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<http://www.digitalemc.com>

CERTIFICATE OF COMPLIANCE
FCC Part 2, & 95 Certification

Dates of Tests: June 28, 2004 ~ July 4, 2004

Test Report S/N:DR50110407A

Test Site : DIGITAL EMC CO., LTD.

FCC ID:

PM3GR5500

APPLICANT

GENEX TELECOM CO., LTD.

Device Category : **General Mobile(/Family) Radio Services (GMRS/FRS)**
Device name : **UHF Transceiver**
Manufacturer : **GENEX TELECOM CO., LTD.**
Model name : **GMRS-102B**
Serial number : **Identical prototype**
FCC Rule Part(s) : **§2, §95**
Frequency Range : **462.5625 ~ 467.7125MHz**
RF Output Power : **1.5W / 0.5W**
Channel Separation : **12.5kHz**
Emission Designators : **11K0F3E**
Data of issue : **July 4, 2004**

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



NVLAP LAB CODE 200559-0

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1. General information's

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address : 683-3, Yubang-Dong, Yongin-Si, Kyunggi-Do, Korea. 449-080

<http://www.digitalemc.com> E-mail : demc@unitel.co.kr

Tel: +82-31-321-2664 Fax: +82-31-321-1664

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

This laboratory is accredited by NVLAP for NVLAP Lab. Code : 200559-0.

Test operator: engineer

July 4, 2004

Kyung-Taek LEE



Data

Name

Signature

Report Reviewed By: manager

July 4, 2004

Dong-Min JUNG



Data

Name

Signature

Ordering party:

Company name : GENEX TELECOM CO., LTD.
 Address : 6F FARMAX B/D 769-27 Bangbae-Dong, Seocho-Gu,
 Zipcode : 137-830
 City/town : Seoul
 Country : Korea
 Date of order : June 14, 2004

2. Information's about test item

PM3GR5500

2.1 Equipment information

Equipment model no.	GMRS-102B
Equipment serial no.	Identical prototype
Type of equipment	Hand Portable
Frequency Range	462.5625 ~ 467.7125 MHz
Channel Separation	12.5kHz
Rated RF output power	1.5W (High Power) / 0.5W(Low Power)
Duty cycle TX power	50%
Type of antenna	$\lambda/4$ Helical Antenna
Battery type	4.8V DC rechargeable NiMH battery
Speaker Impedance	8 ohm
Audio Output Power	300mW
Intermediate Frequencies	1 st : 21.7 MHz 2 st: 450 kHz

2.2 Tested frequency

Frequency	Tx	Rx
Low Frequency	462.5625 MHz	462.5625 MHz
High Frequency	467.7125 MHz	467.7125 MHz

2.3 Test conditions

Test Conditions	Temperature(°C)
Low	-30
High	+50

3. Test Report

3.1 Summary of tests

Rule Reference	Parameter	Status (note 1)
2.1046	Carrier Output Power (Conducted)	C
2.1047	Audio Low Pass Filter (Voice Input)	C
2.1047	Audio Frequency Response	C
2.1047	Modulation Limiting	C
2.1049	Emission Masks (Occupied Bandwidth)	C
2.1051	Unwanted Emissions (Transmitter Conducted)	C
2.1053	Field Strength of Spurious Radiation	C
2.1055	Frequency Stability (Temperature Variation)	C
2.1055	Frequency Stability (Voltage Variation)	C
2.202	Necessary Bandwidth and Emission Bandwidth	C
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable		

The device is governed by CFR rule Part 95 subpart A (GMRS) and 95 subpart B (FRS).

3.2 Requirements

3.2.1 Carrier Output Power

Definition:

- The carrier power output for a transmitter for this service is the power available at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load.

FCC ID : **PM3GR5500**
 Specification : 47 CFR 2.1046 (a)
 Test method : ANSI/TIA/EIA-603-2001, Paragraph 2.2.1

Measurement Procedure:

- The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R.F. Power Meter.
- Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001. The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Conducted Measurement data:

TEST CONDITIONS	Conducted Carrier power(W)	
	462.5625MHz	467.7125MHz
Power level (W)		
Low power	0.494	0.440
High power	1.370	1.200
Measurement uncertainty	± 0,45dB	

ERP Measurement data for SAR:

ERP TEST CONDITIONS					
462.7250 MHz	Ref. level (dBm)	Pol. (H/V)	ERP (W)	ERP (dBm)	Supplied Power
Low power	-6.31	V	0.49	26.9	Battery
High power	-1.10	V	1.39	31.4	Battery

Note: battery is options for this phone.

3.2.2 Unwanted Emissions (Transmitter Conducted)

Definition:

- Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies which are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.

FCC ID : **PM3GR5500**
 Specification : 47 CFR 2.1051
 Test method : ANSI/TIA/EIA-603-2001, Paragraph 2.2.13

Measurement Procedure:

- The emissions were measured for the worst case as follows:
 - (1) Within a band of frequencies defined by the carrier frequency plus and minus one channel.
 - (2) From the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40GHz, whichever is lower.
- The magnitude of spurious emissions that are attenuated more than 20dB below the permissible value need not be specified.

