

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net



Test Report

Product Name: GMRS/FRS Combination

MODEL NO:GXT650

FCC ID:MMAGXT600

Applicant:

Midland Radio Corporation.

1120 Clay St. North Kansas City,

MO 64116

Date Receipt:01/06/2006

Date Tested: 02/14/2006

Cover Sheet

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

TABLE OF CONTENTS LIST

APPLICANT: Midland Radio Corporation.

FCC ID :MMAGXT600

TEST REPORT

PAGE 1.....	GENERAL INFORMATION & TECHNICAL DESCRIPTION
PAGE 2.....	TECHNICAL DEACRIPTION & RF POWER OUTPUT
PAGE 3.....	MOD. CHARACTERISTICS & AUDIO FREQUENCY RESPONSE GRAPH
PAGE 4.....	MODULATION LIMITING GRAPH - 300 Hz
PAGE 5.....	MODULATION LIMITING GRAPH - 1000 Hz & 2500 Hz
PAGE 6.....	AUDIO LOW PASS FILTER GRAPH
PAGE 7.....	OCCUPIED BANDWIDTH
PAGE 8.....	OCCUPIED BANDWIDTH PLOT
PAGE 9.....	SPURIOUS EMISSIONS AT ANTENNA TERMINALS
PAGE 10.....	UNWANTED RADIATION - GMRS
PAGE 11.....	UNWANTED RADIATION - FRS
PAGE 12.....	METHOD OF MEASURING RADIATED SPURIOUS EMISSIONS
PAGE 13.....	FREQUENCY STABILITY
PAGE 14-15	LIST OF EMC TEST EQUIPMENT

EXHIBITS CONTAINING:

EXHIBIT 1....	FCC ID LABEL SAMPLES
EXHIBIT 2....	LABEL LOCATION
EXHIBIT 3....	EXTERNAL PHOTOGRAPHS
EXHIBIT 4....	INTERNAL PHOTOGRAPHS
EXHIBIT 5....	BLOCK DIAGRAM
EXHIBIT 6....	SCHMATICS
EXHIBIT 7....	USER'S MANUAL
EXHIBIT 8....	THEORY OF OPERATION
EXHIBIT 9....	ALIGNMENT PROCEDURE
EXHIBIT 10...	PARTS LIST
EXHIBIT 11...	TEST SET UP PHOTO

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

GENERAL INFORMATION REQUIRED FOR CERTIFICATION

2.1033 (c) (1) (2) MidLand Radio Corporation. will manufacture
the FCCID: MMAGXT600 GMRS/FRS COMBINATION TRANSCEIVER
in quantity, for use under FCC RULES PART 95A&B.
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 Frequency Range : 20.0kHz

2.1033 (c) (5) GMRS Frequency Range: 1. 462.5500 13. 462.7000
95.621 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: 1. 462.5625 8. 467.5625
95.627 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 6 V, and the transmitter properly
adjusted the RF output measures:
power supply : Rocket batteries (1.5VDC) 4

GMRS (HIGH) - 1.513 Watts
GMRS (LOW) - 0.360 Watts
FRS - 0.367 Watts

APPLICANT : Midland Radio Corporation.
FCC ID : MMAGXT600
REPORT : THRU-601002
Pages: 1 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

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 HIGH POWER SETTING INPUT POWER: (6V)(1.118A)=6.708 Watts

FOR GMRS LOW POWER SETTING INPUT POWER: (6V)(0.326A)=1.956 Watts

FOR FRS POWER SETTING INPUT POWER: (6V)(0.326A)=1.956 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.

