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APPLICANT: MIDLAND RADIO CORPORATION

FCC ID: MMA714050C

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EXHIBITS CONTAINING:

EXHIBIT 1.....FCC ID LABEL SAMPLE
EXHIBIT 2.....SKETCH OF LOCATION
EXHIBIT 3.....SCHEMATICS
EXHIBIT 4.....USER'S MANUAL
EXHIBIT 5.....EXTERNAL PHOTOS
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EXHIBIT 10....TEST SET-UP PHOTOGRAPHS

GENERAL_INFORMATION_REQUIRED FOR_TYPE_ACCEPTANCE

2.1033(c)(1)(2) MIDLAND RADIO CORPORATION will manufacture the FCCID: MMA714050C VHF TRANSCEIVER in quantity, for use under FCC RULES PART 90.

MIDLAND RADIO CORPORATION
1120 CLAY STREET
NORTH KANSAS CITY, MO 64116

2.1033 (c) TECHNICAL_DESCRIPTION

2.1033(c)(3) Instruction book. A draft copy of the instruction manual is included as EXHIBIT 5.

2.1033(c) (4) 90.209 Type of Emission: 14K2F3E

Bn = 2M + 2DK
M = 3000
D = 4100
Bn = 2(3000)+2(4100) = 14.2k

2.1033(c) (4) 90.209 Type of Emission: 10K0F3E

Bn = 2M + 2DK
M = 3000
D = 2000
Bn = 2(3000)+2(2000) = 10.0k

2.1033(c)(5) 90.209 Frequency Range: 465-500 MHz

2.1033(c)(6)(7) 90.205 Operating power is fixed at the factory at 70 watts and cannot be adjusted.

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

FINAL AMPLIFIER ONLY
Vce = 13.7 Volts
IC = 13.0 A

2.1033(c)(9) Tune-up procedure. The tune-up procedure is included in Exhibit 8.

2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 4. The block diagram is included as EXHIBIT 3.

2.1033(c)(11) A photograph or a drawing of the equipment identification label is included as Exhibit #1.

2.1033(c)(12) Photographs(8"X10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, labels for controls, including any view under shields - See EXHIBIT 6-7.

2.1033(c)(13) Digital modulation is not allowed.

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

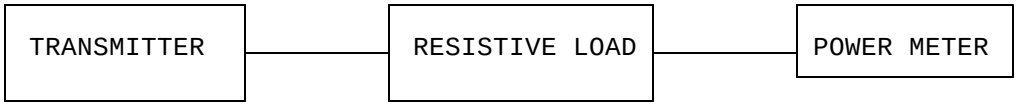
2.1046(a) RF power output.

90.205 RF power is measured by connecting a 50 ohm, Resistive wattmeter to the RF output connector. With a nominal battery voltage of 13.6 VDC, and the Transmitter properly adjusted, the RF output measures:

INPUT POWER: (13.7V)(13.0A) = 178.10 Watts

OUTPUT POWER: 70 Watts

METHOD OF MEASURING RF POWER OUTPUT



2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on page 5.

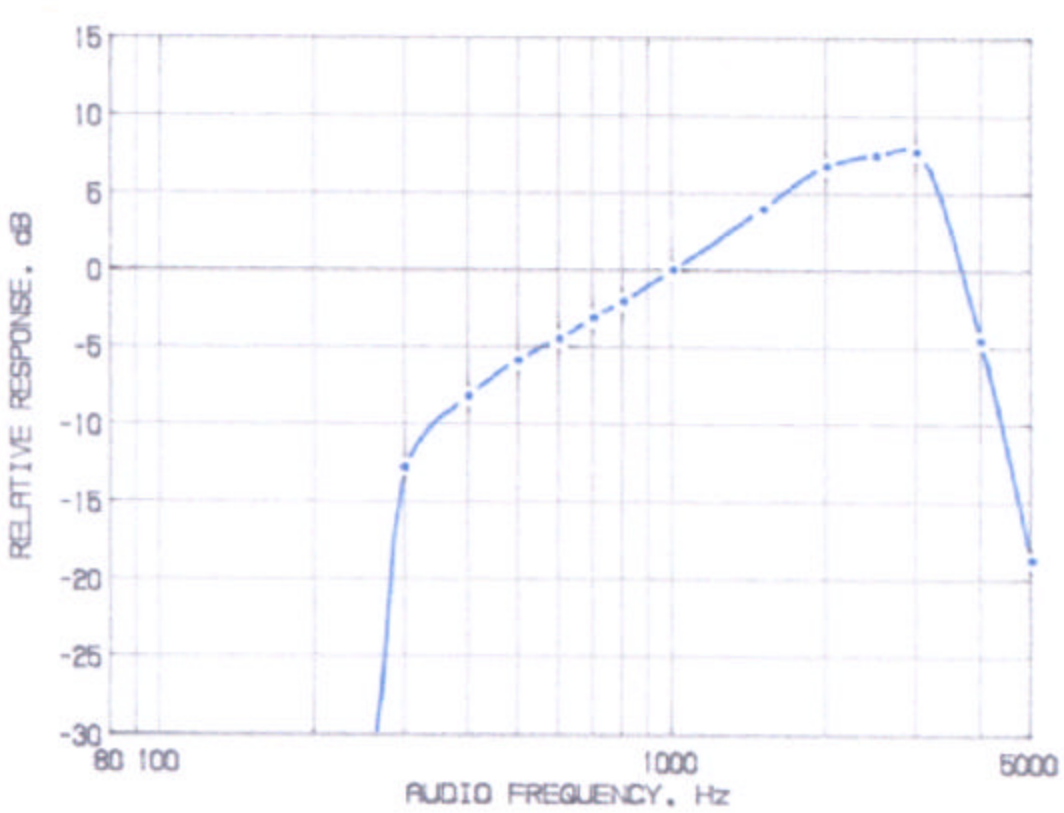
The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.

