THRUlab & Engineering.

RM1105,11FL, ACE TECHNO TOWER
197-22,GURO-DONG GURO-GU SEOUL KOREA
81221095059F81221095056 email thrukang@kornet.net

Test Report

Product Name: GMRS/FRS Combination

FCC ID:MMAG4

MODEL NO:G4

Applicant:

Midland Radio Corporation.

1120 Clay St.

North Kansan City, MO 64116

Date Receipt:11/03/2004

Date Tested: 11/02/2004

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APPLICANT: Midland Radio Corporation.
FCC ID :MMAG4

TEST REPORT

EXHIBITS CONTAINING:

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GENERAL INFORMATION REQUIRED
FOR CERTIFICATION

2.1033 (c) (1) (2) MidLand Radio Corporation. will manufacture

the FCCID: MMAG4 GMRS/FRS COMBINATION TRANSCEIVER
in quantity, for use under FCC RULES PART 95.
MidLand Radio Corporation.
-1120 Clay St.
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 7.

2.1033 (c) (4) Type of Emission : 10K5F3E
95.631

Bn = 2M + 2DK
M = 3000
D = 2.25k
Bn =2(3000) + 2(2250) = 10.5k

GMRS Authorized Bandwidth:20.0kHz

2.1033 (c) (5) GMRS Frequency Range:
95.621

1. 462.5500 13. 462.7000
2. 462.5625 14. 462.7125
3. 462.5750 15. 462.7250
4. 462.5875 16. 467.5500
5. 462.6000 17. 467.5750
6. 462.6125 18. 467.6000
7. 462.6250 19. 467.6250
8. 462.6375 20. 467.6500
9. 462.6500 21. 467.6750
10. 462.6625 22.467.7000
11. 462.6750 23. 467.7250
12. 462.6875

FRS Authorized Bandwidth:12.5kHz

2.1033(c)(5) FRS Frequency Range:
95.627

1. 462.5625 8. 467.5625
2. 462.5875 9. 467.5875
3. 462.6125 10. 467.6125
4. 462.6375 11. 467.6375
5. 462.6625 12. 467.6625
6. 462.6875 13. 467.6875
7. 462.7125 14. 467.7125 MHz

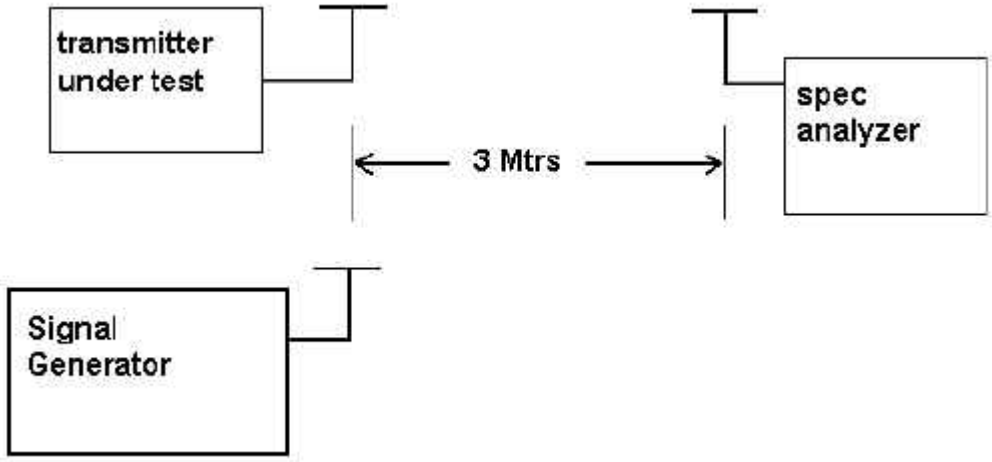
2.10311c)(6)(7) RF power is measured by the substitution method as
2.1046(a) outlined in TIA/EIA - 603. With a nominal battery voltage of 4.5VDC and the transmitter properly adjusted the RF output measures:

GMRS :0.115 Watts Max,(1CH)

FRS :0.144 Watts Max(11CH)