Measurement Data:

Refer to the Next page

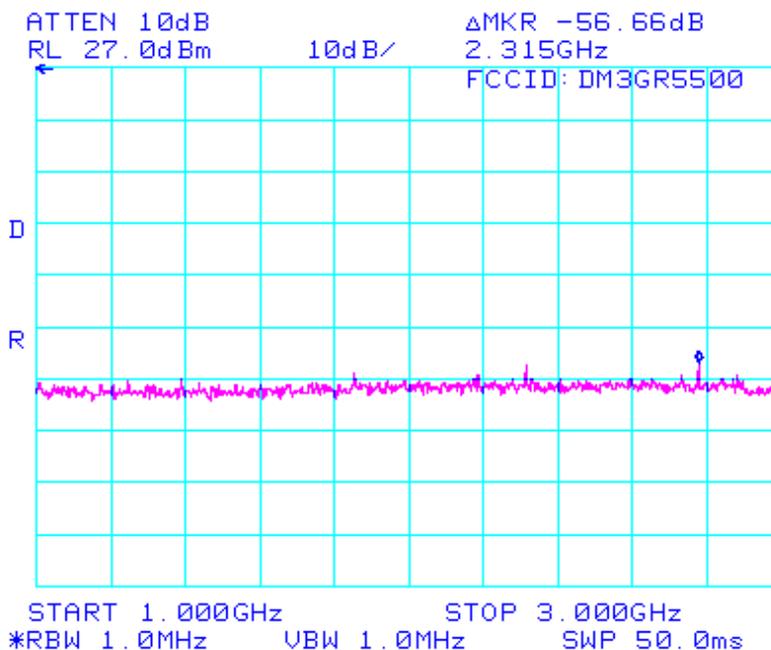
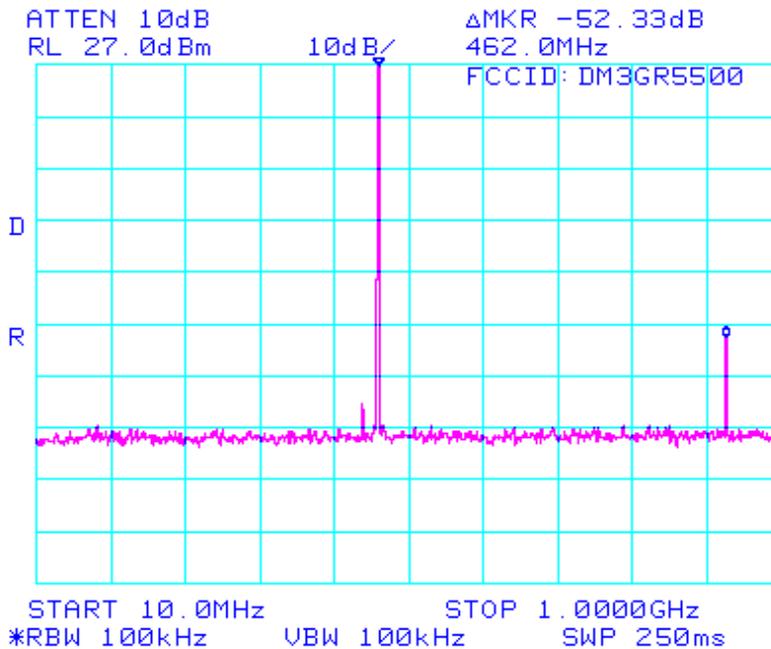
LIMIT

$= 43 + 10 \log_{10} (P) \text{ dBc (or -13 dBm)}$

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

Unwanted Emissions (Transmitter Conducted)

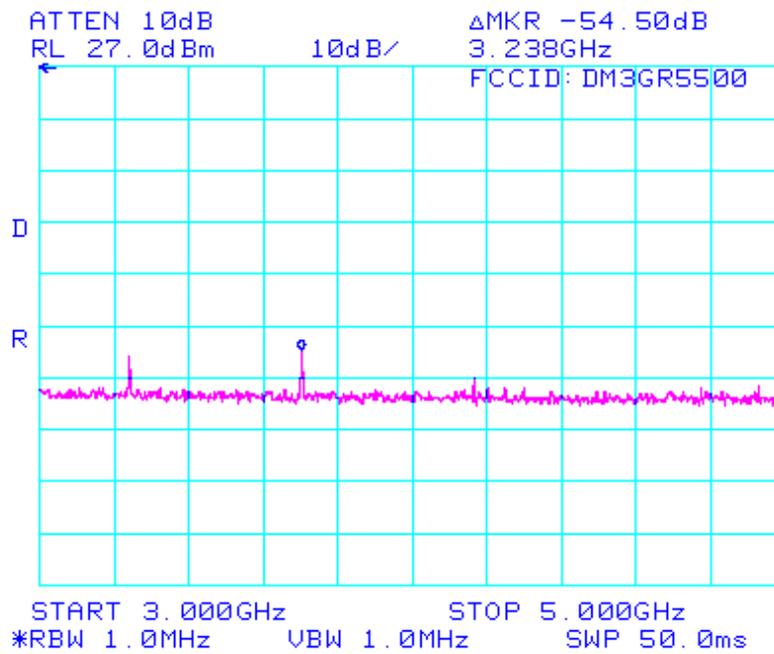
- POWER: Low Power



Unwanted Emissions (Transmitter Conducted)

