PCTEST Engineering Laboratory, Inc.
6660-B Dobbin Road · Columbia, MD 21045 · U.S.A.
TEL (410) 290-6652 · FAX (410) 290-6654
http://www.pctestlab.com

CERTIFICATE OF COMPLIANCE
FCC Part 90 Certification

GENEX Telecom Co., Ltd.
6F Farmax B/D 796-27 Bangbae-Dong,
Seocho-Gu, Seoul 137-830, Korea

Dates of Tests: August 19-20, 2003
Test Report S/N: 90.230808390.PM3
Test Site: PCTEST Lab, MD U.S.A.

FCC ID	**PM3MT800**
APPLICANT	**GENEX Telecom Co., Ltd.**

Classification:	**Licensed Non-Broadcast Station Transmitter (TNB)**
FCC Rule Part(s):	**§ 90**
EUT Type:	**VHF FM Transceiver**
Trade Name(s):	***GENEX***
Model(s):	***MT-800***
Tx/Rx Frequency Range:	**148 ~ 174 MHz**
Max. RF Output Power:	**40 W (Conducted)**
Frequency Tolerance:	**0.00025% (2.5 ppm)**
Emission Designator:	**16K0F3E, 11K0F3E**

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947.

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.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

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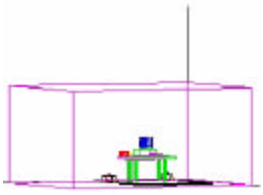
MEASUREMENT REPORT



1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

General Information

Applicant Name:	**GENEX Telecom Co., Ltd.**
Address:	**6F Farmax B/D 796-27 Bangbae-Dong, Seocho-Gu, Seoul 137-830, Korea**

- **FCC ID:** **PM3MT800**
- **Model(s):** **MT-800**
- Quantity: Quantity production is planned
- Emission Designator: 16K0F3E, 11K0F3E
- Tx/Rx Freq. Range: 148 -174 MHz
- Equipment Class: Licensed Non-Broadcast Station Transmitter (TNB)
- Equipment Type: VHF FM Transceiver
- Modulation: FM
- Frequency Tolerance: ± 0.00025% (2.5 ppm)
- Max. Power: 40 W (Conducted)
- FCC Rule Part(s): § 90
- Power Supply: 13.6 V DC
- Dates of Tests: August 19-20, 2003
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 90.230808390.PM3

2.1 INTRODUCTION

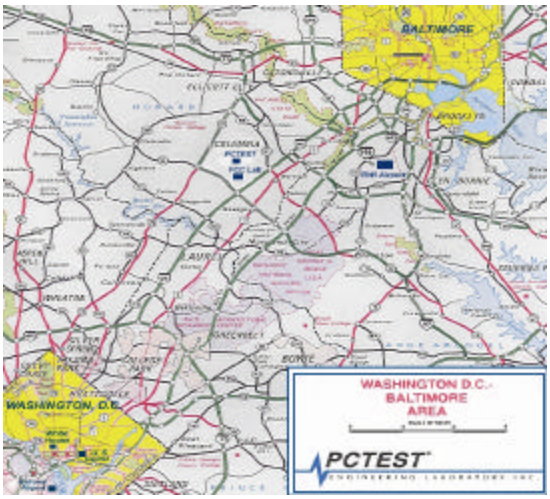


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

These measurement tests were conducted at ***PCTEST Engineering Laboratory, Inc.*** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

Measurement Procedure

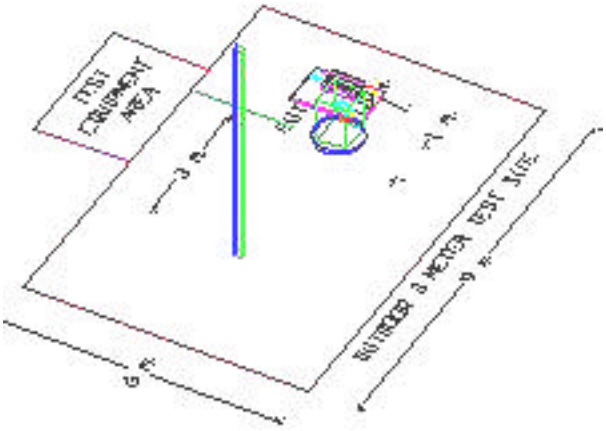


Figure 2. 3-meter outdoor test site

The radiated and spurious measurements were made outdoors at a 3-meter test range (see Figure2). The equipment under testing was placed on a wooden turntable, 3-meters from the receive antenna. The receive antenna height and turntable rotations 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. This level was recorded.