The GMRS does Not transmit the higher power on the FRS frequencies

2.1033(c)(6)(7)	FRS Power Output shall not exceed 0.50 Watts effective
95.639	radiated power. There can be no provisions for
95.649	Increasing the power or varying the power.
2.1033(c)(8)	DC Voltages and Current into Final Amplifier: FINAL AMPLIFIER ONLY
FOR GMRS	POWER SETTING INPUT POWER: (4.5V)(0.260A)=1.17 Watts.
FOR FRS	POWER SETTING INPUT POWER: (4.5V)(0.260A)=1.17 Watts.
2.1033(c)(9)	Tune-up procedure. The tune-up procedure is included as EXHIBIT # 9.
2.1033(c)(10)	Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 6 of this report. The block diagrams are included as EXHIBIT 5 of this report.
2.1033(c)(11)	A photograph or a drawing of the equipment identification label is included as exhibit No. 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 exhibits 3-4.
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. The test procedure used was TIA/EIA-603.


transmitter
under test
spec
analyzer
3 Mtrs
Signal
Generator

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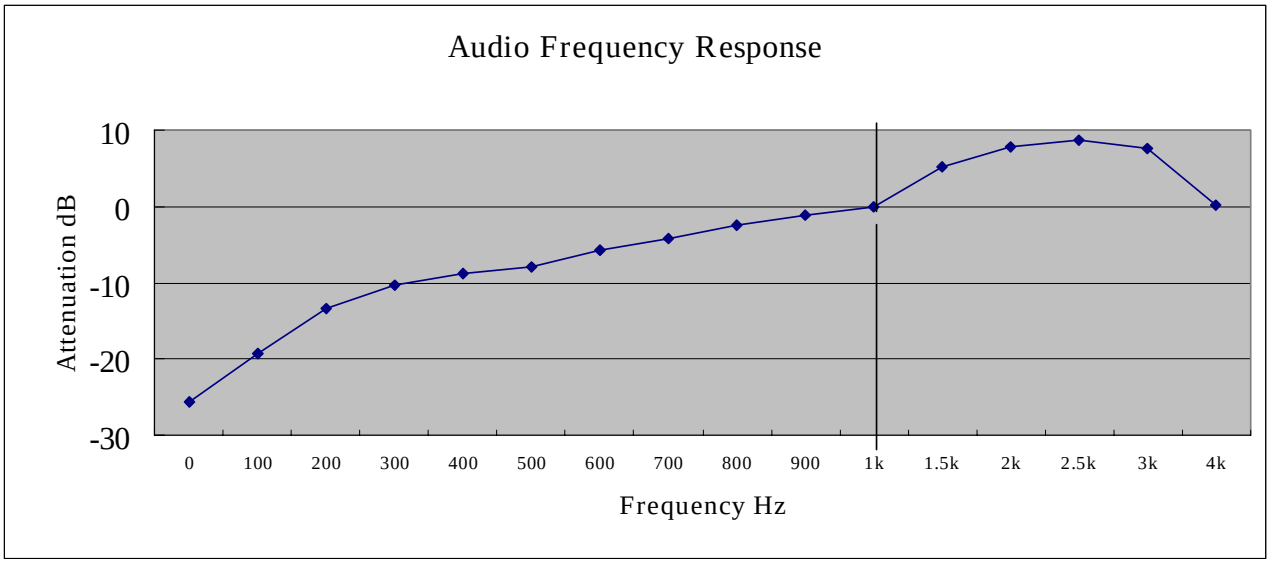
2.1047 (a) (b) Modulation characteristics :