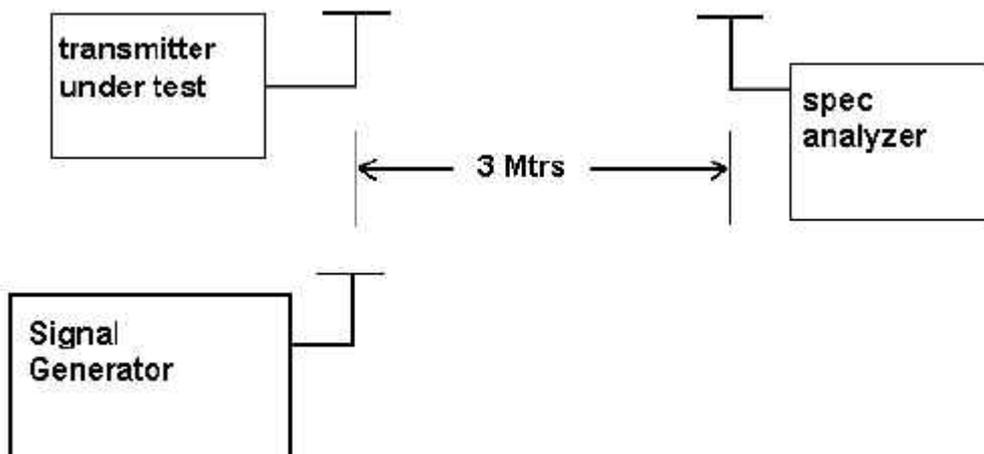
2.1033(c)(11) A photograph or a drawing of the equipment identification label is included as exhibit No. 1.

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.



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 2 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

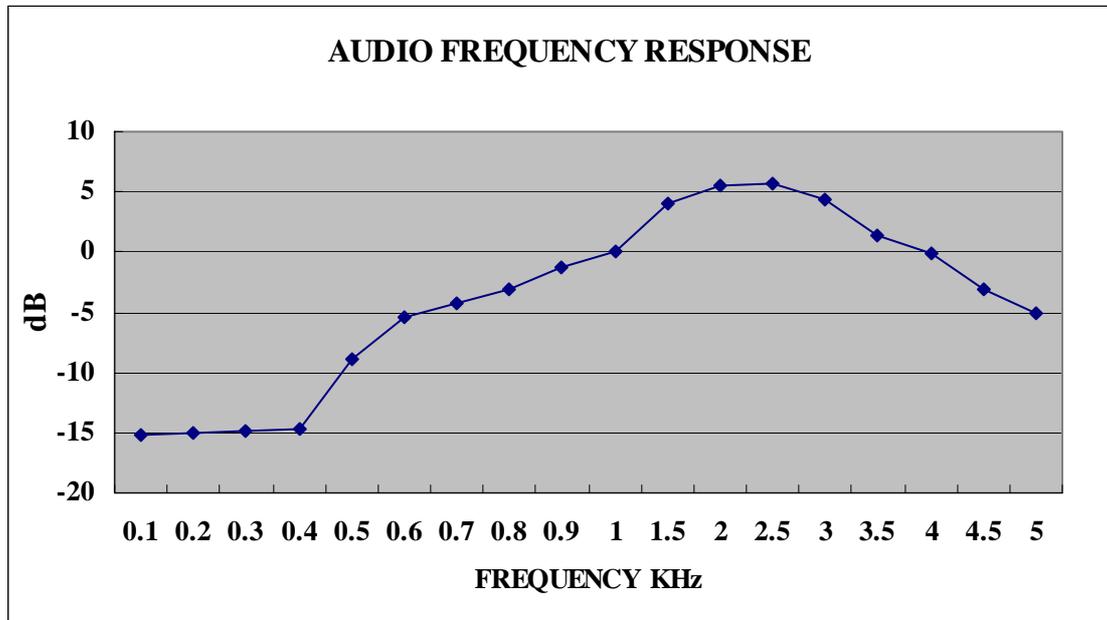
T820318835092F820318835169 email thrukang@kornet.net

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 FREQUENCY RESPONSE PLOT GOES HERE



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 3 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