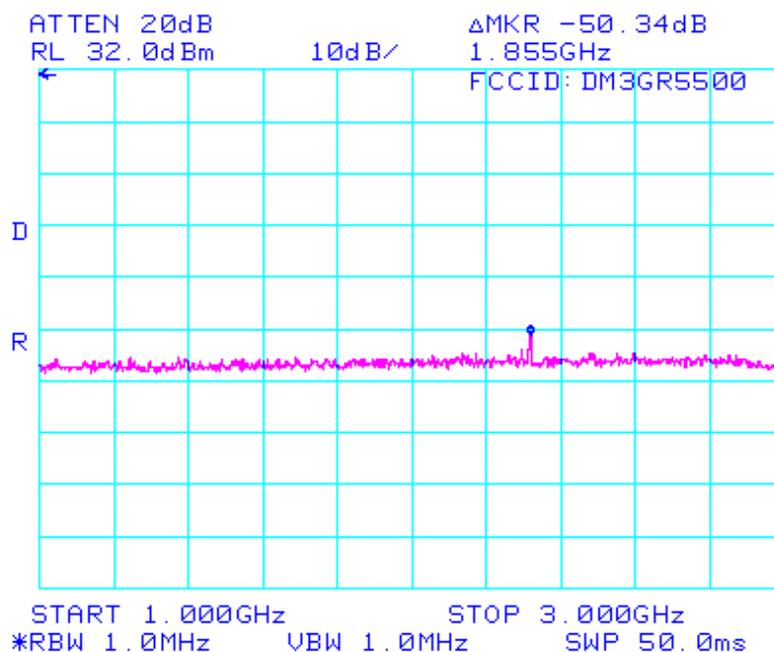
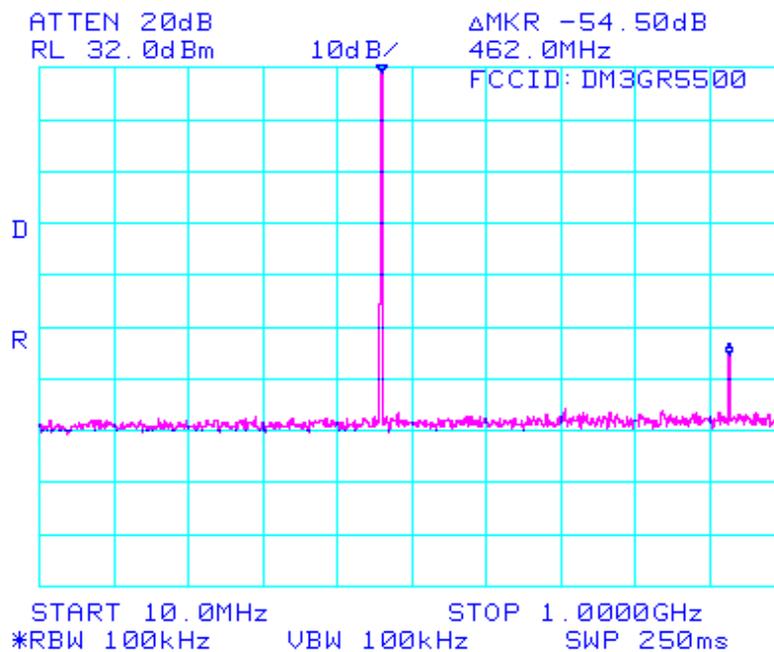
- POWER: Low Power

- Continuous



Unwanted Emissions (Transmitter Conducted)

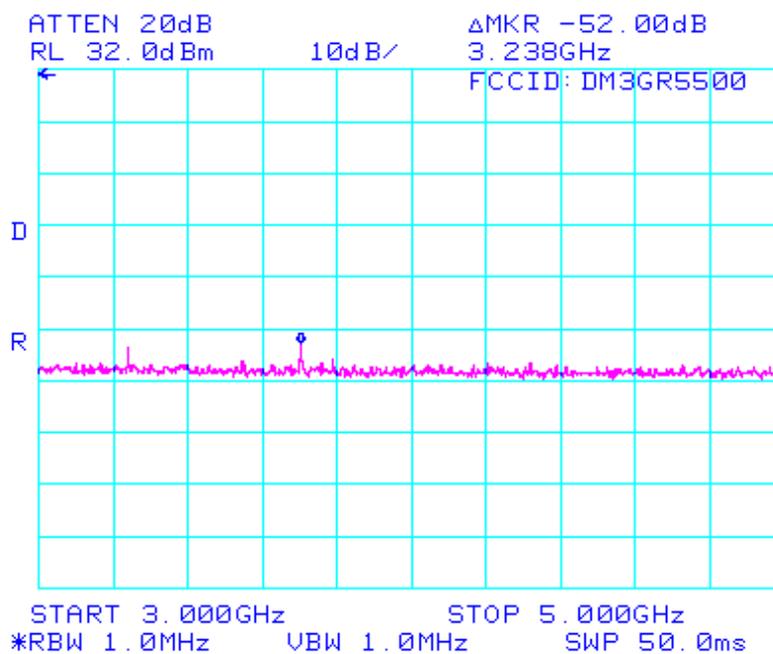
- POWER: High Power



Unwanted Emissions (Transmitter Conducted)

- POWER: High Power

- Continuous



3.2.3 Field Strength of Spurious Radiation

Definition:

- Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

FCC ID : **PM3GR5500**
 Specification : 47 CFR 2.1053(a)
 Test method : ANSI/TIA/EIA-603-2001, Paragraph 2.2.12

Measurement Procedure:

- The test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.
- In the field, the test sample was placed on a wooden turntable above ground at three meters away from the search antenna.
- The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.
- The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.
- The field strength of each emission within 20dB of the limit was recorded and corrected with the appropriate cable and transducer factors.
- From the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40GHz, whichever is lower.
- The worst case for all channels is shown.