For readings above 1 GHZ, the above procedure would be repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.1 INSERTS

Block Diagram(s) & Circuit Diagram(s)

The block diagram is shown in Attachment I, and the circuit diagram is shown in Attachment J.

Operating Instructions

The instruction manual is shown in Attachment K.

4.1 DESCRIPTION OF TESTS

4.2 Transmitter Audio Frequency Response

The frequency response of the audio modulating circuit over the frequency range 100 – 5000 Hz is measured. The audio signal generator is connected to the audio input circuit/microphone of the EUT. The audio signal input is adjusted to obtain 50% modulation at 1kHz and this point is taken as the 0dB reference. With the input held constant and below the limit at all frequencies, the audio signal generator is varied from 100 to 50 kHz. The response in dB relative to 1kHz is measured using the HP8901 a Modulation Analyzer. For the frequency response of the audio low-pass filter, the audio input is connected at the input to the modulation limiter and the modulated stage. The audio output is connected at the output of the modulated stage. The corresponding plots are shown herein.

4.3 Modulation Limiting

The audio signal generator is connected to the audio input circuit/microphone of the EUT. The modulation response is measured for each of the three modulating frequencies (300Hz, 1000 Hz, and 2990Hz), and the input voltage is varied from 30% modulation (±3.6kHz deviation) to at least 20dB higher than the saturation point. Measurements of modulation and the plots are attached herein.