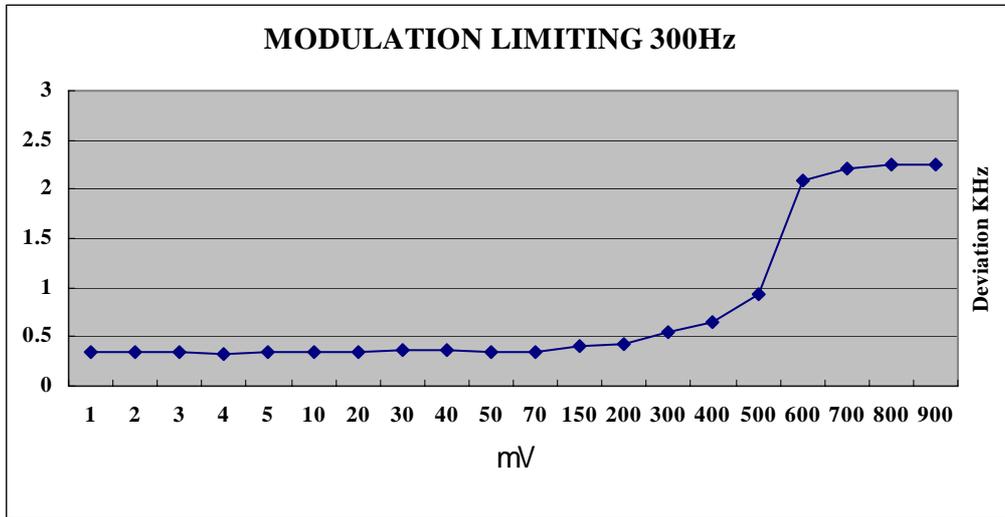
Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

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 on the following pages. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz. See Pages 6 and 7 of report.



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

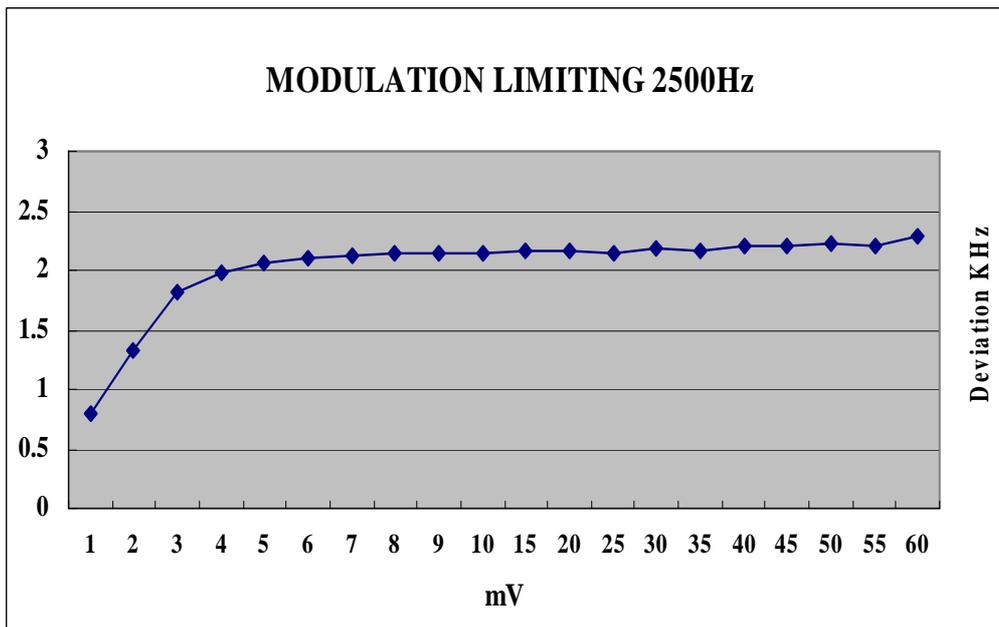
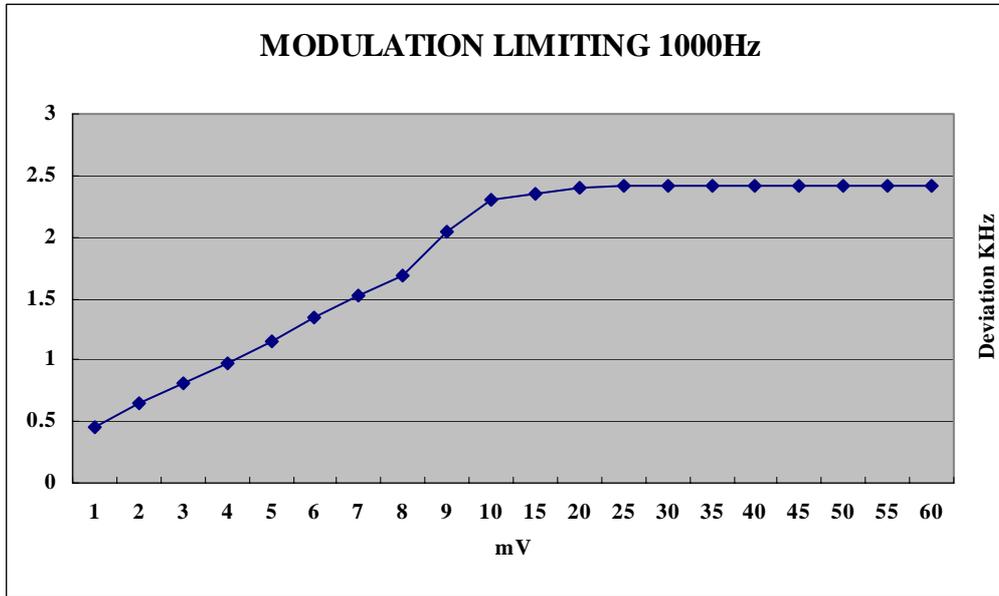
Pages: 4 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 5 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

