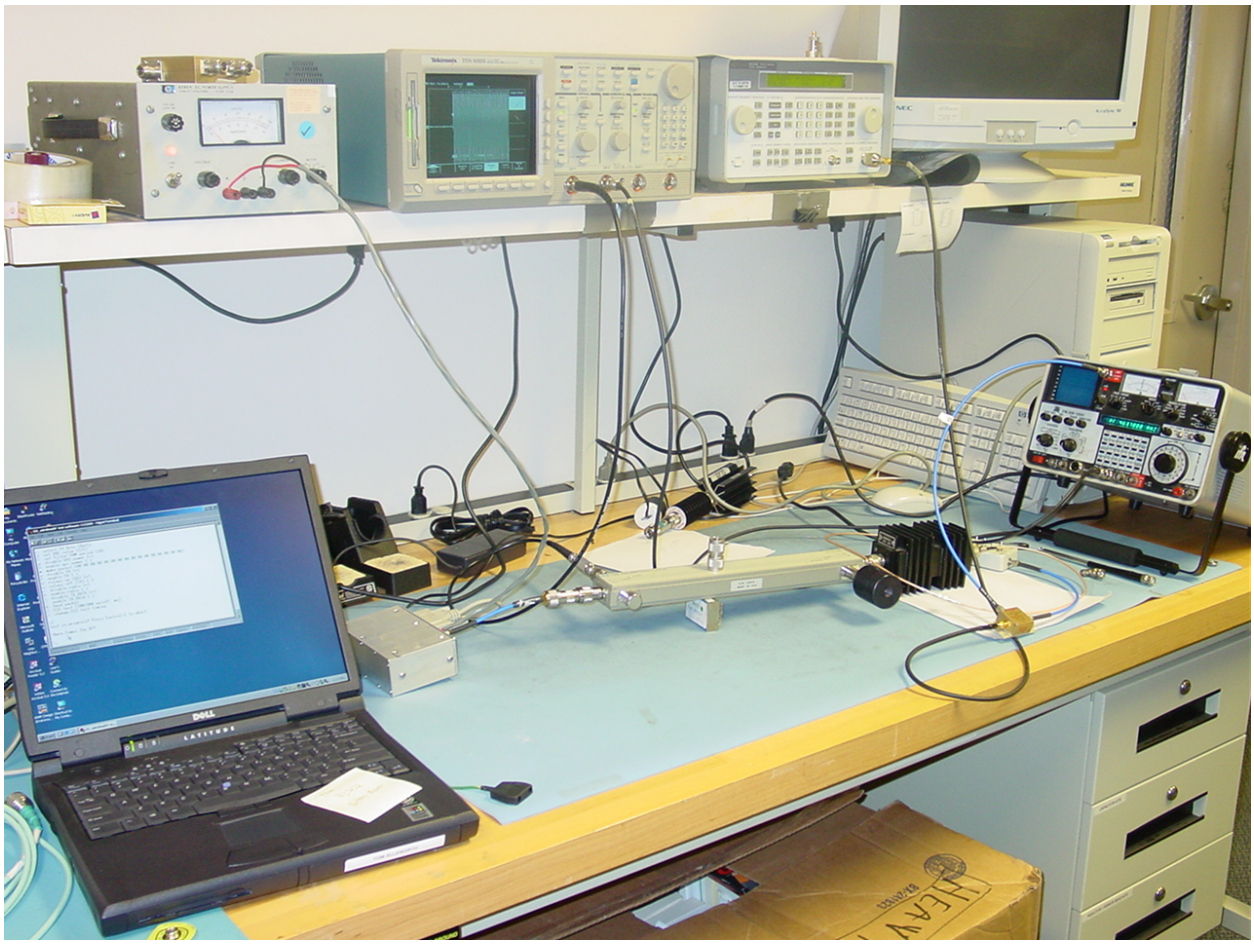
4 Test Equipment Use List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	10-May-04	10-May-05
Ant. Log Periodic	AH Systems	SAS-516	133	19-Jan-04	19-Jan-05
Antenna Horn	EMCO	3115	2236	14-Oct-04	14-Oct-05
Cable, Coax	Andrew	FSJ1-50A	031	16-Jan-04	16-Jan-05
Cable, Coax	Andrew	FSJ1-50A	034	19-Jan-04	19-Jan-05
Cable, Coax	Thermax	RG 142 B/U	035	19-Jan-04	19-Jan-05
Cable, Coax	Andrew	FSJ1-50A	042	15-Jan-04	15-Jan-05
Cable, Coax	Andrew	FSJ1-50A	045	15-Jan-04	15-Jan-05
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	27-Jan-04	27-Jan-05
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	11-Aug-04	11-Aug-05
Ant. Dipole Set BL 1-4	EMCO	3121C	9302-914	20-Oct-04	20-Oct-05
Antenna Horn	EMCO	3115	5770	11-Mar-04	11-Mar-05
Meter, Multi	Fluke	179	82940101	27-Sept-04	27-Sept-05
Meter, Multi	Fluke	79-3	69200606	6-Aug-04	6-Aug-05
Meter, RF Power	Boonton	4231A	66801	22-Aug-04	22-Aug-05
Meter, Temp/Humid/Barom	Fisher	02-400	01	13-Aug-04	13-Aug-05
Oscilloscope	Tektronix	TDS 680B	B030230	14-Feb-04	14-Feb-05
Power Sensor	Boonton	51075	32091	22-Aug-04	22-Aug-05
Power Sensor	Boonton	51011-EMC	32203	22-Aug-04	22-Aug-05
Temperature Chamber	Espec	ECT-2	052525	CNR II	CNR II
Receiver	IFR	1200A	844912/002	CNR II	CNR II
Power Supply, DC	Lambda	LK343A FM	D24270	CNR II	CNR II