2.1047(b) Audio input versus modulation

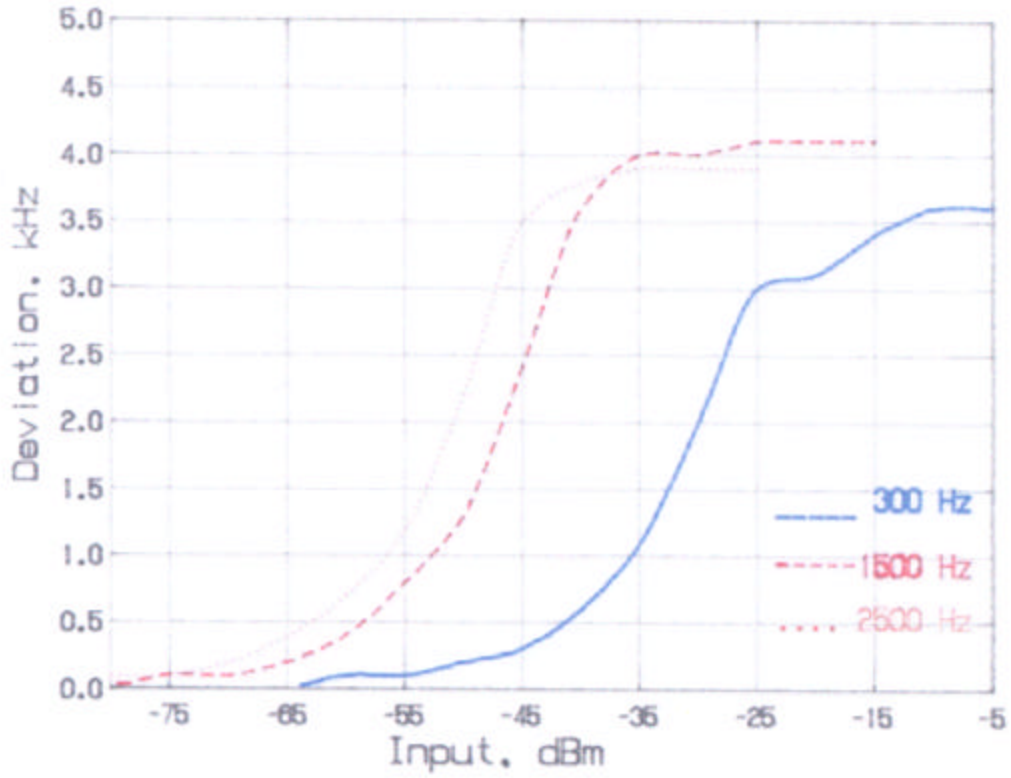
The audio input level needed for a particular per-percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are shown in pages 6-7. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

Post Limiter Filter The filter must be between the modulation limiter and the modulated stage. At any frequency between 3 & 20 kHz the filter must have an attenuation of 60log (f/3) greater that the attenuation at 1KHz. See the plot; page 8.