AUDIO FREQUENCY RESPONSE

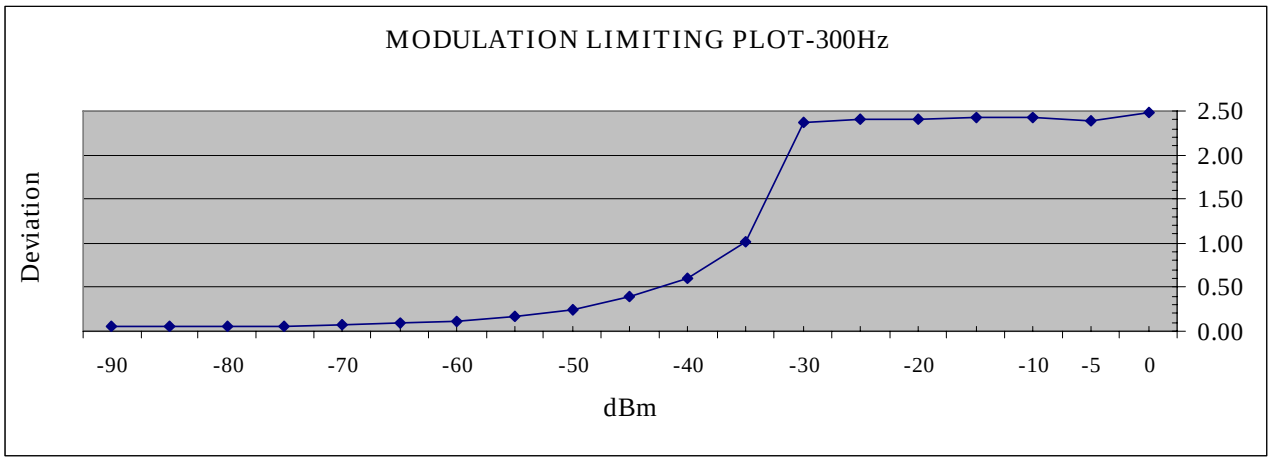
The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page. The audio signal was fed into a dummy microphone Circuit and into the microphone connector. The Input required to produce 30 percent modulation Level was measured. See plot below.

AUDIO FRQUENCY RESPONSE PLOT GOES HERE



2.1047 (b) Audio input versus modulation

The audio input level needed for a particular per-percentage of modulation was measured in accor - dance with TIA/EIA Specification 603. The audio input curves versus modulation are on the following pages. Curves are provided for audio input frequent-cies of 300, 1000, and 2500 Hz. See Pages 6 and 7 of report.



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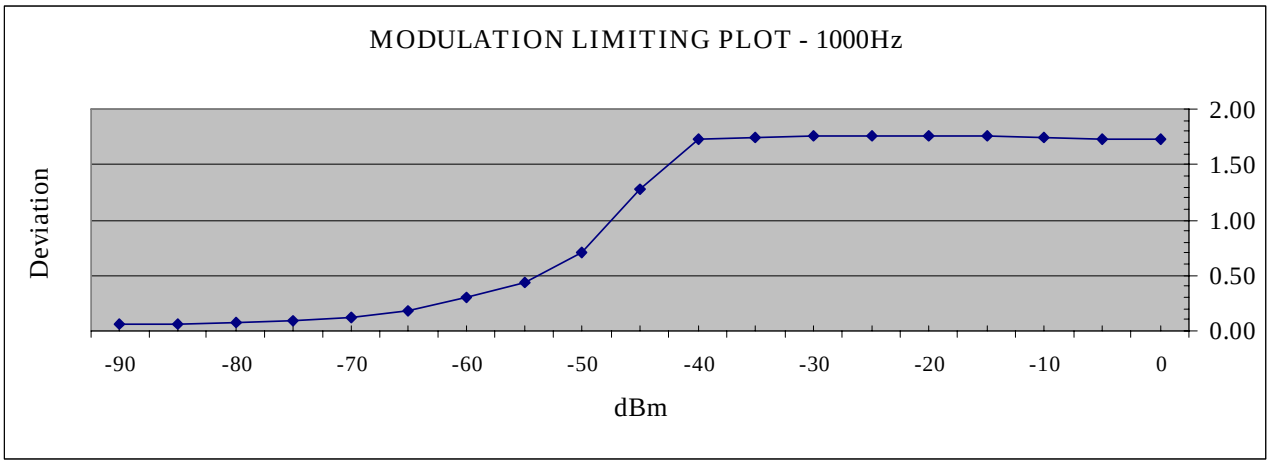