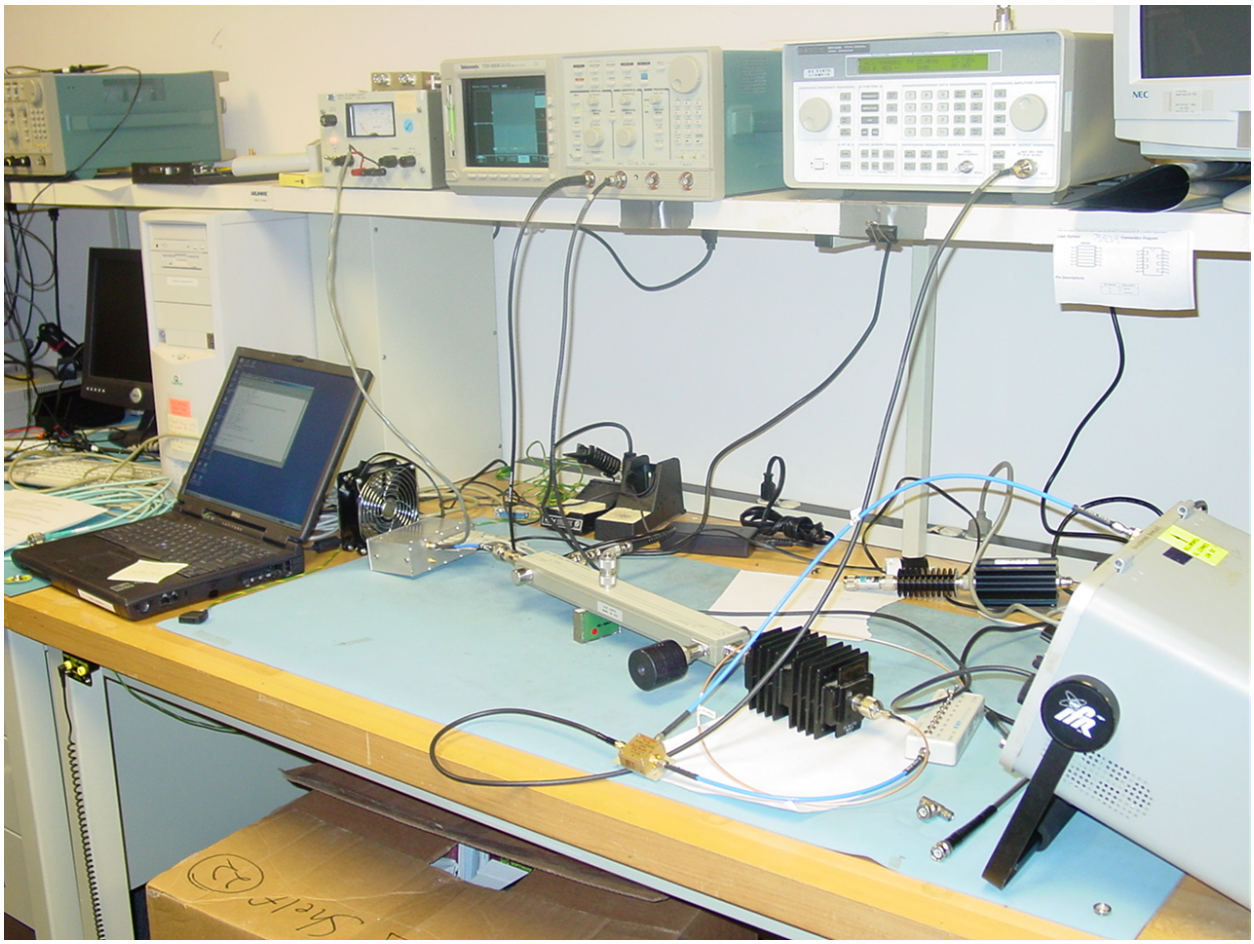
* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