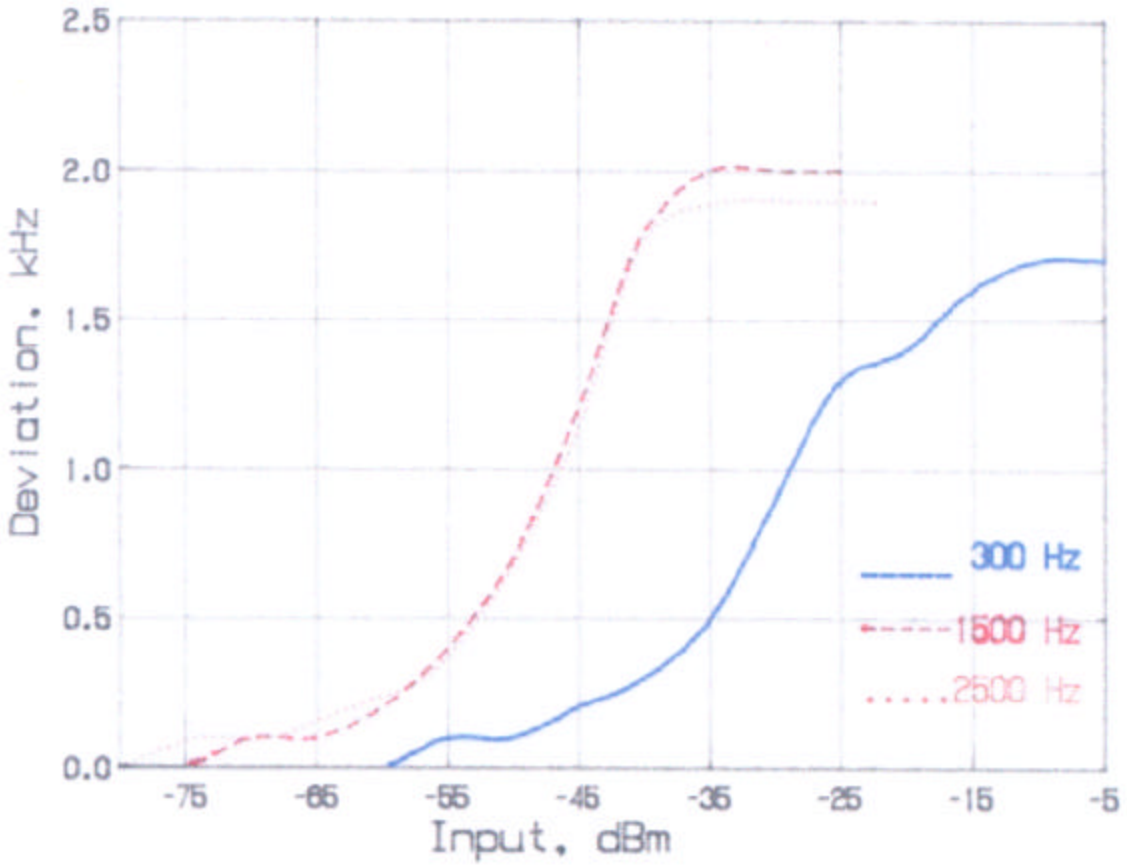
AUDIO RESPONSE GRAPH



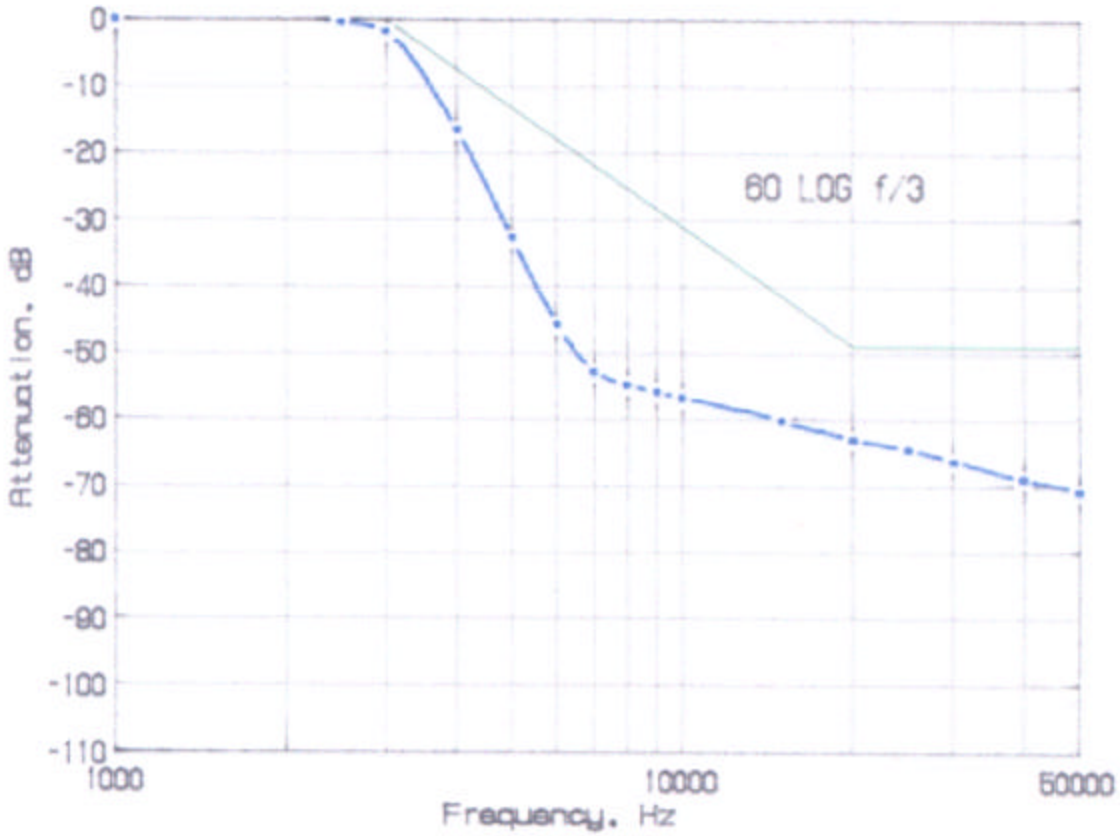
MODULATION LIMITING GRAPH – WIDE BAND



MODULATION LIMITING – NARROW BAND



AUDIO LOW PASS FILTER PLOT



2.1049(c)
90.210(b)

EMISSION BANDWIDTH:

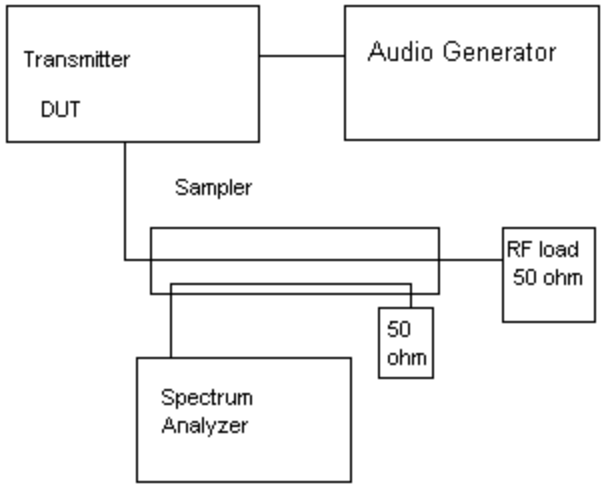
Data in the plots shows that the sidebands from greater than 50% to 100% of the authorized bandwidth must be attenuated by at least 25 dB and from 100 to 250% the sidebands must be attenuated by at least 35 dB. Beyond 250% the sidebands must be attenuated by at least 43+log10(TP). The transmitter was modulated with 2500 Hz, adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram follows. See the occupied bandwidth plots; pages 10, 11.

Radiotelephone transmitter with modulation limiter.

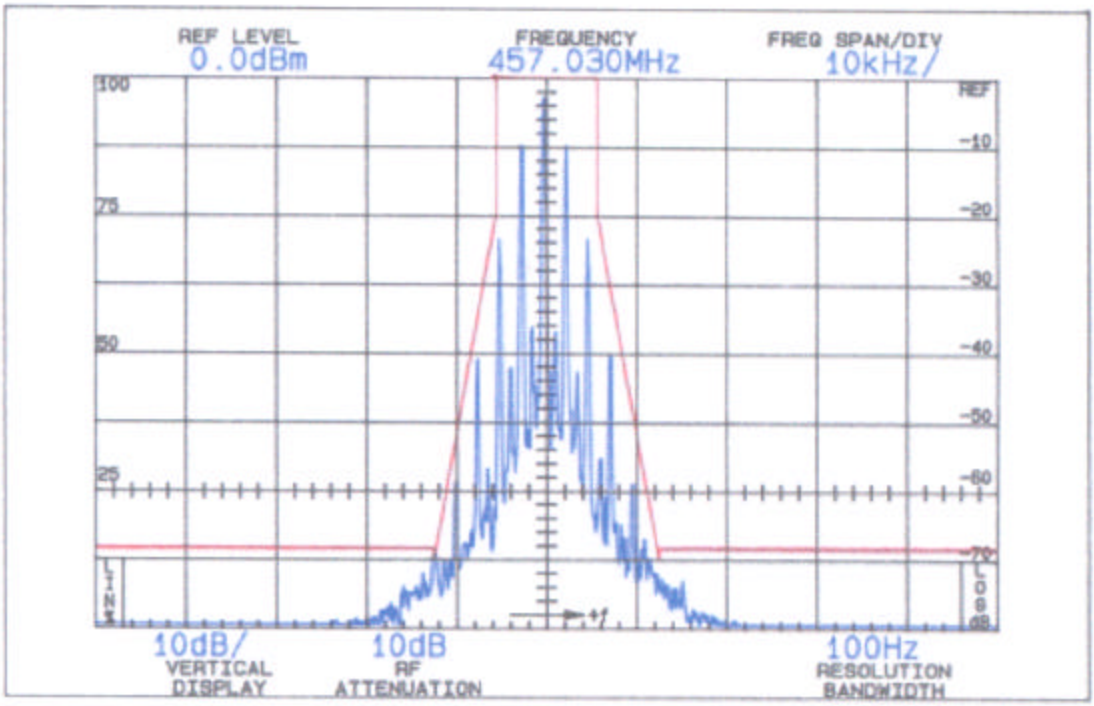
Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT

Occupied BW Test Equipment Setup



OCCUPIED BANDWIDTH PLOT
90.210(d)