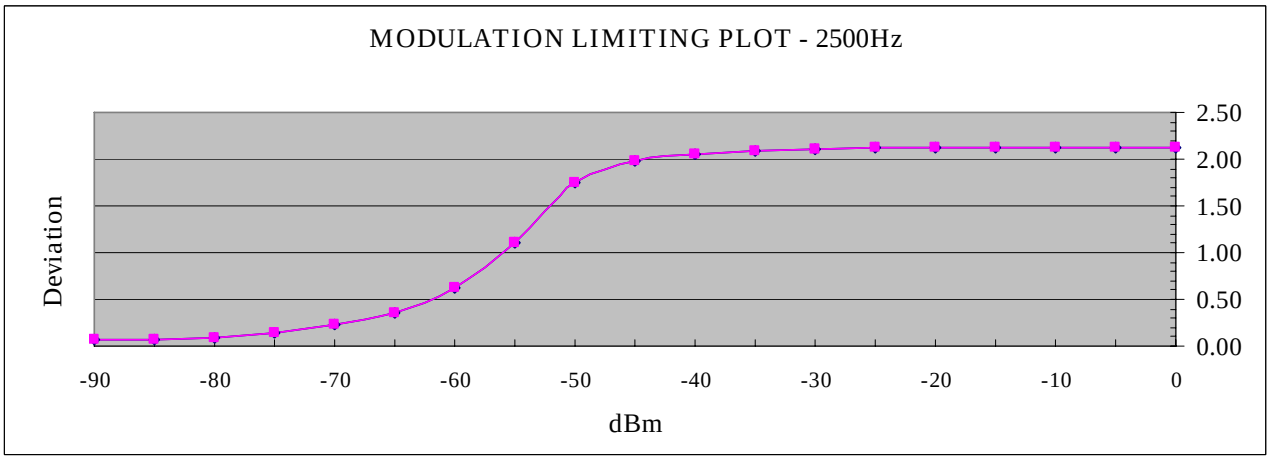

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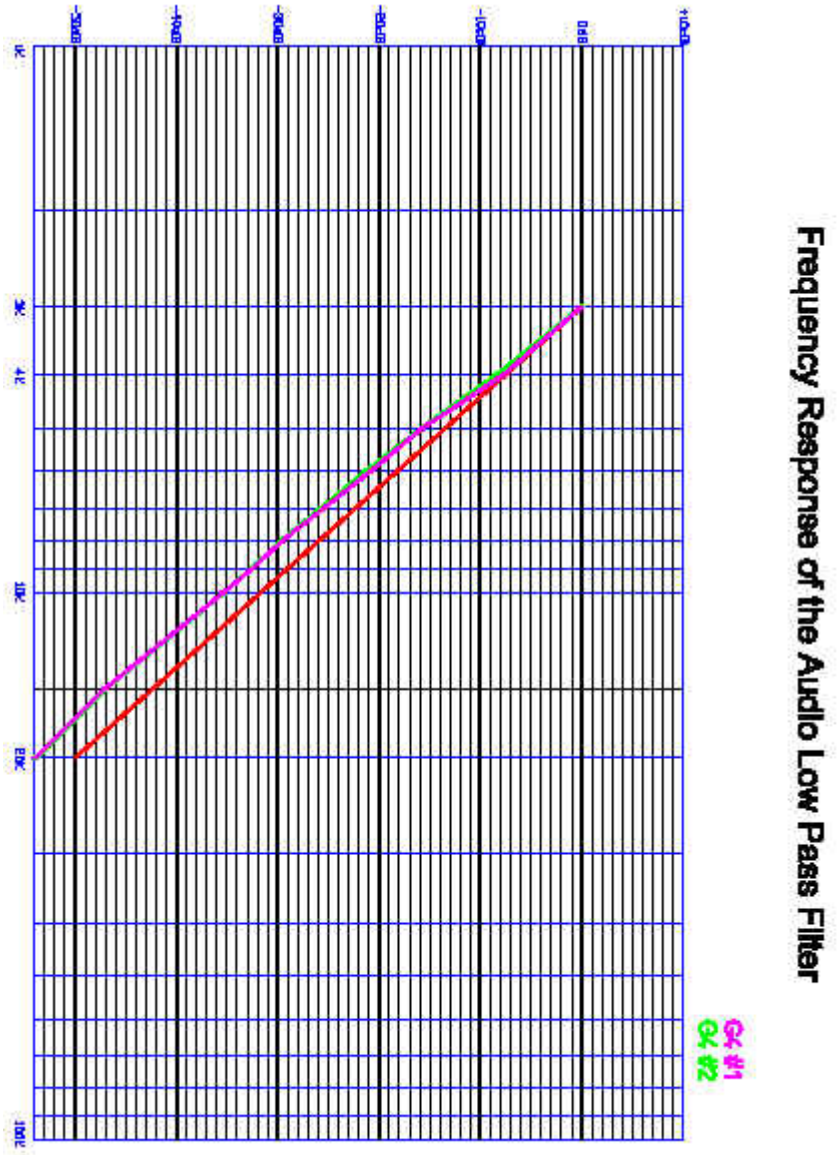
AUDIO LOW PASS FILTER GRAPH

95.637 Post Limiter Filter Each GMRS transmitter, except a Mobile station transmitter with a power of 2.5Watts or less, must be equipped with an audio low pass filter. At any frequency between 3 & 20 kHz the filter must have an attenuation of 60log (f/3) greater than the attenuation at 1KHz. See below.