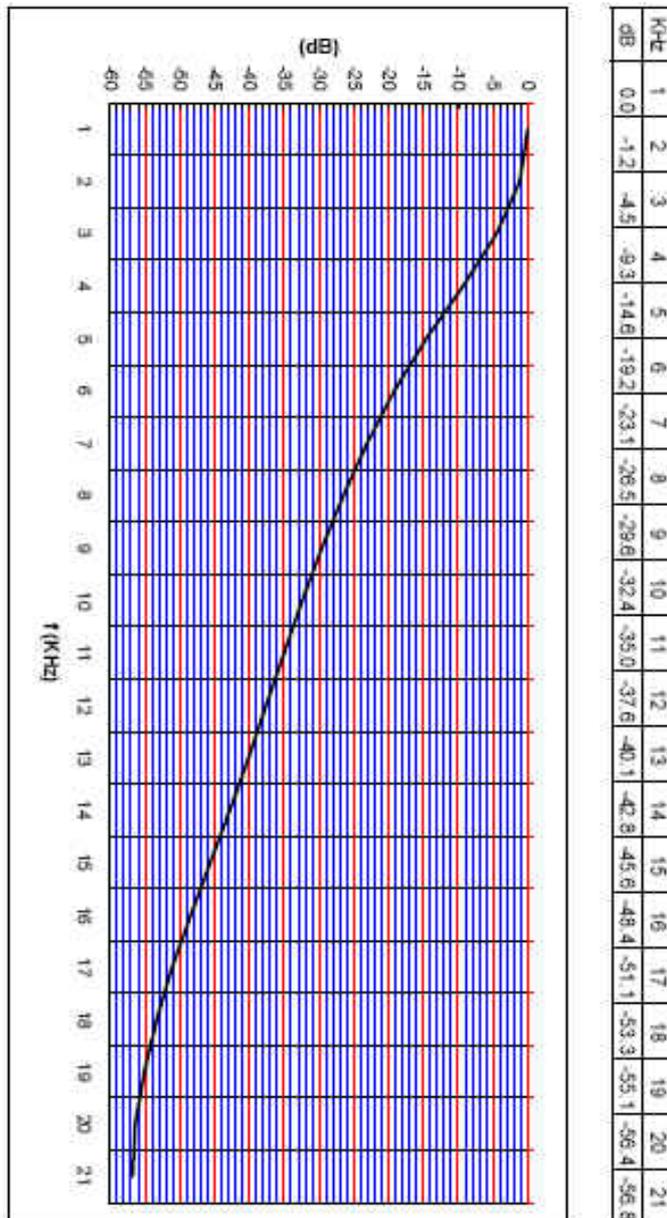
Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

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 $60\log(f/3)$ greater than the attenuation at 1KHz. See below.