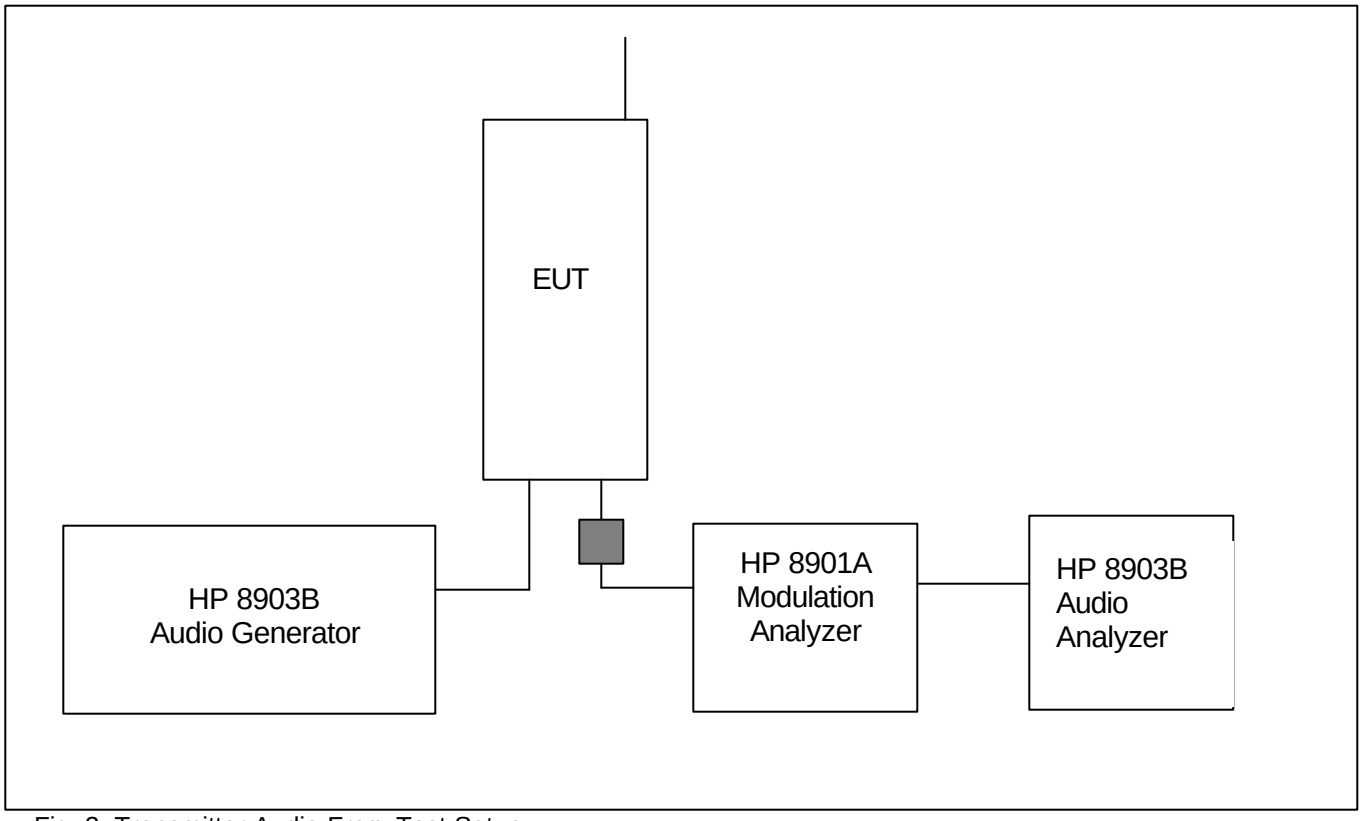


Fig. 3. Transmitter Audio Freq. Test Setup

4.4 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to the tenth harmonic.

4.5 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions above 1 GHz is measured at out 3-meter indoor site. The EUT is placed on the turntable connected to a dummy load in normal operation using the intended power source. A receiving antenna located 3 meters from the turntable receives any signal radiated from the transmitter and its operating accessories. The antenna is varied from 1 to 4 meters and the polarization is varied (horizontal and vertical) to determine the worst-case emission level. To obtain actual radiated signal strength, a signal generator is adjusted in output until a reading identical to that obtained with the actual transmitter is obtained at the receiver. Signal strength is read directly from the generator and recorded on the attached table.

4.1 DESCRIPTION OF TESTS (CONTINUED)

4.7 Occupied Bandwidth

The audio signal generator is adjusted to 1kHz. The output level is set to ±6kHz deviation. With the level constant, the frequency is set to 2500Hz. Then the audio signal level is increased by 16dB. The occupied bandwidth data is obtained for the SAT (Supervisory Audio Tone), ST (Signaling Tone), WBD (Wideband data), and DTMF (Dual Tone Multi Frequencies). The results are shown on the attached graphs.

Specified Limits:

a. On any frequency removed from the assigned carrier frequency by more than 20 kHz, up to and including 45kHz, the sideband is at least 26dB below the carrier.

b. On any frequency removed from the assigned carrier frequency by more than 45 kHz, up to and including 90kHz, the sideband is at least 45dB below the carrier.

c. On any frequency removed from the assigned carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, the sideband is at least 60dB below the carrier or 40 + $\log_{10}$ (mean power output in Watts) dB, whichever is the smaller attenuation.

4.8 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to 10 GHz. The transmitter is modulated with a 2500Hz tone at a level of 16dB greater than that required to provided 50% modulation.

At the input terminals of the spectrum analyzer, an isolator (RF circulator with on port terminated with 50 ohms) and an 870 MHz to 890 MHz bandpass filter is connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The rejection of the bandpass filter to signals in the 825 – 845 MHz range is adequate to limit the transmit energy from the test transceiver which appears to a level which will allow the analyzer to measure signals less than –90dBm. Calibration of the test receiver is performed in the 870 – 890 MHz range to insure accuracy to allow variation in the bandpass filter insertion loss to be calibrated.

4.9 Frequencies

At the input terminals of the spectrum analyzer, an isolator (RF pad) and an high-pass filter are connected between the test transceiver (for conducted tests) or the receive antenna (for radiated tests) and the analyzer. The high-pass filter (signals below 1.6 GHz) is to limit the fundamental frequency from interfering with the measurement of low-level spurious and harmonic emissions and to ensure that the preamplifier is not saturated.

4.10 Radiation Spurious and Harmonic Emissions

Radiation and harmonic emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were 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 with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

5.0 Frequency Stability/Temperature Variation.

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +60°C using an environmental chamber.

b.) **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 ±0.00025 (±2.5 ppm) of the center frequency.

Time Period and Procedure:

1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature (22°C to 25°C to provide a reference).
2. The equipment is subjected to an overnight "soak" at -30°C without any power applied.
3. 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.
4. 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.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. 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.
7. The artificial load is mounted external to the temperature chamber.