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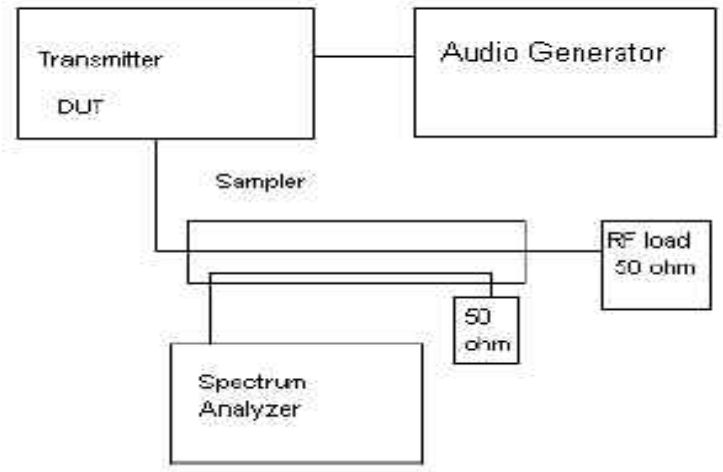
2.1049 Occupied bandwidth :
95.635 (b) (1) (3) (7)

At least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50%up to and including 100% of the authorized bandwidth. At least 35dBon any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At lease 43+log10(TP) dBon any frequency removed from the center of the authorized bandwidth by more than 250%. See plots on the next 1 pages.

Occupied BW Test Equipment Setup



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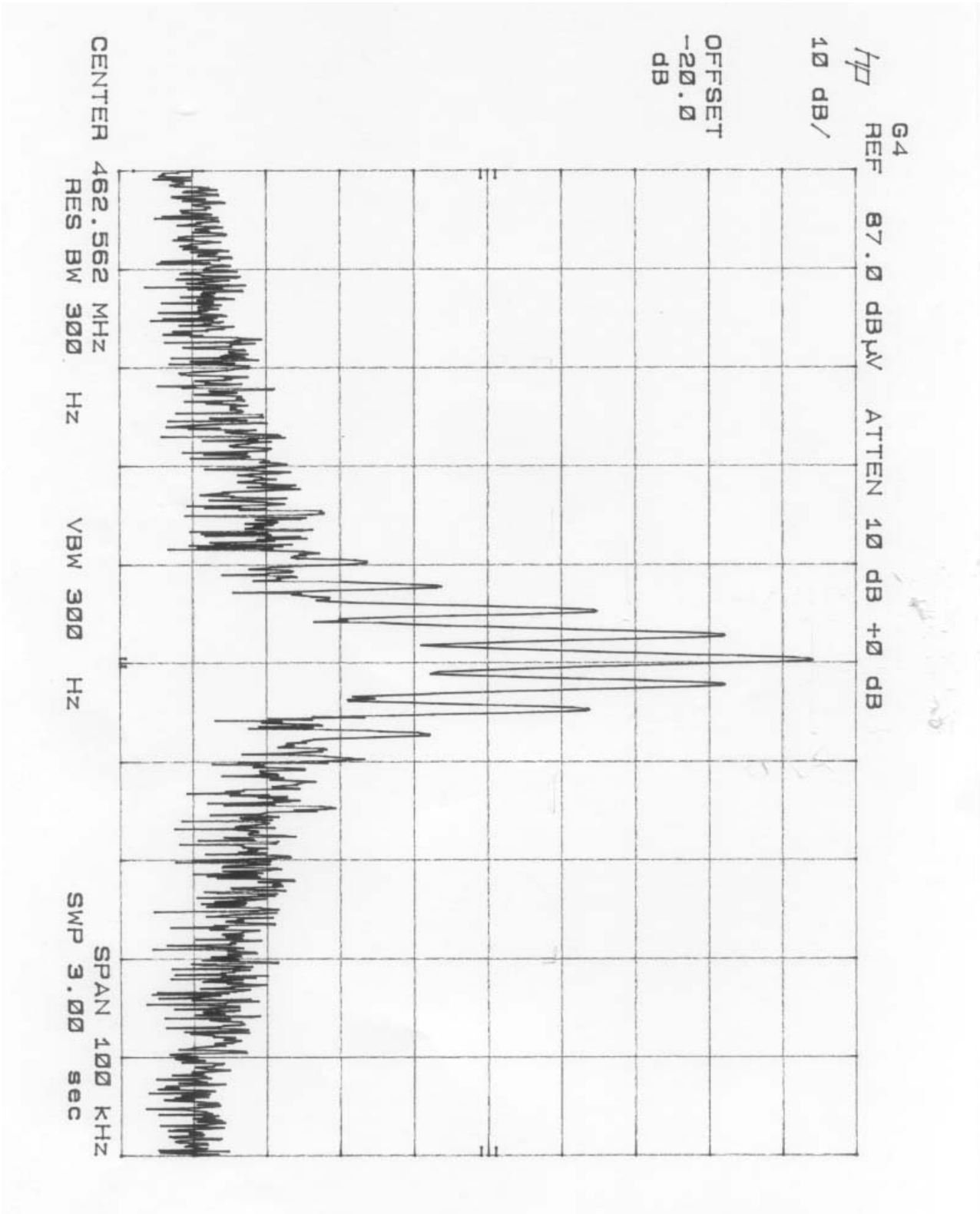