5 Test Setup Photos

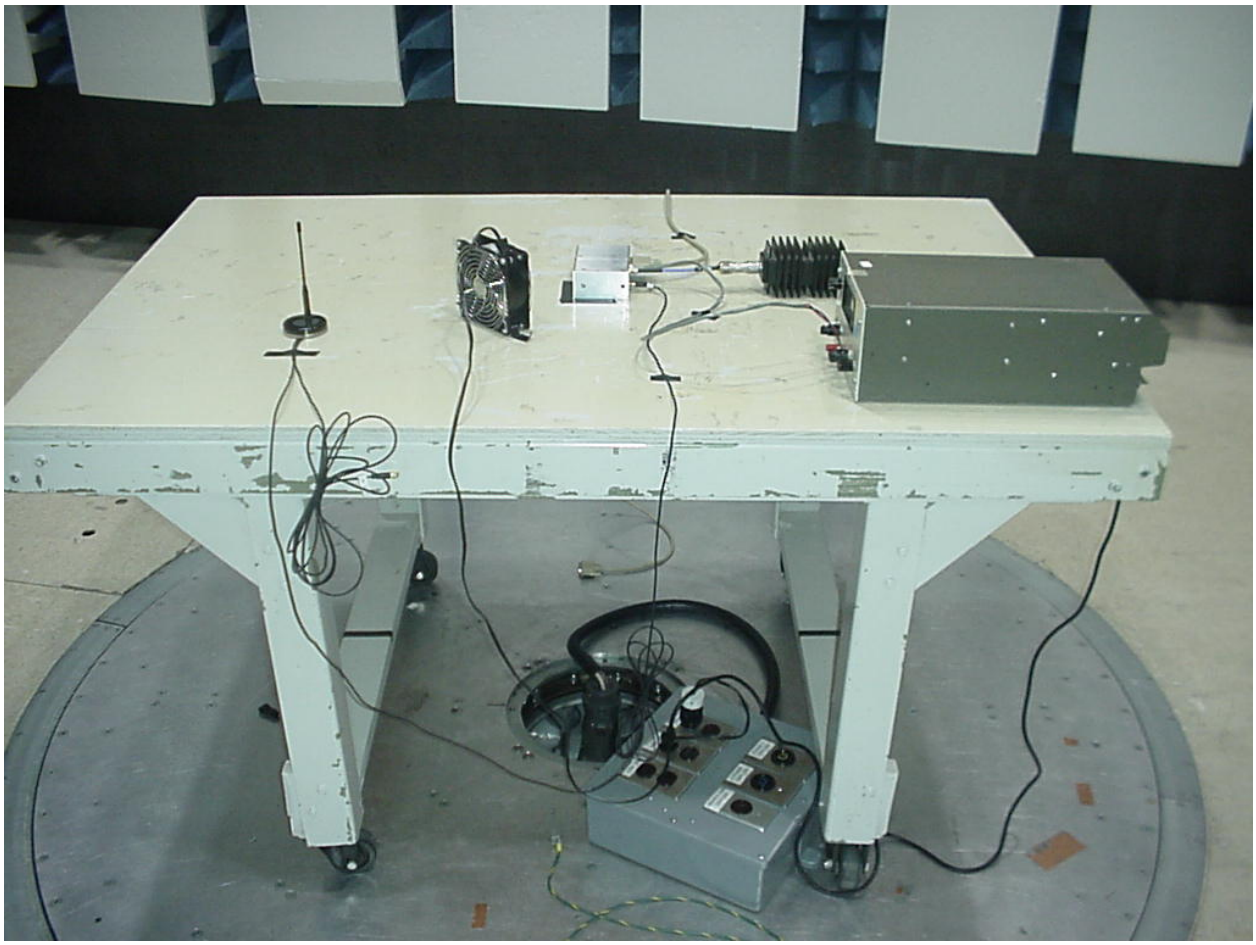
Spurious Emissions At Antenna Port, Output Power, Mask, and Bandwidth Test