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

6.1 Test Data

6.2 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 148.03 MHz
CHANNEL: 01 (Low)
MEASURED OUTPUT POWER: 46.021 dBm = 39.999 W
MODULATION SIGNAL: FM (Internal)
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 59.02 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
296.05	-53.18	6.10	-47.08	V	93.1
444.08	-54.48	6.70	-47.78	V	93.8
592.10	-67.18	6.80	-60.38	V	106.4
740.13	-76.28	6.50	-69.78	V	115.8

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 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. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

6.1 Test Data (Continued)

6.3 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 152.03 MHz
CHANNEL: 17 (Mid)
MEASURED OUTPUT POWER: 46.021 dBm = 39.999 W
MODULATION SIGNAL: FM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 59.02 dBc

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
304.05	-54.48	6.10	-48.38	V	94.4
456.08	-54.08	6.70	-47.38	V	93.4
608.10	-66.28	6.80	-59.48	V	105.5
760.13	-75.88	6.50	-69.38	V	115.4

NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 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. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

6.1 Test Data (Continued)

6.4 Radiated Measurements

Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 173.95 MHz
CHANNEL: 32 (High)
MEASURED OUTPUT POWER: 46.021 dBm = 39.999 W
MODULATION SIGNAL: FM (Internal)
DISTANCE: 3 meters
LIMIT: $43 + 10 \log_{10} (W)$ = 59.02 dBc

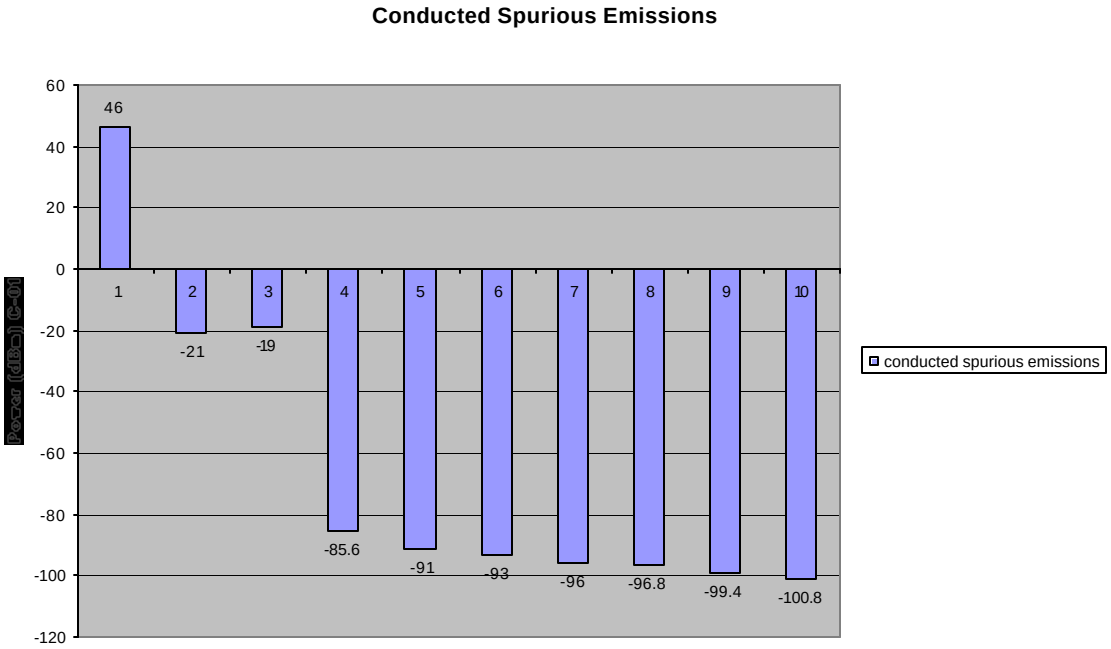
FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	CORRECT GENERATOR LEVEL (dBm)	POL (H/V)	(dBc)
347.90	-53.68	6.10	-47.58	V	93.6
521.85	-54.18	6.70	-47.48	V	93.5
695.80	-66.28	6.80	-59.48	V	105.5
869.75	-76.68	6.50	-70.18	V	116.2

NOTES:

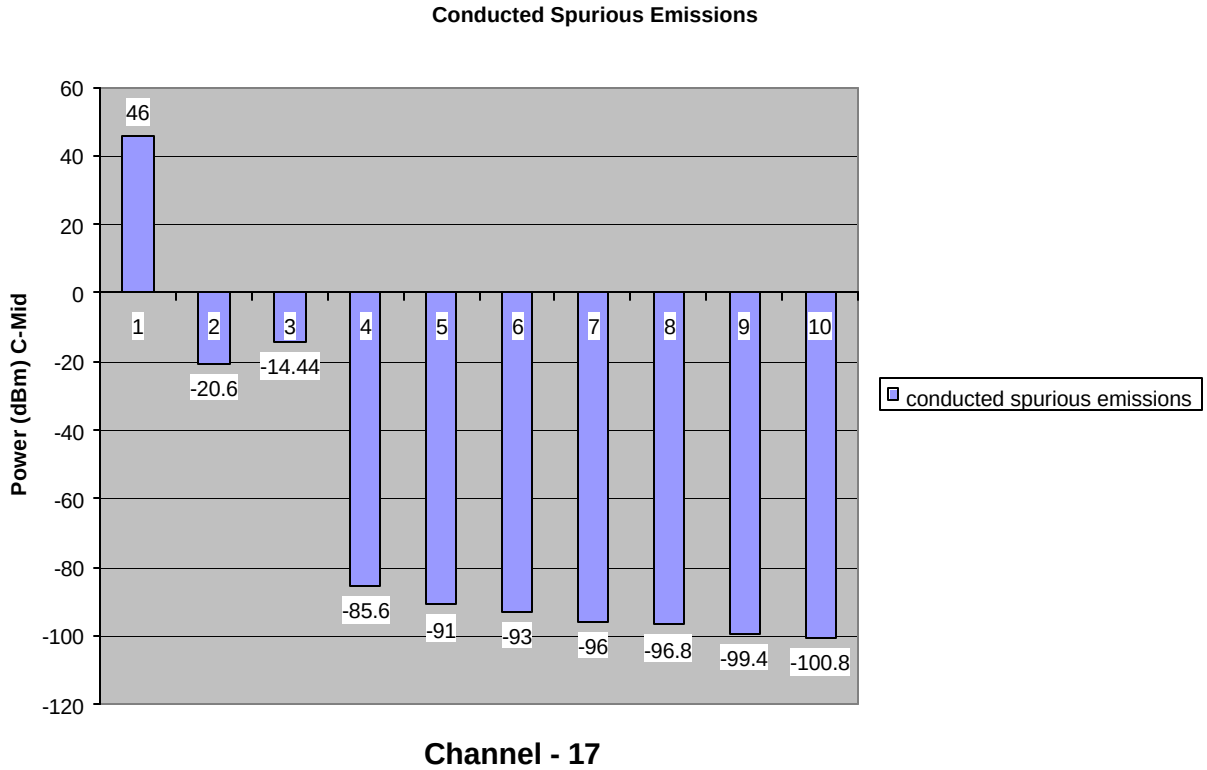
Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2001, Aug. 15, 2001:

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. This spurious level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