Frequency Response of the Audio Low Pass Filter [Model : GX T650C]

- Condition : 200 mVrms IN at "MIC1" Point
 - Measurement Point : "Pin2 of VR3" Point

APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 6 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

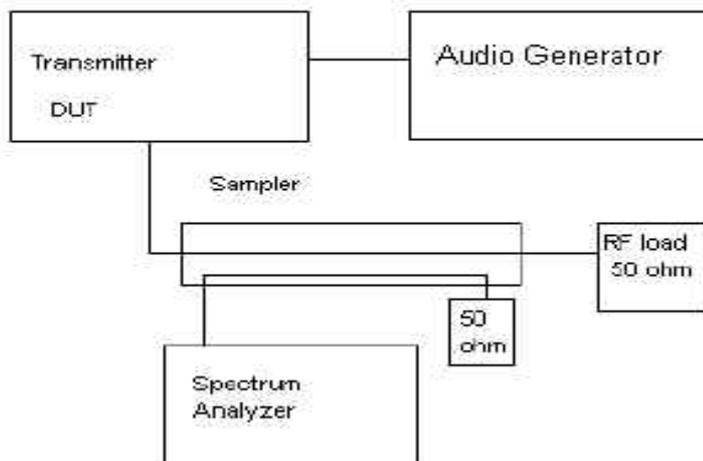
T820318835092F820318835169 email thrukang@kornet.net

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 35dB on any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At least $43 + \log_{10}(TP)$ dB on 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



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 7 of 15

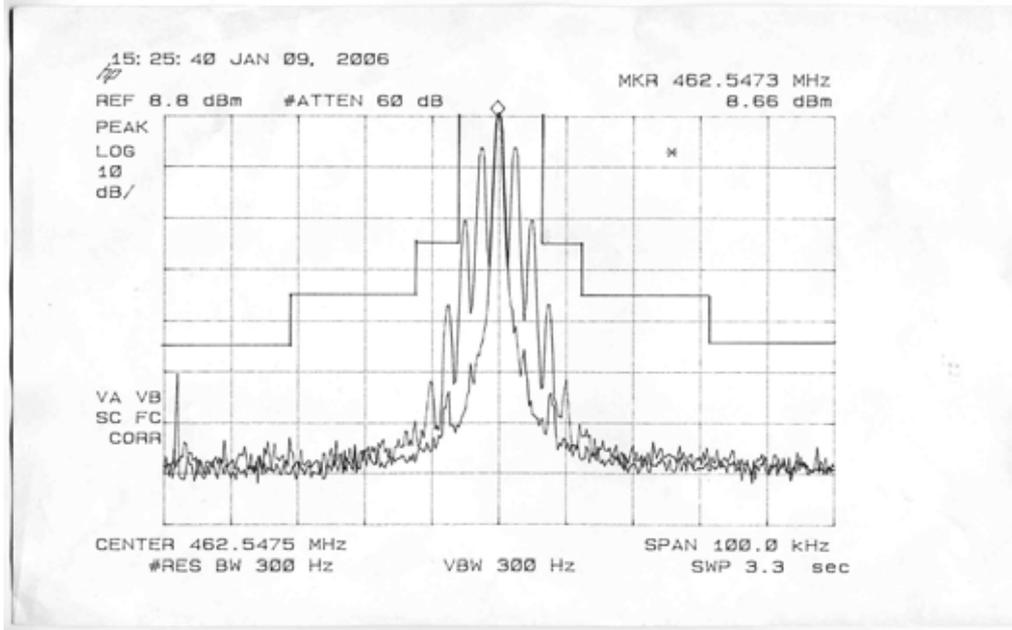
THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