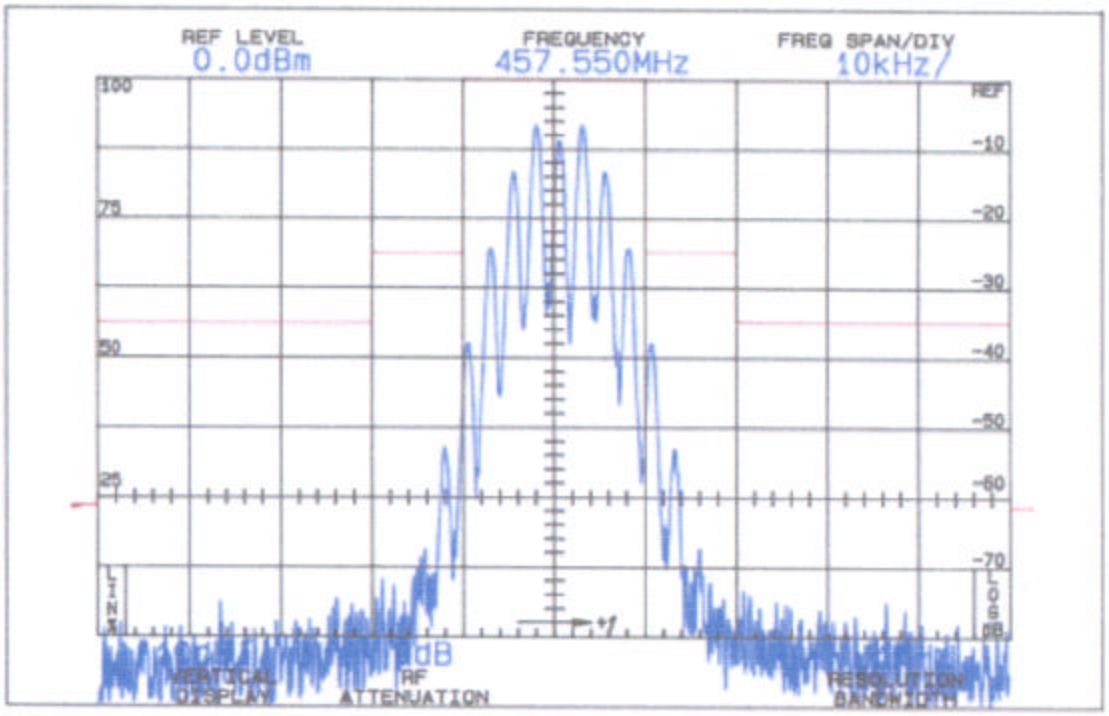


90.210(d)

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 Fo to 5.625 kHz removed from F0: Zero dB. (2) On any frequency removed 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.

OCCUPIED BANDWIDTH PLOT

90.210(b)



2.1051 Spurious emissions at antenna terminals(conducted): Data on the following page 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.

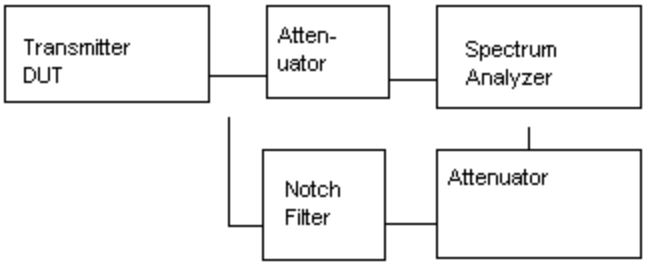
REQUIREMENTS: Emissions must be 50 +10log(Po) dB below the mean power output of the transmitter.

50 + 10log(70) = 68.4 dB

EMISSION FREQUENCY MHz	dB BELOW CARRIER
482.5	00.0
965.0	96.8
1447.5	91.8
1903.0	90.2
2412.5	89.9
2895.0	100.4
3377.5	86.5
3860.0	98.0
4342.5	113.8
4825.0	111.3

Method of Measuring Conducted Spurious Emissions

Spurious Emissions at
Antenna Terminals



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. An audio generator was connected to the UUT through a dummy microphone circuit and the output of the transmitter connected to a standard load and from the standard load through a pre-selector filter of the spectrum analyzer. The spectrum was scanned from 400 kHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer. The measurements were made using the shielded room located at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

2.1053 Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

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

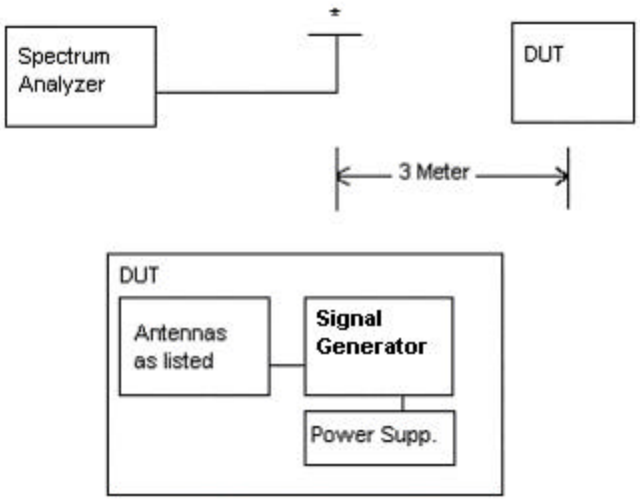
50 + 10log(70)=68 dB

TEST DATA:

Emission Frequency MHz	dBc	dBm	Margin dB
482.50	0	47.9	0.00
965.00	103	-55	35.00
1,447.50	84	-36	16.00
1,930.00	76	-28	8.00
2,412.60	80	-32	12.00
2,895.10	91	-43	23.00
3,377.60	87	-39	19.00
3,860.10	90	-42	22.00
4,342.60	85	-37	17.00
4,825.20	85	-37	17.00

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 substitutin method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

Method of Measuring Radiated Spurious Emissions



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. The EUT was placed in the temperature chamber at 25 degrees 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 degrees 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 degree increments up to + 50 degrees C.