6.1 TEST DATA

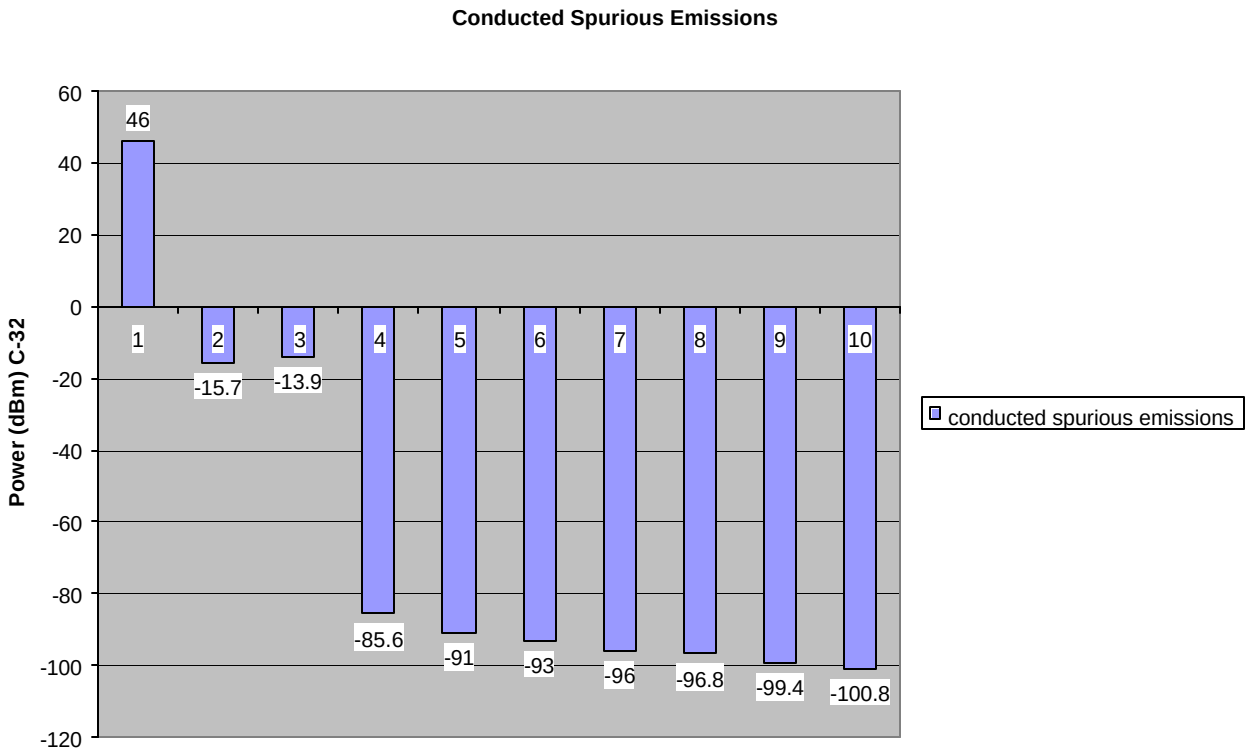


Channel - 01



Channel - 17

6.1 TEST DATA



Channel - 32

6.1 TEST DATA

Radiated Test Data

FREQ (MHz)	Level (dBm)	AFCL (dB)	POL (H/V)	Height (m)	Azimuth (° angle)	F/S (uV/M)	Margin (dB)
31.76	-76.22	-0.78	V	2.8	80	31.67	-10
66.4	-85.79	5.80	H	2.4	190	22.44	-13
99.6	-84.56	9.56	H	2	30	39.86	-11.5
130	-90.00	12.20	H	2.4	190	28.89	-14.3
165.9	-88.95	14.65	V	2.3	180	43.20	-10.8
200	-92.00	16.50	V	2	200	37.63	-12

Table A-1. Radiated Measurements at 3-meters

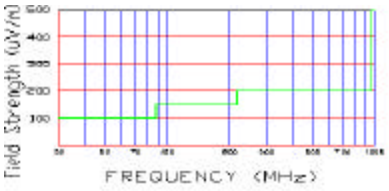


Figure A-1. Limits at 3 meters

NOTES:

1. All modes of operation were investigated and the worst-case emissions are reported.

2. The radiated limits are shown on Figure A-1. Above 1 GHz the limit is 500µV/m.

[1] All readings are calibrated by HP8640B signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).

[2] AFCL = Antenna Factor (Roberts dipole) and Cable Loss (30 ft. RG58C/U).

[3] Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used with a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