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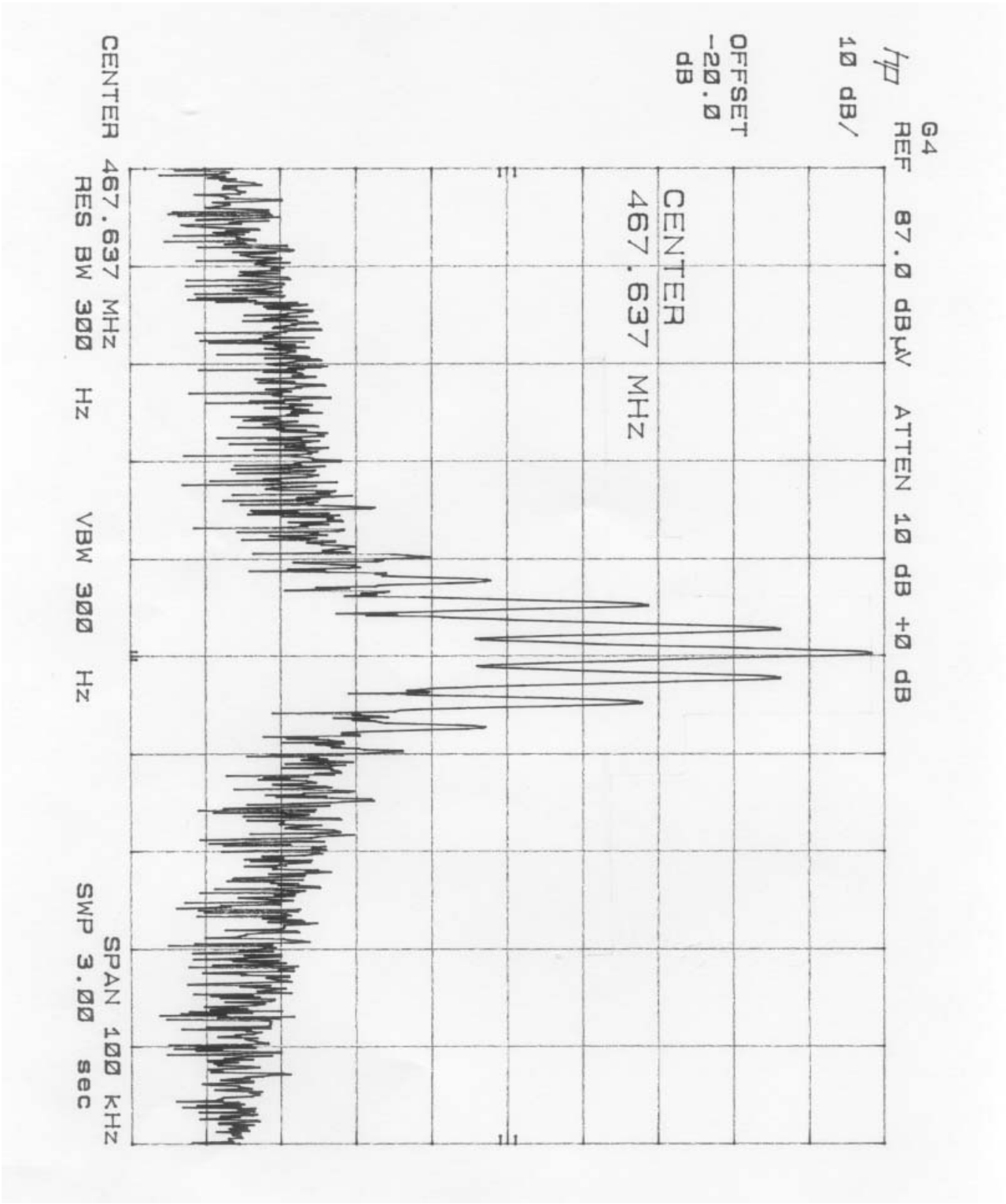
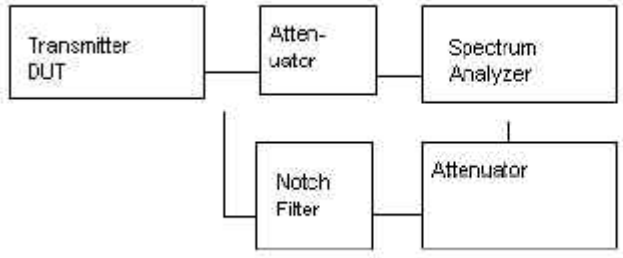