Readings were also taken at minus 15% of the battery voltage of 13.6VDC, which we estimate to be the battery endpoint.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 457.030 000 MHz

TEMPERATURE_°C	FREQUENCY_MHz	PPM
REFERENCE_____	457.030 000	00.0
-30_____	457.030 069	+ 0.2
-20_____	457.030 114	+ 0.2
-10_____	457.030 113	+ 0.2
0_____	457.030 246	+ 0.5
+10_____	457.030 070	+ 0.2
+20_____	457.029 993	+ 0.0
+30_____	457.030 025	+ 0.1
+40_____	457.029 878	- 0.3
+50_____	457.029 834	- 0.4
-15% Battery End-Point VDC	457.029 990	- 0.0

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was –0.4 ppm to +0.5 ppm.

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

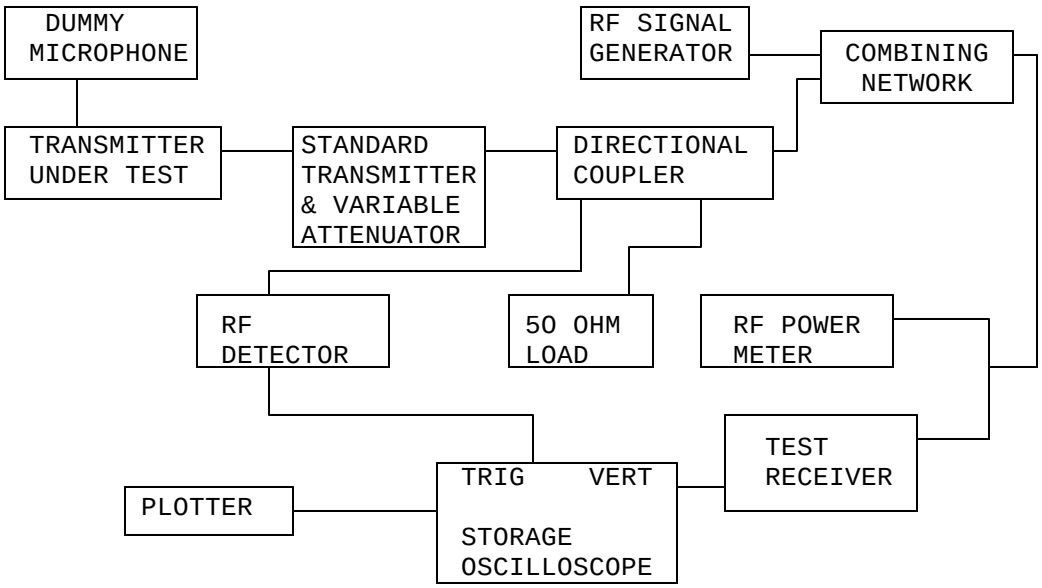
REQUIREMENTS: In the 450-500MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 12.5kHz Channels:

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

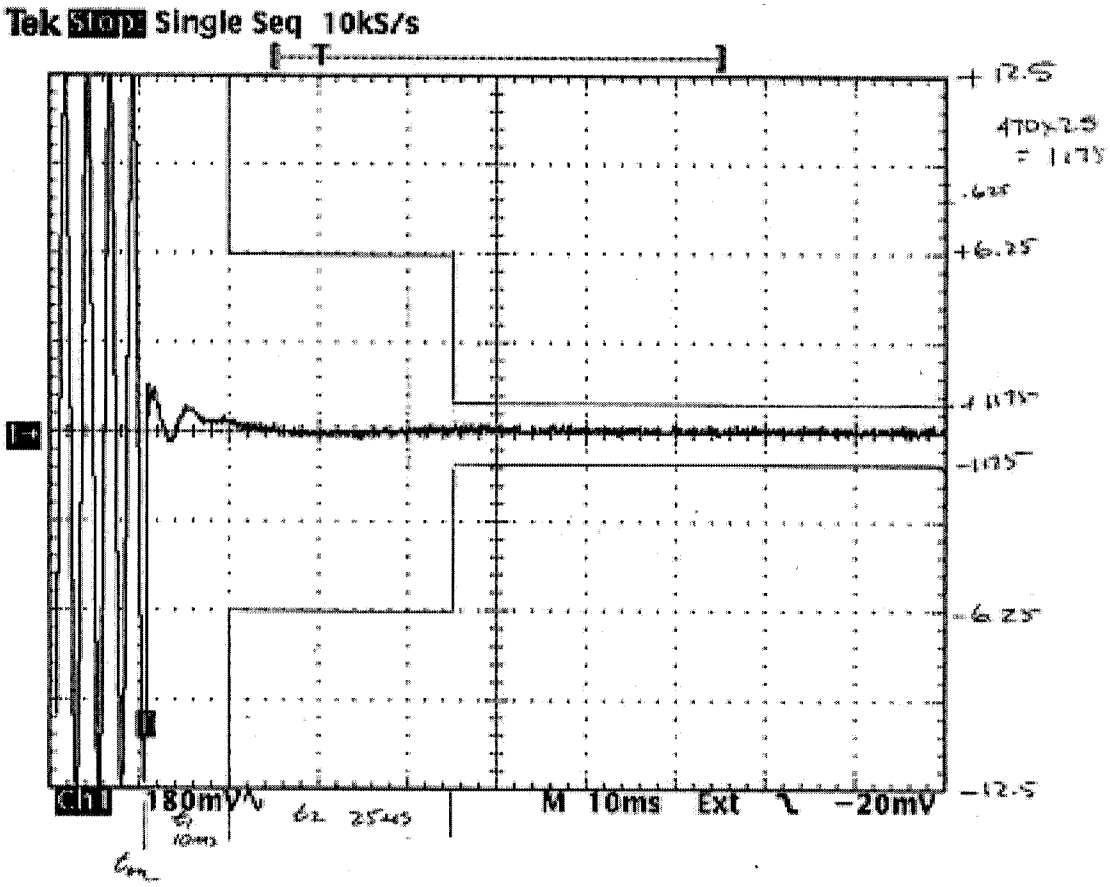
TEST PROCEEDURE: TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