6.1 Test Data

Part 90 FREQUENCY STABILITY

OPERATING FREQUENCY: 153,025,443 Hz

CHANNEL: 17

REFERENCE VOLTAGE: 13.0 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

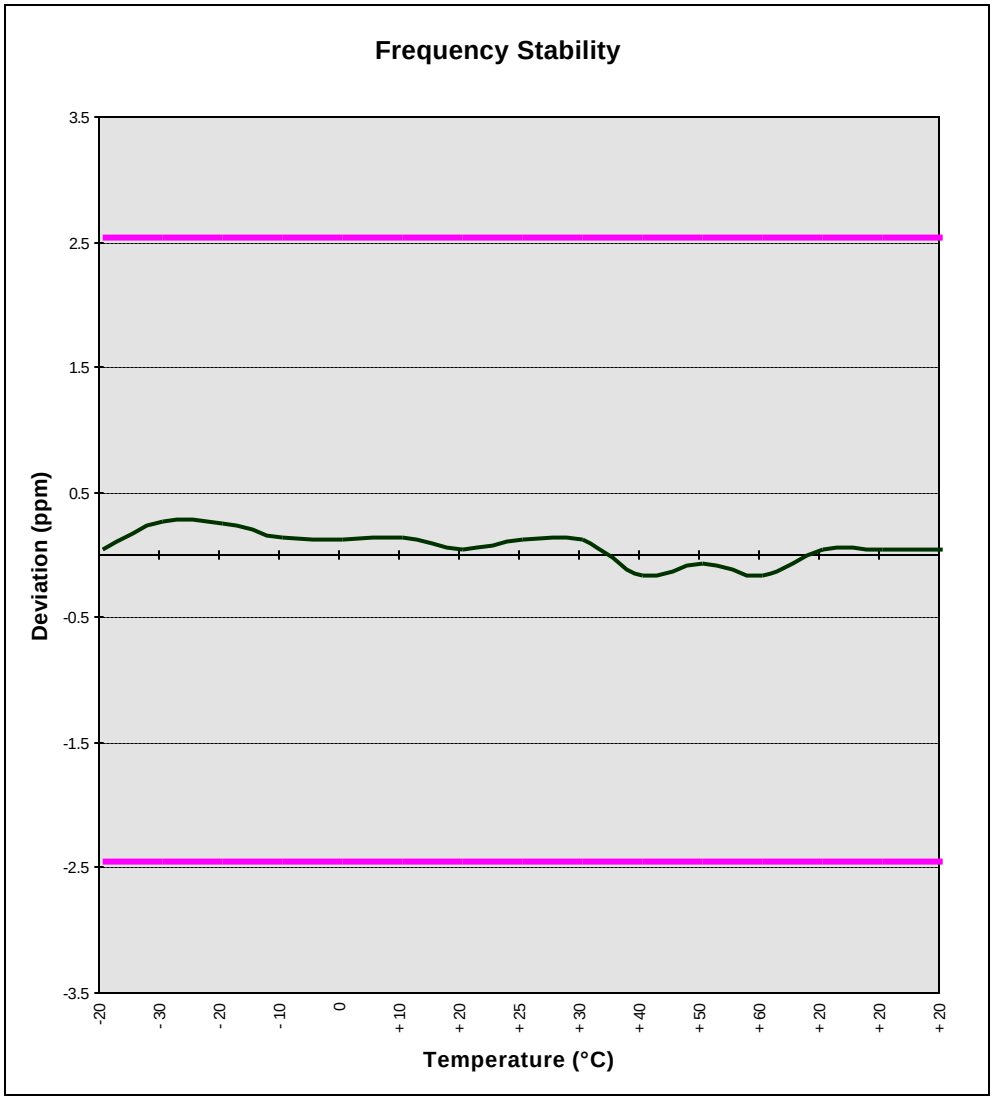
GENEX TELECOM 8/19/2003

MT800

VOLTAGE (%)	POWER (VdC)	TEMP (ºC)	FREQ. (Hz)	Deviation (%)
100 %	13.00	+ 20 (Ref)	153,025,443	0.000000
100 %		- 30	153,025,408	0.000023
100 %		- 20	153,025,411	0.000021
100 %		- 10	153,025,428	0.000010
100 %		0	153,025,431	0.000008
100 %		+ 10	153,025,429	0.000009
100 %		+ 20	153,025,443	0.000000
100 %		+ 25	153,025,431	0.000008
100 %		+ 30	153,025,431	0.000008
100 %		+ 40	153,025,474	-0.000020
100 %		+ 50	153,025,460	-0.000011
100 %		+ 60	153,025,474	-0.000020
85 %	11.05	+ 20	153,025,443	0.000000
115 %	14.95	+ 20	153,025,443	0.000000
BATT. ENDPOINT	9.20	+ 20	153,025,443	0.000000