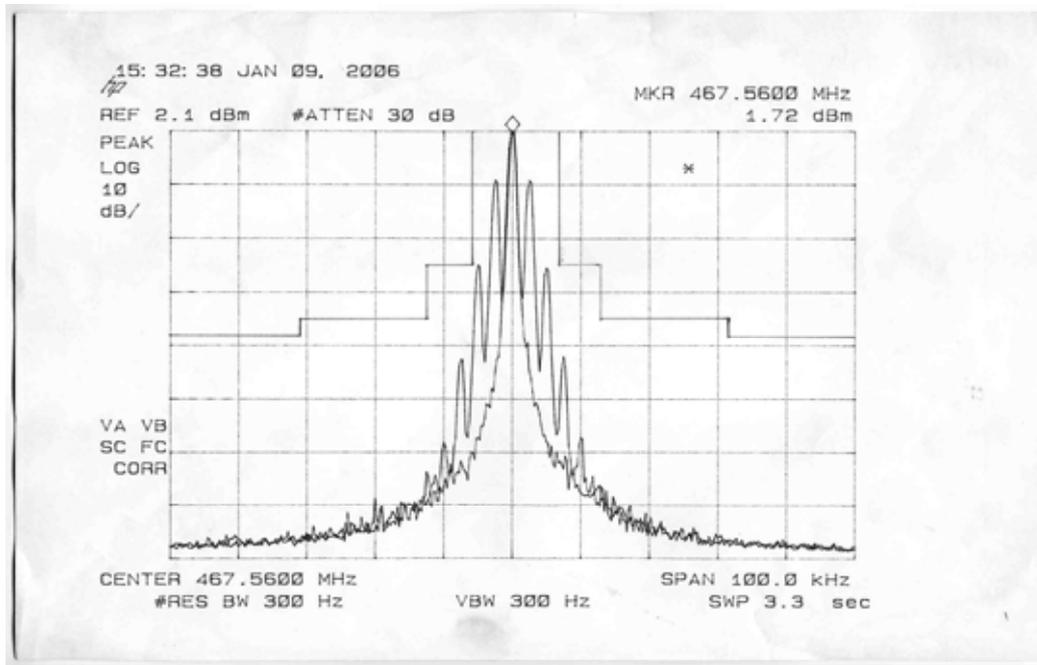
Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

15ch



8ch



APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 8 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

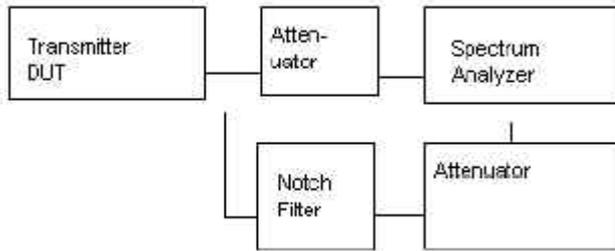
Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

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.

APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 9 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

2.1053
95.635 (b) (7)

UNWANTED RADIATION

The tabulated Data shows the results of the radiated Field strength emissions test. The spectrum was Scanned from 30 MHz to at least the 10th harmonic of The fundamental. This test was conducted per ANSI C63.4 - 2003.

REQUIREMENTS: GMRS (HIGH): $43 + 10\log(1.513) = 44.79838\text{dB}$
(LOW) : $43 + 10\log(0.360) = 38.56302\text{dB}$

GMRS-High				GMRS-Low			
	dBc	Margin	dBm		dBc	Margin	dBm
462.5500	0	0		462.5500	0	0	
925.1000	54.65	9.85	-22.85	925.1000	54.41	15.84	-28.84
1387.6500	60.43	15.63	-28.63	1387.6500	62.38	23.81	-36.81
1850.2000	60.54	15.74	-28.74	1850.2000	63.90	25.33	-38.33
2312.7500	64.11	19.31	-32.31	2312.7500	57.68	19.11	-32.11
2775.3000	62.05	17.25	-30.25	2775.3000	59.52	20.95	-33.95
3237.8500	63.33	18.53	-31.53	3237.8500	58.90	20.33	-33.33
3700.4000	64.79	19.99	-32.99	3700.4000	62.36	23.79	-36.79
4162.9500	72.99	28.19	-41.19	4162.9500	65.56	26.99	-39.99
4625.5000	68.09	23.29	-36.29	4625.5000	62.96	24.39	-37.39

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 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do, 469-803, Korea

THRU Lab & Engineering.