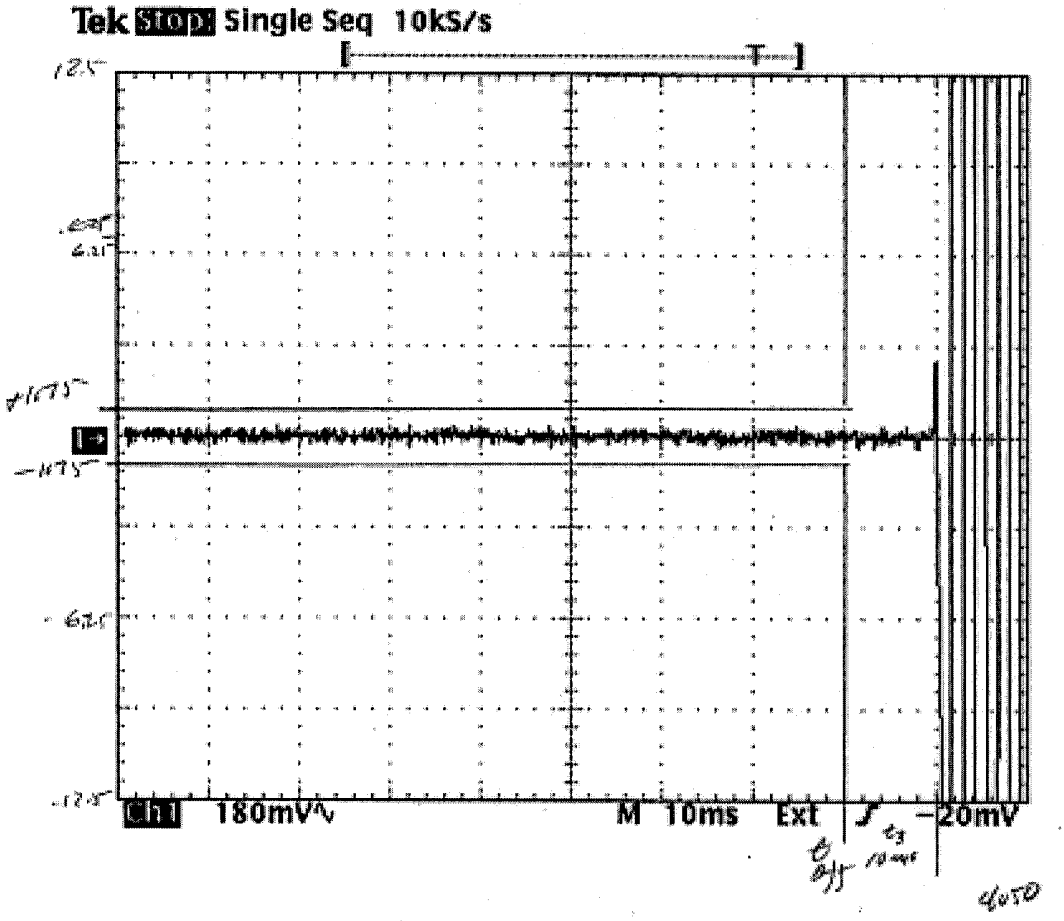
1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained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

2.1055 Frequency stability:
90.214 Transient Frequency Behavior
(Continued)



TRANSIENT FREQUENCY RESPONSE PLOT




Tek Stop: Single Seq 10kS/s
Ch1 180mV
M 10ms Ext
-20mV

EMC Equipment List

	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
X	3-Meter OATS	TEI	N/A	N/A	Listed 12/22/99	12/22/02
	3/10-Meter OATS	TEI	N/A	N/A	Listed 3/26/01	3/26/04
	Receiver, Beige Tower					
	Spectrum Analyzer (Tan)	HP	8566B Opt 462	3138A07786 3144A20661	CAL 8/31/01	8/31/03
	RF Preselector (Tan)	HP	85685A	3221A01400	CAL 8/31/01	8/31/03
	Quasi-Peak Adapter (Tan)	HP	85650A	3303A01690	CAL 8/31/01	8/31/03
X	Receiver, Blue Tower					
X	Spectrum Analyzer (Blue)	HP	8568B	2928A04729 2848A18049	CHAR 10/22/01	10/22/03
X	RF Preselector (Blue)	HP	85685A	2926A00983	CHAR 10/22/01	10/22/03
X	Quasi-Peak Adapter (Blue)	HP	85650A	2811A01279	CHAR 10/22/01	10/22/03
X	Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/26/01	4/26/03
	Biconnical Antenna	Eaton	94455-1	1096	CAL 10/1/01	10/1/03
	Biconnical Antenna	Eaton	94455-1	1057	CHAR 3/15/00	3/15/02
	BiconiLog Antenna	EMCO	3143	9409-1043		
X	Log-Periodic Antenna	Electro-Metrics	LPA-25	1122	CAL 10/2/01	10/2/03
	Log-Periodic Antenna	Electro-Metrics	EM-6950	632	CHAR 10/15/01	10/15/03
	Log-Periodic Antenna	Electro-Metrics	LPA-30	409	CHAR 10/16/01	10/16/03
	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	152	CAL 3/21/01	3/21/04
	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	153	CHAR 11/24/00	11/24/03
	Double-Ridged Horn Antenna	Electro-Metrics	RGA-180	2319	CAL 12/19/01	12/19/03
	Horn Antenna	Electro-Metrics	EM-6961	6246	CAL 3/21/01	3/21/03
	Horn Antenna	ATM	19-443-6R	None	No Cal Required	
	Passive Loop Antenna	EMC Test Systems	EMCO 6512	9706-1211	CHAR 7/10/01	7/10/03