6.1 Test Data (Continued)

Part 90 FREQUENCY STABILITY



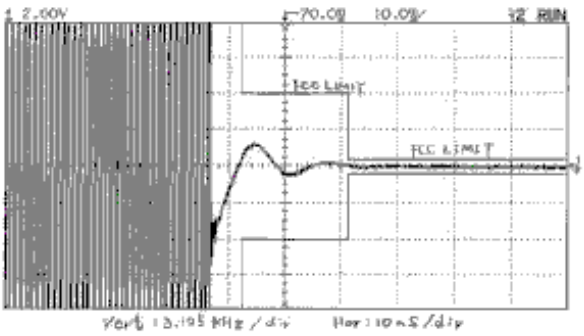
7.1 TRANSIENT FREQUENCY

Transient Frequency Characteristics

MT-800

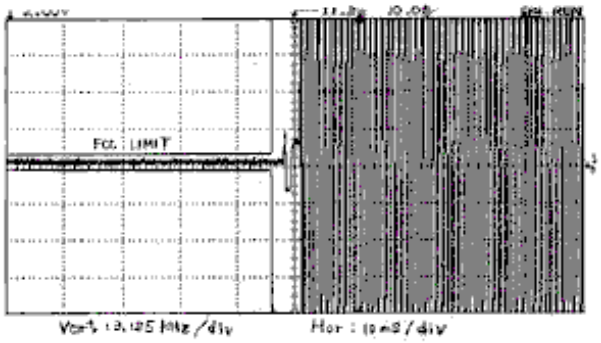
Turn on with 1000Hz Modulation

161.060MHz



Transmitter Transient Behavior
Turn off with 1000Hz Modulation

161.050MHz



8.1 PLOT(S) OF EMISSIONS

(SEE ATTACHMENT D)

9.1 TEST EQUIPMENT

9.2 Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	08/15/04	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/04	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (100Hz-1.8GHz)	08/10/04	3144A02458
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/04	2232A19558
Signal Generator*	HP 8640B (500Hz-1GHz)	06/03/04	1851A09816
Signal Generator*	Rohde & Schwarz (0.1-1000MHz)	09/11/03	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/04	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/04	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/03	0608-03241
Quasi-Peak Adapter	HP 85650A	08/15/04	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	3/11/04	0194-04082
RG58 Coax Test Cable	No.167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470, 1937A03348
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)		2820A00300
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design		1295, 1332, 0355
Log-Spiral Antenna (3)	Ailtech/Eaton 93490-1		0608, 1103, 1104
Roberts Dipoles	Compliance Design (1 set)		
Ailtech Dipoles	DM-105A (1 set)		33448-111
EMCO LISN	3816/2		1079
EMCO LISN	3816/2		1077
EMCO LISN	3725/2		2009
Microwave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		3123A00181
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8594A		3051A00187
Spectrum Analyzer (2)	HP 8591A		3034A01395, 3108A02053
Modulation Analyzer	HP 8901A		2432A03467
NTSC Pattern Generator	Leader 408		0377433
Noise Figure Meter	HP 8970B		3106A02189
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473
Microwave Survey Meter	Holaday Model 1501 (2.450GHz)		80931
Digital Thermometer	Extech Instruments 421305		426966
Attenuator	HP 8495A (0-70dB) DC-4GHz		
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)		
Shielded Screen Room	RF Lindgren Model 26-2/2-0		6710 (PCT270)
Shielded Semi-Anechoic Chamber	Ray Proof Model S81		R2437 (PCT278)
Enviromental Chamber	Associated Systems Model 1025 (Temperature/Humidity)		PCT285

* Calibration traceable to the National Institute of Standards and Technology (NIST).

10.1 SAMPLE CALCULATIONS

Occupied Bandwidth

The audio signal generator is adjusted to 1kHz. The output level is increased until deviation limiting takes place. With the level constant, the freq. is set to 2,500Hz. Then the audio signal level is increased by 16dB.

The limits are specified in Section 2.1049.

Bandwidth Calculations (2M + 2D):

2(3.0) + 2 (5.0)
6 + 10.0 = 16.0 kHz

Emission Designator = 16K0F3E

M = maximum modulation frequency
D = maximum deviation from modulating limiting plot

Bandwidth Calculations (2M + 2D):

2(3.0) + 2 (2.5)
6 + 5.0 = 11.0 kHz

Emission Designator = 11K0F3E

M = maximum modulation frequency
D = maximum deviation from modulating limiting plot

11.1 CONCLUSION

The data collected shows that the **GENEX TELECOM CO., LTD. VHF FM Transceiver FCC ID: PM3MT800** complies with all the requirements of Part 90 of the FCC rules.