477-6, Hager-Ri, Yoju-Up, Yoju-Gun

Kyunggi-Do,469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

2.1053
95.635 (b) (7)

UNWANTED RADIATION:

The tabulated Data shows the results of the radiated Field strength emissions test. The spectrum was Scanned from 30 MHz to at least the 10th harmonic of The fundamental. This test was conducted per ANSI C63.4 - 2003.

REQUIREMENTS: FRS: $43 + 10\log(0.367) = 38.64666\text{dB}$

FRS			
	dBc	Margin	dBm
467.5625	0	0	
935.1250	51.68	13.03	-26.03
1402.6875	62.64	23.99	-36.99
1870.2500	63.01	24.36	-37.36
2337.8125	57.89	19.24	-32.24
2805.3750	65.34	26.69	-39.69
3272.9375	62.70	24.05	-37.05
3740.5000	62.87	24.22	-37.22
4208.0625	63.40	24.75	-37.75
4675.6250	60.05	21.40	-34.40

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 477-6, Hager-Ri, Yoju-Up, Yoju-Gun, Kyunggi-Do,469-803, Korea

APPLICANT : Midland Radio Corporation.
FCC ID : MMAGXT600
REPORT :THRU-601002
Pages: 11of15

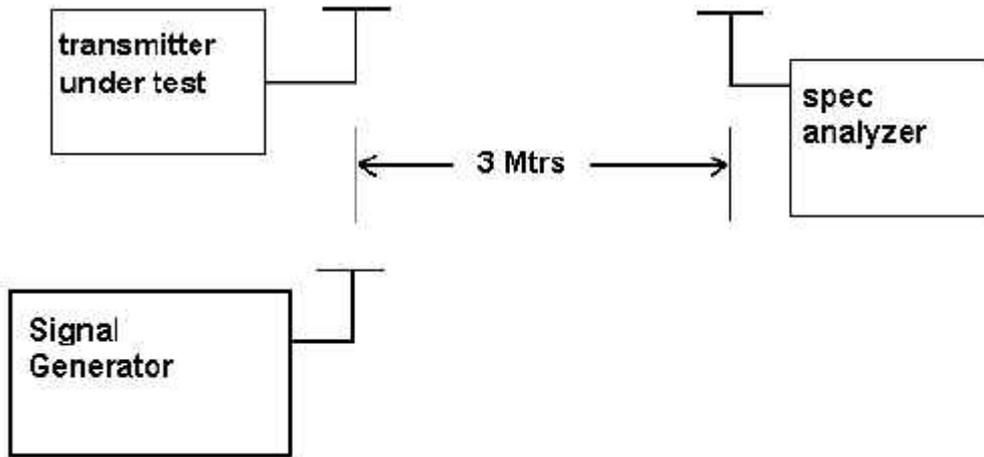
THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground

on a rotatable platform.

* Appropriate antenna raised from 1 to 4 M.

APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 12of15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

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 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 the end point of the battery voltage of 6 V/dc

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.5500

TEMPERATURE	FREQUENCY (MHz)	ppm	LIMIT (ppm)
REFERENCE	462.55	0	
-30	462.54786	-4.56	5.0
-20	462.54915	-1.84	2.5
-10	462.54909	-1.97	2.5
0	462.54962	-0.82	2.5
10	462.54963	-0.80	2.5
20	462.54967	-0.71	2.5
30	462.54977	-0.50	2.5
40	462.54993	-0.15	2.5
50	462.55042	0.91	2.5
END POINT OF BATTERY: 3.7V	462.54983	-0.95	2.5

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

APPLICANT: Midland Radio Corporation.