LIMIT

$$= 43 + 10 \log_{10} (P) \text{ dBc (or -13 dBm)}$$

TEST EQUIPMENT USED: 1, 8, 19, 22, 23, 33, 34, 35

Measurement Data: Attached for Worst Case

OPERATING FREQUENCY : 462.5625 MHz
 POWER : Low Power
 OUTPUT POWER : 0.5 W = 26.99 dBm
 MODULATION SIGNAL : FM
 LIMIT : $43 + 10 \log_{10} (W) =$ 40.0 dBc

Freq. (MHz)	LEVEL@ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
925.3	-35.3	6.2	-29.1	V	56.09
1387.56	-47.5	8.5	-38.5	V	65.49
1850.36	-50.8	10.3	-40.5	V	67.49

Remarks

No other emissions were detected at a level greater than 20dB below limit.

Measurement Data: Attached for Worst Case

OPERATING FREQUENCY : 462.5625 MHz
 POWER : High Power
 OUTPUT POWER : 1.5 W = 31.76 dBm
 MODULATION SIGNAL : FM
 LIMIT : $43 + 10 \log_{10} (W)$ = 45 dBc

Freq. (MHz)	LEVEL@ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
924.96	-30.4	6.2	-24.2	V	55.96
1387.78	-44.59	8.5	-36.09	V	67.85
1850.28	-44.83	10.3	-34.53	V	66.29
2312.83	-39.74	9.9	-29.84	V	61.60

Remarks

No other emissions were detected at a level greater than 20dB below limit.

3.2.4 Emission Masks (Occupied Bandwidth)

Definition:

- The term transmitter Sideband Spectrum denotes the sideband energy produced at a discrete frequency separation from the carrier up to the test bandwidth due to all sources of unwanted noise within the transmitter in a modulated condition.

FCC ID	:	PM3GR5500
Specification	:	47 CFR 2.1049(c)(1)
Test method	:	ANSI/TIA/EIA-603-2001, Paragraph 2.2.11

Measurement Procedure:

- The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
- For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ± 1.25 kHz deviation (or 50% modulation). With level constant, the signal level was increased 16dB.
- For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

Measurement Data:

Refer to the next page

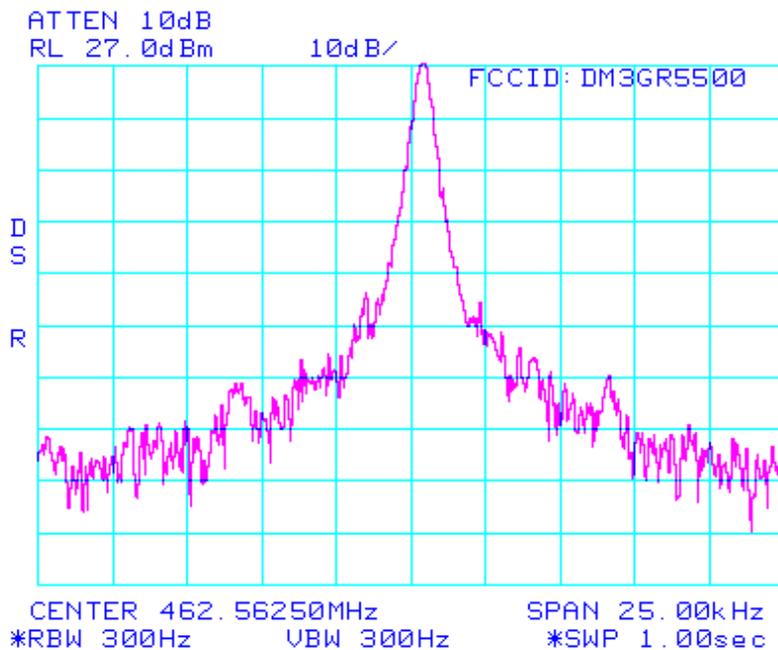
TEST EQUIPMENT USED: 2, 19, 20, 35, 37
.....