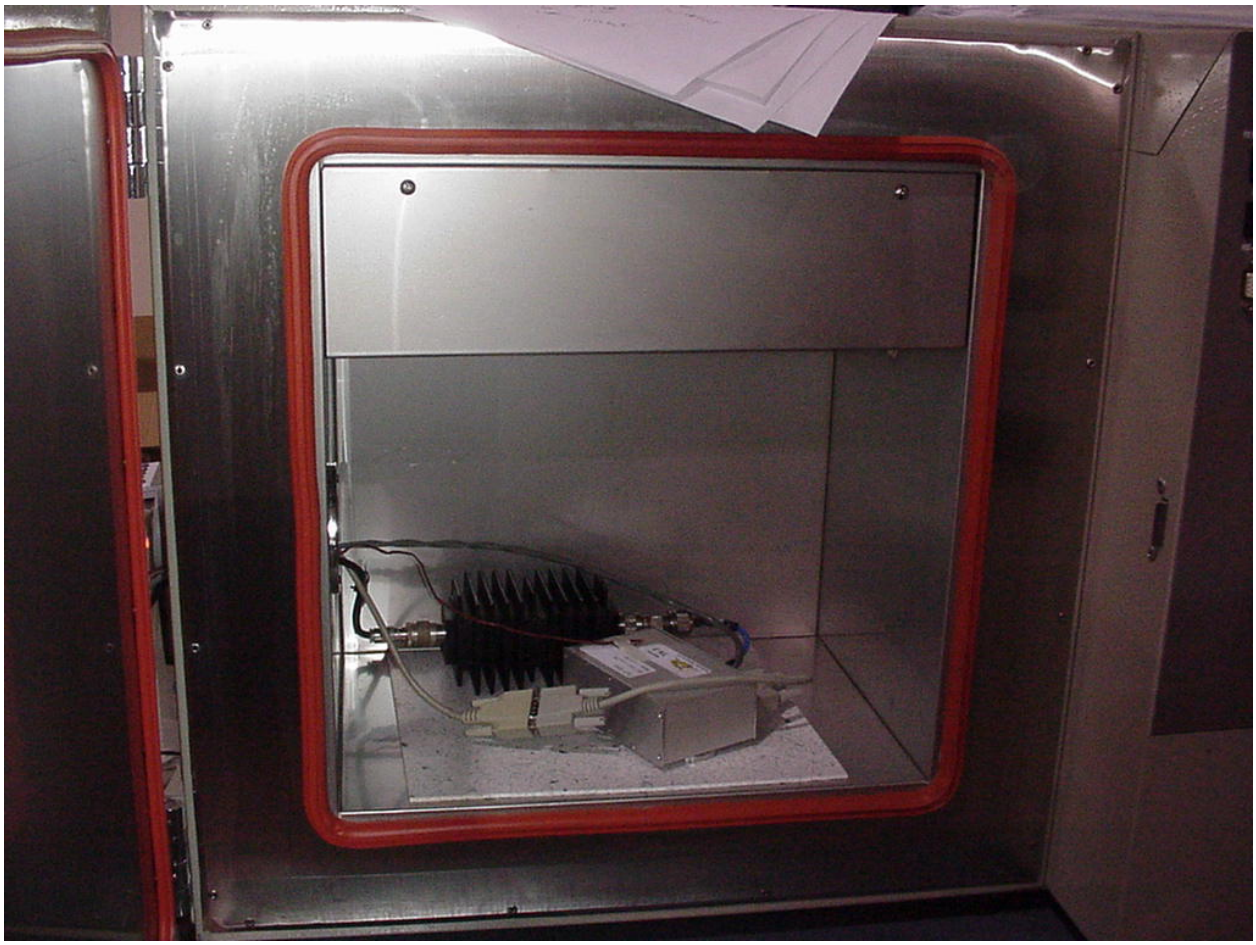
Transient Frequency Behavior



Transient Frequency Behavior



Radiated Spurious Emissions



Frequency Stability