2.1051 Spurious emissions at antenna terminals (conducted) :

The following data shows the level of conducted spurious responses at the antenna terminal. The test procedure used was TIS/EIA 603 S2.2.13 with the exception that the emissions were recorded in dBc. The spectrum was the fundamental.

spurious Emission at
antenna Terminals



Method of Measuring Conducted Spurious Emissions

2.1051 Spurious emissions at the Antenna Terminals

NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

2.1051 Not Applicable, no antenna terminal allowed.

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2.1053 UNWANTED RADIATION
95.635 (b) (7)

The tabulated Data shows the results of the radiated Field strength emissions test. The spectrum was Scanned from 30 MHz to at least the 10^{th} harmonic of The fundamental. This test was conducted per ANSI C63.4 – 1992

REQUIREMENTS: 43 + 10log(TP) = 43 + 10log(0.115) = 33.60dB (1CH)

Emission Frequency	ATTN dBc	Margin dB
462.56	0.00	0.00
925.13	42.46	8.85
1387.69	40.90	7.30
1850.25	48.77	15.16
2312.81	41.75	8.15
2775.38	39.77	6.17
3237.94	56.60	22.99
3700.50	55.66	22.06
4163.06	47.99	14.38
4625.63	55.11	21.51

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 TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of ThruLab & ENGINEERING. located at RM1105,11FL, ACE THCHNO TOWER 197-22, GURO-DONG GURO-GU, Seoul, Korea.

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2.1053 UNWANTED RADIATION:
95.635 (b) (7)

The tabulated Data shows the results of the radiated Field strength emissions test. The spectrum was Scanned from 30 MHz to at least the 10^{th} harmonic of The fundamental. This test was conducted per ANSI C63.4 – 1992

REQUIREMENTS: 43 + 10log(TP) = 43 + 10log(0.144) = 34.59dB (11CH)

Emission Frequency	ATTN dBc	Margin dB
467.64	0.00	0.00
935.28	44.17	9.58
1402.91	42.16	7.57
1870.55	45.15	10.56
2338.19	40.11	5.52
2805.83	50.93	16.34
3273.46	54.95	20.36
3741.10	59.32	24.73
4208.74	49.63	15.04
4676.38	55.92	21.33

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 TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of ThruLab & ENGINEERING. located at RM1105,11FL, ACE THCHNO TOWER 197-22, GURO-DONG GURO-GU, Seoul, Korea.