Emission Masks Measurement Data:

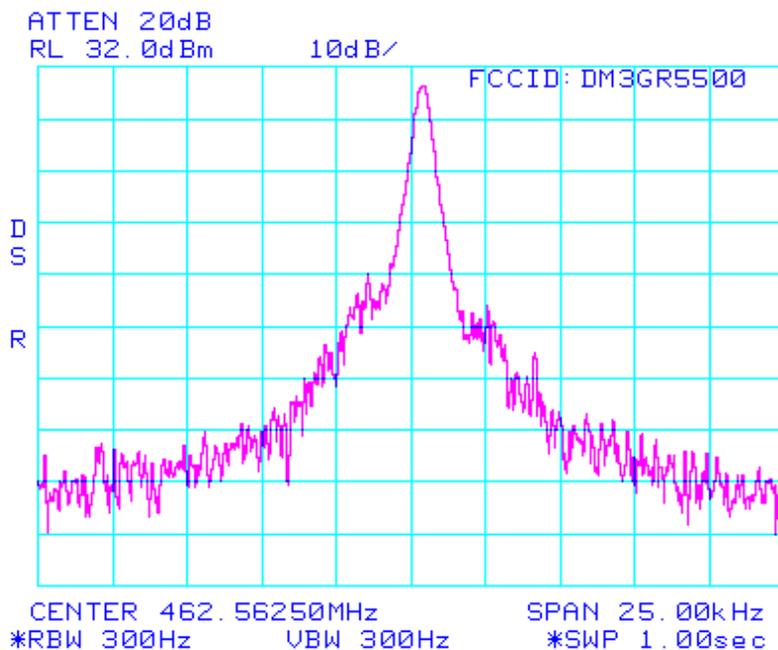
OPERATING FREQUENCY : 462.5625 MHz

MODULATION : None

POWER : Low Power



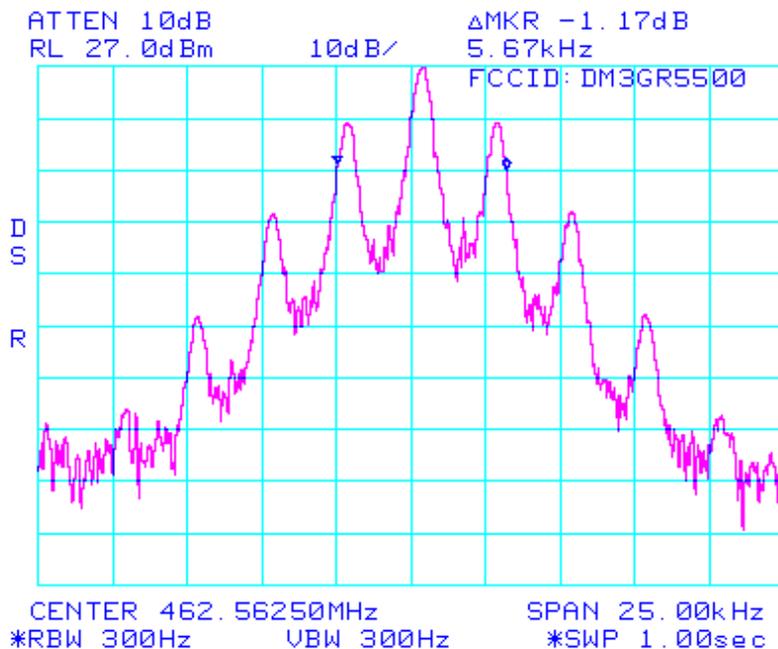
POWER : High Power



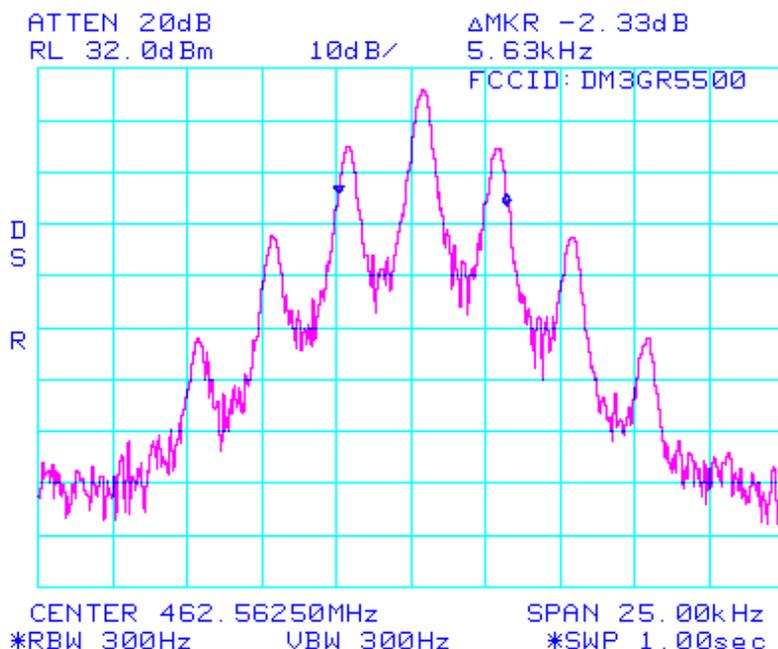
OPERATING FREQUENCY : 462.5625 MHz

MODULATION : Voice: 2500 Hz, Sine Wave

POWER : Low Power



POWER : High Power



3.2.5 Audio Frequency Response

Definition:

- The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

FCC ID : **PM3GR5500**
 Specification : 47 CFR 2.1047(a)
 Test method : ANSI/TIA/EIA-603-2001, Paragraph 2.2.6

Measurement Procedure:

- The audio signal input was adjusted to obtain 20% modulation at 1kHz, and this point was taken as the 0dB reference level.
- With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 300 Hz to 30 kHz.
- The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.