FCC ID: MMAGXT600

REPORT: THRU-601002

Pages: 13 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

TEST Equipment List

No	Description	Manufacturer	Model No.	Serial No.	Due Cal.
1	Test Receiver	Rohde & Schwarz	ESVS10	830489/001	2006.04.23
2	Test Receiver	Rohde & Schwarz	ESHS 10	825832/014	2006.08.25
3	Test Receiver	Rohde & Schwarz	ESVS 10	826008/014	2006.05.24
4	Spectrum Analyzer	Hewlett Packard	8566B	2311A02394	2006.04.23
5	Spectrum Display	Hewlett Packard	85662A	2542A12429	2006.04.23
6	Quasi-peak Adapter	Hewlett Packard	85650A	2521A00887	2006.04.23
7	RF Preselector	Hewlett Packard	85685A	2648A00504	2006.04.23
8	Preamplifier	Hewlett Packard	8449B	3008A00375	2006.04.23
9	Preamplifier	Hewlett Packard	8447F	3113A05367	2006.04.23
10	Preamplifier	Hewlett Packard	8447F	2805A02570	2005.12.12
	Preamplifier	A.H. Systems	PAM-0118	164	2007.04.01
11	Biconical Antenna	Eaton Corp.	94455-1	0977	2007.04.01
12	Biconical Antenna	EMCO	3104C	9111-2468	2006.06.07
13	Log Periodic Antenna	EMCO	3146	2051	2007.04.01
14	Log Periodic Antenna	EMCO	3146	8901-2320	2006.03.28
15	Horn Antenna	A.H. Systems	SAS-571	414	2006.03.17
	Horn Antenna	A.H. Systems	SAS-571	781	2006.01.07
16	Loop Antenna	Rohde & Schwarz	HFH2- Z2.335.4711.52	826532/006	2006.01.31
17	Dipole Antenna	Rohde & Schwarz	VHAP	574	2006.12.12
18	Dipole Antenna	Rohde & Schwarz	VHAP	575	2006.12.12
19	Dipole Antenna	Rohde & Schwarz	UHAP	546	2006.12.12

APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 14 of 15

THRU Lab & Engineering.

477-6, Hager-Ri, Yaju-Up, Yaju-Gun

Kyunggi-Do, 469-803, Korea

T820318835092F820318835169 email thrukang@kornet.net

20	Dipole Antenna	Rohde & Schwarz	UHAP	547	2006.12.12
21	Signal Generator	Rohde & Schwarz	SMS	872165/100	2006.04.23
22	Signal Generator	Rohde & Schwarz	SMX	825459/030	2006.05.20
23	Spectrum Monitor	Rohde & Schwarz	EZM	862304/007	None
24	Panorama Monitor	Rohde & Schwarz	EPN	883707/207	None
25	Spectrum Analyzer	Advantest Corp.	R3261C	61720208	2006.04.23
26	Spcetrum Analyzer	Hewlett Packard	8591A	3205A02641	2005.12.12
27	LISN	EMCO	3825/2	9111-1912	2005.12.12
28	LISN	Solar	8012-50-R-24	8379121	2007.04.25
29	LISN	Kyoritsu	KNW-242	8-923-2	2007.04.25
30	Plotter	Hewlett Packard	7475A	2210A02802	None
31	Modulation Analyzer	Hewlett Packard	8901B	3438A05094	2006.04.23
32	Frequency Counter	Tektronic	CMC251	TW52489	2006.04.23
33	Temperature & Humidity Chamber	TABAI EZPEC CORP.	MC711P	112000492	2006.0827
34	Antenna Mast	EMCO	1070-3	9109-1617	None
35	Turn Table	EMCO	1080-1,2	9203-1762	None
36	Positioning Controller	EMCO	1090	9111-1054	
37	Antenna Power Supply	Rohde & Schwarz	HZ-9	920127	None
38	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	881052	None
39	Coaxial Take-up Reel	EMCO	100817	9109-1684	None

APPLICANT : Midland Radio Corporation.

FCC ID : MMAGXT600

REPORT : THRU-601002

Pages: 15 of 15