	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
	Line Impedance Stabilization . . .	Electro-Metrics	ANS-25/2	2604	CAL 10/9/01	10/9/03
	Line Impedance Stabilization . . .	Electro-Metrics	EM-7820	2682	CAL 3/16/01	3/16/03
	Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 5/25/99	5/25/01
	Termaline Wattmeter	Bird Electronic Corporation	6104	1926	CAL 12/12/01	12/12/03
	Oscilloscope	Tektronix	2230	300572	CHAR 2/1/01	2/1/03
X	Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 1/22/02	1/22/04
X	AC Voltmeter	HP	400FL	2213A14499	CAL 10/9/01	10/9/03
	AC Voltmeter	HP	400FL	2213A14261	CHAR 10/15/01	10/15/03
	AC Voltmeter	HP	400FL	2213A14728	CHAR 10/15/01	10/15/03
X	Digital Multimeter	Fluke	77	35053830	CHAR 1/8/02	1/8/04
	Digital Multimeter	Fluke	77	43850817	CHAR 1/8/02	1/8/04
	Digital Multimeter	HP	E2377A	2927J05849	CHAR 1/8/02	1/8/04
	Multimeter	Fluke	FLUKE-77-3	79510405	CAL 9/26/01	9/26/03
	Peak Power Meter	HP	8900C	2131A00545	CHAR 1/26/01	1/26/03
	Digital Thermometer	Fluke	2166A	42032	CAL 1/16/02	1/16/04
	Thermometer	Traulsen	SK-128		CHAR 1/22/02	1/22/04
X	Temp/Humidity gauge	EXTech	44577F	E000901	CHAR 1/22/02	1/22/04
	Frequency Counter	HP	5352B	2632A00165	CAL 11/28/01	11/28/03
	Power Sensor	Agilent Technologies	84811A	2551A02705	CAL 1/26/01	1/26/03
	Service Monitor	IFR	FM/AM 500A	5182	CAL 11/22/00	11/22/02
	Comm. Serv. Monitor	IFR	FM/AM 1200S	6593	CAL 5/12/02	5/12/04
	Signal Generator	HP	8640B	2308A21464	CAL 11/15/01	11/15/03
	Modulation Analyzer	HP	8901A	3435A06868	CAL 9/5/01	9/5/03
	Near Field Probe	HP	HP11940A	2650A02748	CHAR 2/1/01	2/1/03

	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
	BandReject Filter	Lorch Microwave	5BR4-2400/ 60-N	Z1	CHAR 3/2/01	3/2/03
	BandReject Filter	Lorch Microwave	6BR6-2442/ 300-N	Z1	CHAR 3/2/01	3/2/03
	BandReject Filter	Lorch Microwave	5BR4-10525/ 900-S	Z1	CHAR 3/2/01	3/2/03
	High Pas Filter	Microlab	HA-10N		CHAR 10/4/01	10/4/03
	Audio Oscillator	HP	653A	832-00260	CHAR 3/1/01	3/1/03
	Frequency Counter	HP	5382A	1620A03535	CHAR 3/2/01	3/2/03
	Frequency Counter	HP	5385A	3242A07460	CHAR 12/11/01	12/11/03
	Preamplifier	HP	8449B-H02	3008A00372	CHAR 3/4/01	3/4/03
	Amplifier	HP	11975A	2738A01969	CHAR 3/1/01	3/1/03
	Egg Timer	Unk			CHAR 8/31/01	8/31/03
	Measuring Tape, 20M	Kraftixx	0631-20		CHAR 2/1/02	2/1/04
	Measuring Tape, 7.5M	Kraftixx	7.5M PROFI		2/1/02	2/1/04
	Coaxial Cable #51	Insulated Wire Inc.	NPS 2251-2880	Timco #51	CHAR 1/23/02	1/23/04
	Coaxial Cable #64	Semflex Inc.	60637	Timco #64	CHAR 1/24/02	1/24/04
	Coaxial Cable #65	General Cable Co.	E9917 RG233/U	Timco #65	CHAR 1/23/02	1/23/04
	Coaxial Cable #106	Unknown	Unknown	Timco #106	CHAR 1/23/02	1/23/04