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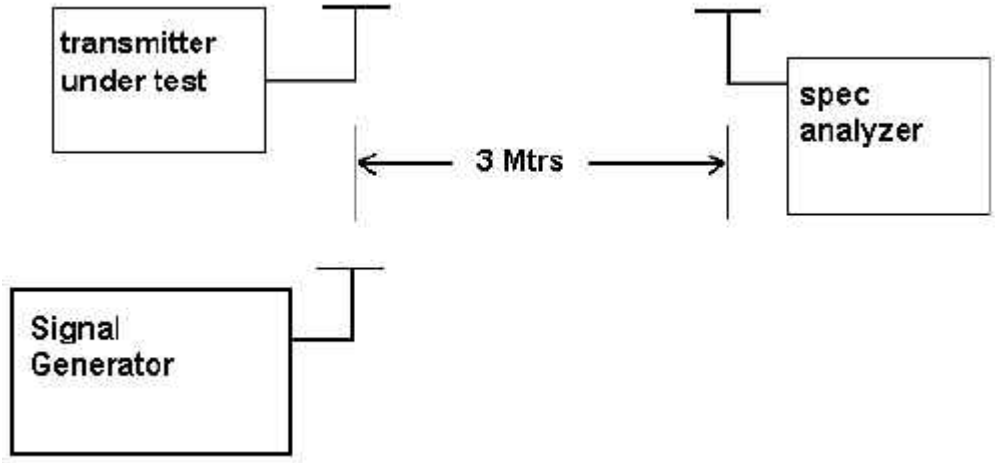
Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground

on a rotatable platform.

* Appropriate antenna raised from 1 to 4 M.

2.1055 Frequency stability
95.621 (b)

Temperature and voltage tests were performed to verify that The frequency remains within the 0.0005%, 5 ppm specification limit. The test was conducted as follows : The transmitter 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 acssigned channel frequency was considered to be the reference frequency. The temperature was then reduced to - 30 degress C after which the transmitter was again allowed to stabi-lize 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.

Reading were also taken at battery end poit 4.5 V/dc

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.6375

TEMPERATURE	FREQUENCY(MHz)	ppm	LIMIT(ppm)
REFERENCE	**462.5625**	**0**	
-30	462.56186	-1.38	5.0
-20	462.56212	-0.82	2.5
-10	462.56268	0.39	2.5
0 도	462.56284	0.74	2.5
10	462.56297	1.02	2.5
20	462.56275	0.54	2.5
30	462.56251	0.02	2.5
40	462.56237	-0.28	2.5
50	462.56208	-0.91	2.5
Power+15%	462.56243	-0.15	2.5
Power-15%	462.56241	-0.19	2.5

+Battery End-point 6.0VDC 462.56241 -0.19

Note: This EUT mees the frequency stability requirement for a FRS: +/-2.5ppm over temp range of -20 degress C to + 50 degrees C. It also meets the GMRS frequency stability requirements : +/- 5ppm over the temp range -30 degrees C to +50 degrees C.

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EMC Equipment List

DEVICE	MODEL	MFGR	SERNO	DUE.CAL
EMI Test Receiver	ESVS 10	Rohde & Schwarz	830489/001	2004.04.25.
Spectrum Analyzer	8566B	Hewlett Packard	2311A02394	2004.03.17
Spectrum Display	85662A	Hewlett Packard	2542A12429	2004.03.17
Quasi-Peak Adapter	85650A	Hewlett Packard	2521A00887	2004.03.17
RF Preselector	85685A	Hewlett Packard	2648A00504	2004.03.17
Pre-Amplifier	8449B	Hewlett Packard	3008A00375	2004.03.17
Pre-Amplifier	8447F	Hewlett Packard	3113A05367	2004.03.17
Spectrum Monitor	EZM	Rohde & Schwarz	862304/007	2004.03.17
Bico-Antenna	94455-1	Eaton	977	2004.03.17
Log-Periodic Antenna	3146	EMCO	2051	2004.03.17
Dipole Antenna	TDA25/1/2	Electro Metrics	176/200/200	2004.03.17
Horn Antenna	SAS-571	A.H Systems	414	2004.03.17
Spectrum Analyzer	R3261C	Advantest	71720189	2004.04.26
LISN	KNW-242	Kyoritsu	8-923-2	2004.07.12
LISN	8012-50-R-24	Solar	8379121	2004.07.12
Cell Site Test System	8921A	Hewlett Packard	3524A02261	2004.10.06