Measurement Data:

Refer to the next page

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

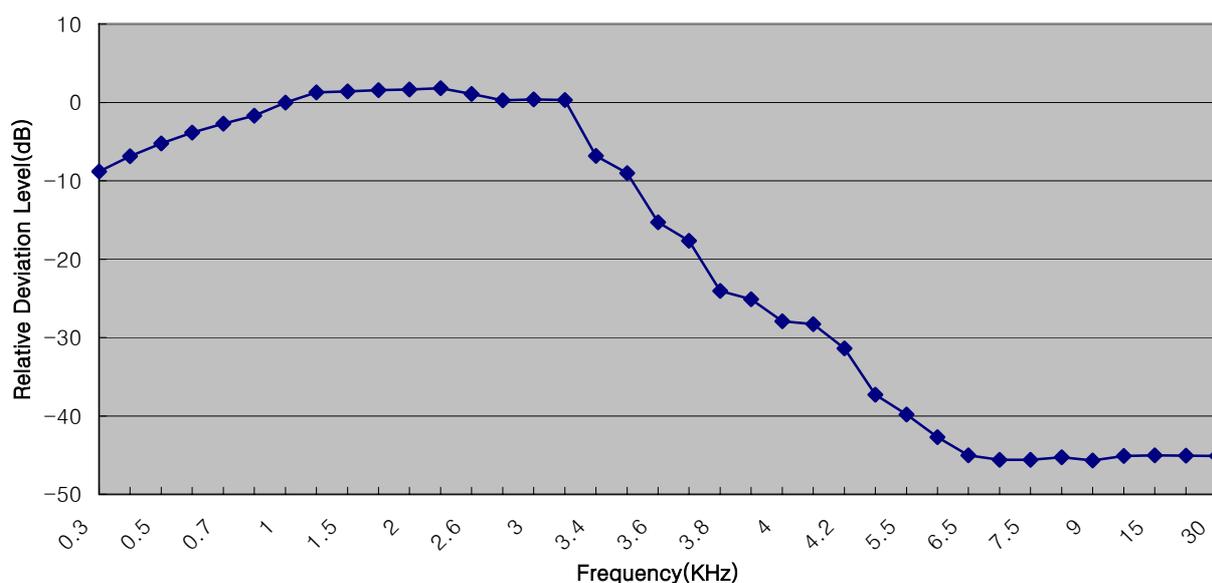
Audio Frequency Response Measurement Data:

OPERATING FREQUENCY : 462.5625 MHz

REFERENCE LEVEL : 0dB @ 1kHz

Audio Frequency Response					
Freq., kHz	Level, dB	Freq., kHz	Level, dB	Freq., kHz	Level, dB
0.3	-8.83	2.8	0.26	5.5	-39.82
0.4	-6.87	3.0	0.38	6.0	-42.70
0.5	-5.22	3.3	0.32	6.5	-45.04
0.6	-3.86	3.4	-6.81	7.0	-45.61
0.7	-2.69	3.5	-9.01	7.5	-45.6
0.8	-1.70	3.6	-15.29	8.0	-45.28
1.0	0	3.7	-17.64	9.0	-45.67
1.2	1.30	3.8	-24.07	10.0	-45.10
1.5	1.41	3.9	-25.11	15.0	-45.05
1.7	1.56	4.0	-27.91	20.0	-45.06
2.0	1.66	4.1	-28.30	30.0	-45.1
2.3	1.83	4.2	-31.40		
2.6	1.08	4.8	-37.30		

Audio Frequency Response



3.2.6 Modulation Limiting

Definition:

- Modulation limiting refers to the transmitter circuits ability to limit the transmitter from producing deviations due to modulation in excess of a rated system deviation.

FCC ID	:	PM3GR5500
Specification	:	47 CFR 2.1047(b)
Test method	:	ANSI/TIA/EIA-603-2001, Paragraph 2.2.3

Measurement Procedure:

- The signal generator was connected to the input of the EUT as for " Frequency Response of the Modulating Circuit."
- The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.
- The input level was varied from 30% modulation (± 1.5 kHz deviation) to at least 20 dB higher than the saturation point.

Measurement Data:

Refer to the next page

TEST EQUIPMENT USED: 2, 19, 20, 35, 37
.....

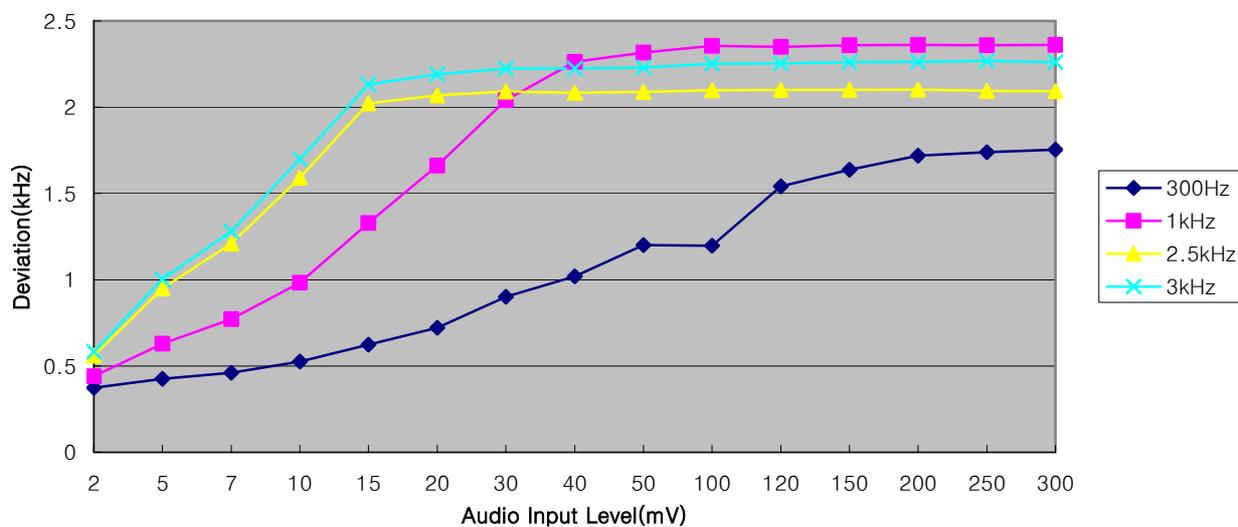
Modulation Limiting Measurement Data:

OPERATING FREQUENCY : 462.5625 MHz

CHANNEL SPACING : 12.5 kHz

Input Level (mV)	FM Deviation in kHz at Indicated Modulating Frequency			
	300Hz	1KHz	2.5KHz	3KHz
2	0.373	0.441	0.560	0.583
5	0.426	0.629	0.950	1.003
7	0.461	0.771	1.211	1.281
10	0.526	0.982	1.591	1.698
15	0.623	1.329	2.022	2.132
20	0.721	1.661	2.068	2.191
30	0.902	2.042	2.091	2.225
40	1.019	2.264	2.084	2.225
50	1.201	2.316	2.089	2.229
100	1.197	2.356	2.099	2.252
120	1.542	2.35	2.101	2.254
150	1.638	2.359	2.101	2.261
200	1.719	2.361	2.102	2.263
250	1.740	2.360	2.095	2.269
300	1.754	2.361	2.093	2.262

Deviation Limiting



3.2.7 Frequency Stability

Definition:

- Modulation limiting refers to the transmitter circuits ability to limit the transmitter from producing deviations due to modulation in excess of a rated system deviation.

FCC ID	:	PM3GR5500
Specification	:	47 CFR 2.1055
Test method	:	ANSI/TIA/EIA-603-2001, Paragraph 2.2.2

Measurement Procedure:

The frequency stability of the transmitter is measured by:

- Temperature: The temperature is varied from -30°C to +50°C using an environmental chamber.
- Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification- The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025(\pm 2.5\text{ppm})$ of the center frequency.

Time Period and Procedure:

- The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (25°C to 27°C to provide a reference).
- The equipment is subjected to an overnight “soak” at -30°C without power applied.
- After the overnight “soak” at 30°C (usually 14-16 hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
- Frequency measurements are made at 10°C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
- Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
- Frequency measurements are at 10 intervals starting at -30°C up to +50°C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
- The artificial load is mounted external to the temperature chamber.

NOTE: The EUT is tested down to the battery endpoint.

Measurement Data:

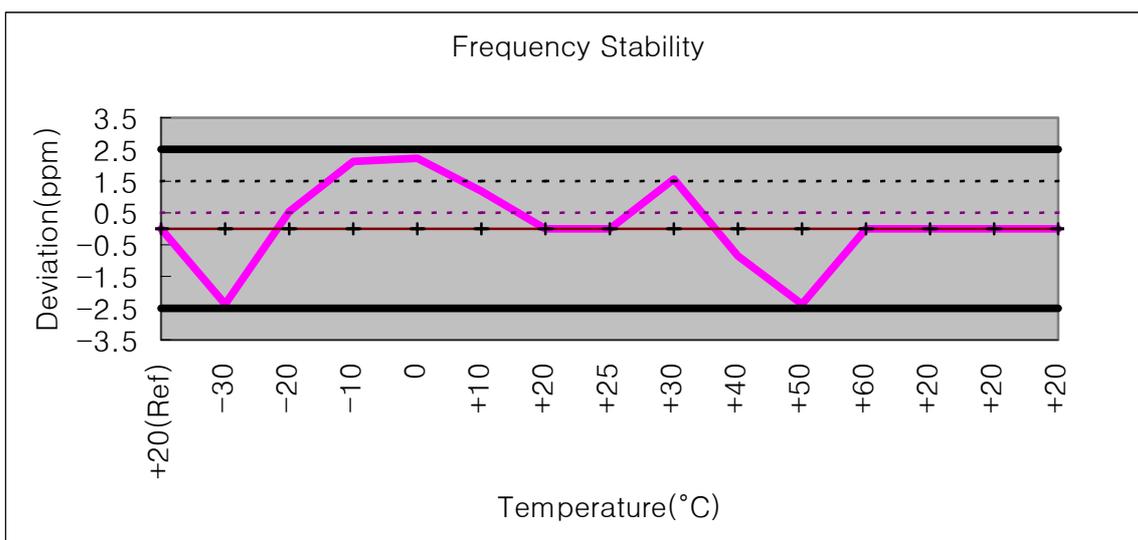
Refer to the next page

TEST EQUIPMENT USED: 2, 19, 20, 35, 37

Frequency Stability Measurement Data:

OPERATING FREQUENCY : 462.562500 MHz
 REFERENCE VOLTAGE: 4.8 VDC CHANNEL SPACING: 12.5 kHz
 DEVIATION LIMIT: ± 0.00025 % or 2.5ppm

VOLTAGE (%)	POWER (VDC)	TEMP (dB)	FREQ (Hz)	Deviation (%)
100%	4.8	+20(Ref)	462,562,500	0.000000
100%		-30	462,563,600	-0.000238
100%		-20	462,562,250	0.000054
100%		-10	462,561,520	0.000212
100%		0	462,561,470	0.000223
100%		+10	462,561,950	0.000119
100%		+20	462,562,500	0.000000
100%		+30	462,561,774	0.000157
100%		+40	462,562,894	-0.000085
100%		+50	462,563,600	-0.000238
85%	4.08	+20	462,562,500	0.000000
115%	5.52	+20	462,562,500	0.000000
BATT.ENDPOINT	2.10	+20	462,562,500	0.000000



3.2.8 Necessary Bandwidth and Emission Bandwidth

FCC ID : **PM3GR5500**
Specification : 47 CFR 2.202 (g)

MODULATION = 11K0F3E

NECESSARY BANDWIDTH CALCULATION:

MAXIMUM MODULATION (M), kHz	= 3
MAXIMUM DEVIATION (D), kHz	= 2.5
CONSTANT FACTOR (K)	= 1
NECESSARY BANDWIDTH (BN), kHz	= (2 * M) + (2 * D * K)
	= 11.0

APPENDIX

TEST EQUIPMENT USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	S/N
01	Spectrum Analyzer	Agilent	E4404B	22/11/04	30601-01-6025569
02	Spectrum Analyzer	H.P	8563E	25/09/04	3551A04634
03	Power Meter	H.P	EPM-442A	16/07/04	GB37170413
04	Power Sensor	H.P	8481A	16/07/04	3318A96332
05	Frequency Counter	H.P	5342A	26/09/04	2119A04450
06	Multifunction Synthesizer	H.P	8904A	15/10/04	3633A08404
07	Signal Generator	H.P	8673D	26/09/04	2844A00753
08	Signal Generator	H.P	E4421A	29/04/05	US37230529
09	Signal Generator	H.P	8657A	26/05/05	3430U02049
10	Audio Analyzer	H.P	8903B	18/04/05	3011A0944B
11	Modulation Analyzer	H.P	8901B	21/04/05	3028A03029
12	Sensor Module	H.P	11722A	21/04/05	3111A04665
13	Oscilloscope	LeCroy	9314A	27/08/04	93144390
14	CDMA Mobile Station Test Set	H.P	8924C	09/09/04	US35360688
15	Power Splitter	WEINSCHTEL	1593	23/04/05	332
16	BAND Reject Filter	Wainwright	WRCG824	19/08/04	SN1
17	BAND Reject Filter	Wainwright	WRCG1750	19/08/04	SN2
18	AC Power supply	DAEKWANG	5KVA	03/04/05	N/A
19	DC Power Supply	H.P	6622A	24/03/05	465487
20	Attenuator (30dB)	H.P	8498A	23/05/04	50101
21	Attenuator (10dB)	WEINSCHTEL	23-10-34	15/10/04	BP4387
22	HORN ANT	EMCO	3115	22/10/04	6419
23	HORN ANT	EMCO	3115	01/10/04	21097
24	HORN ANT	A.H.Systems	SAS-574	27/11/04	154
25	HORN ANT	A.H.Systems	SAS-574	14/11/04	155
26	Dipole Antenna	Schwarzbeck	VHA9103	04/10/04	2116

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	S/N
27	Dipole Antenna	Schwarzbeck	VHA9103	04/10/04	2117
28	Dipole Antenna	Schwarzbeck	UHA9105	04/10/04	2261
29	Dipole Antenna	Schwarzbeck	UHA9105	04/10/04	2262
30	RFI/FIELD Intensity Meter	Kyorits	KNM-504D	25/07/04	SN-161-4
31	Frequency Converter	Kyorits	KCV-604C	25/07/04	4-230-3
32	TEMP & HUMIDITY Chamber	JISCO	J-RHC2	14/09/04	021031
33	Log Periodic Antenna	Schwarzbeck	UHALP9108A1	23/10/04	1098
34	Biconical Antenna	Schwarzbeck	VHA9103	23/10/04	VHA91031946
35	Digital Multimeter	H.P	34401A	15/10/04	3146A13475
36	Attenuator (10dB)	WEINSCHTEL	23-10-34	15/10/04	BP4386
37	High-Pass Filter	ANRITSU	MP526	12/05/05	M27756
38	Attenuator (3dB)	Agilent	8491B	15/10/04	58177
39	Oscillo Scope	Tektronics	TDS644B	18/11/04	B010834
40	RFI/FIELD Intensity Meter	Kyorits	KNW-2402	25/07/04	4N-170-3
41	LISN	Kyorits	KNW-407	29/08/04	8-317-8
42	LISN	Kyorits	KNW-242	22/08/04	8-654-15
43	Spectrum Analyzer	H.P	8591E	23/05/05	3649A05889
44	Software	ToYo EMI	EP5/CE	N/A	Ver 2.0.801
45	CVCF	NF Electronic	4400	N/A	344536 4420064