

FCC PART 15 Subpart C
EMI MEASUREMENT AND TEST REPORT

For

VTech Telecommunications Ltd.

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57 Ting Kok Road, Tai Po NT, Hong Kong

FCC ID: EW780-5299-B00

February 13, 2003

This Report Concerns: <input checked="" type="checkbox"/> Original Report	Equipment Type: Cordless Phone
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *VTech Telecommunications Ltd.*'s product, model name: *gz 2434* or "EUT" as referred to in this report is a 2400MHz base station of cordless telephone. The EUT is measured approximately 5.25"L x 5.5"W x 2.0"H.

The EUT was supplied with VTech AC/DC adapter, M/N: U090050D01.

** The test data gathered is from typical production samples provided by the manufacturer.*

1.2 Objective

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992.

The object of the manufacturer is to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined by FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249.

1.3 Related Submittal(s)/Grant(s)

No related submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at BACL. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.5 Test Facility

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8564E	08303	12/6/2003
HP	Spectrum Analyzer	8593B	2919A00242	12/20/2003
HP	Amplifier	8349B	2644A02662	12/20/2003
HP	Quasi-Peak Adapter	85650A	917059	12/6/2003
HP	Amplifier	8447E	1937A01046	12/6/2003
A.H. System	Horn Antenna	SAS0200/571	261	12/27/2003
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/2003
Com-Power	Biconical Antenna	AB-100	14012	11/2/2003
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/2003
Com-Power	LISN	LI-200	12208	12/20/2003
Com-Power	LISN	LI-200	12005	12/20/2003
BACL	Data Entry Software	DES1	0001	12/20/2003

***Statement of Traceability: BACL Corp.** certifies that all calibration has been performed using suitable standards traceable to the NIST.

1.7 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
TELTONE CORP.	Simulator	TLS-3B-01	80071	DOC
Panasonic	Telephone	KX-T3175	6IBTB142741	ACJMLA -75986-MT-E

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Non-Shielded telephone cable	2.0	RJ 11 Port/EUT	Telephone Simulator RJ11Port
Non-Shielded telephone cable	2.0	RJ 11 Port/Simulator	Telephone RJ11 Port/Panasonic

2 - SYSTEM TEST CONFIGURATION

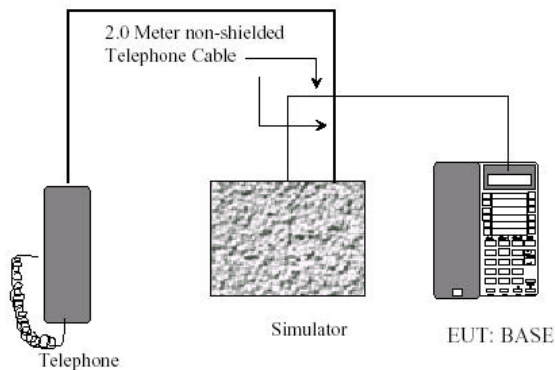
2.1 Description of Test Configuration

The EUT was configured for testing in a typical fashion (as normally used by a typical user).

Base being tested: The Base unit was placed on the wooden table. The Low, middle, and high channels were tested. The base was connected to the line simulator and an AC adapter via its Tel Line and power ports, respectively. The base was transmitting and receiving from the Handset. The conducted as well as radiated data was taken in this mode of operation. All initial and final investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the 2.3.

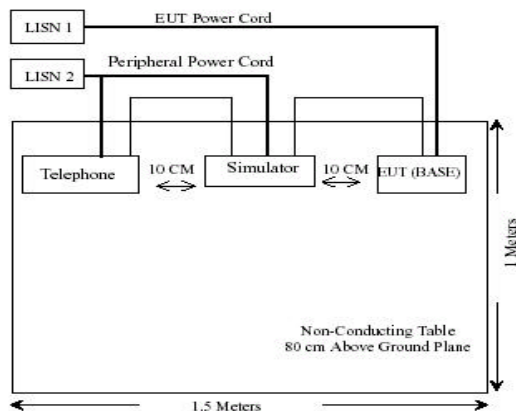
2.2 Configuration of Test System

Radiated Emission: BASE



2.3 Test Setup Block Diagram

Radiated Emission: BASE



2.4 Equipment Modifications

No modification(s) to the EUT were made by BACL to comply with the applicable limits.

3 - CONDUCTED EMISSIONS TEST DATA

3.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

3.2 EUT Setup

The measurement was performed at the **Open Area Test Site**, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC15.207 Class B limits.

The EUT was connected to 110Vac/60Hz power source.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped over edge of the test table and bundle when necessary.

3.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conducted emission test:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed.....	Auto
IF Bandwidth	10 kHz
Video Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Quasi-Peak Adapter Mode.....	Normal

3.4 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first LISN with all support equipment power cords connected to the second.

The EUT was tested to represent worst-case results for the final qualification test. Therefore, these results were used for final test data recorded in the table listed under section 3.6 of this report.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dB of specification limit). Quasi-peak readings are distinguished with a "**Qp**".

3.5 Summary of Test Results

According to the data in section 3.6, the EUT complied with the FCC15.207 Conducted margin for a Class B device and these test results is deemed satisfactory evidence of compliance with RSS-210 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

-4.8 dB μ V at 0.8 MHz in the Neutral mode

3.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC15.207 CLASS B	
Frequency MHz	Amplitude dB μ V	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dB μ V	Margin dB
0.800	41.2	AVE	Neutral	46	-4.8
0.150	44.8	AVE	Line	56	-11.2
0.800	43.6	Qp	Neutral	56	-12.4
0.150	53.2	Qp	Line	66	-12.8
1.215	40.7	Qp	Line	56	-15.3
0.150	37.3	AVE	Neutral	56	-18.7
28.800	31.2	AVE	Line	50	-18.8
28.800	39.9	Qp	Line	60	-20.1
28.500	24.5	AVE	Neutral	50	-25.5
1.215	17.7	AVE	Line	46	-28.3
28.500	27.9	Qp	Neutral	60	-32.1
0.150	30.4	Qp	Neutral	66	-35.6

3.7 Plot of Conducted Emissions Test Data

Plots of Conducted Emissions test data were presented hereinafter as reference.

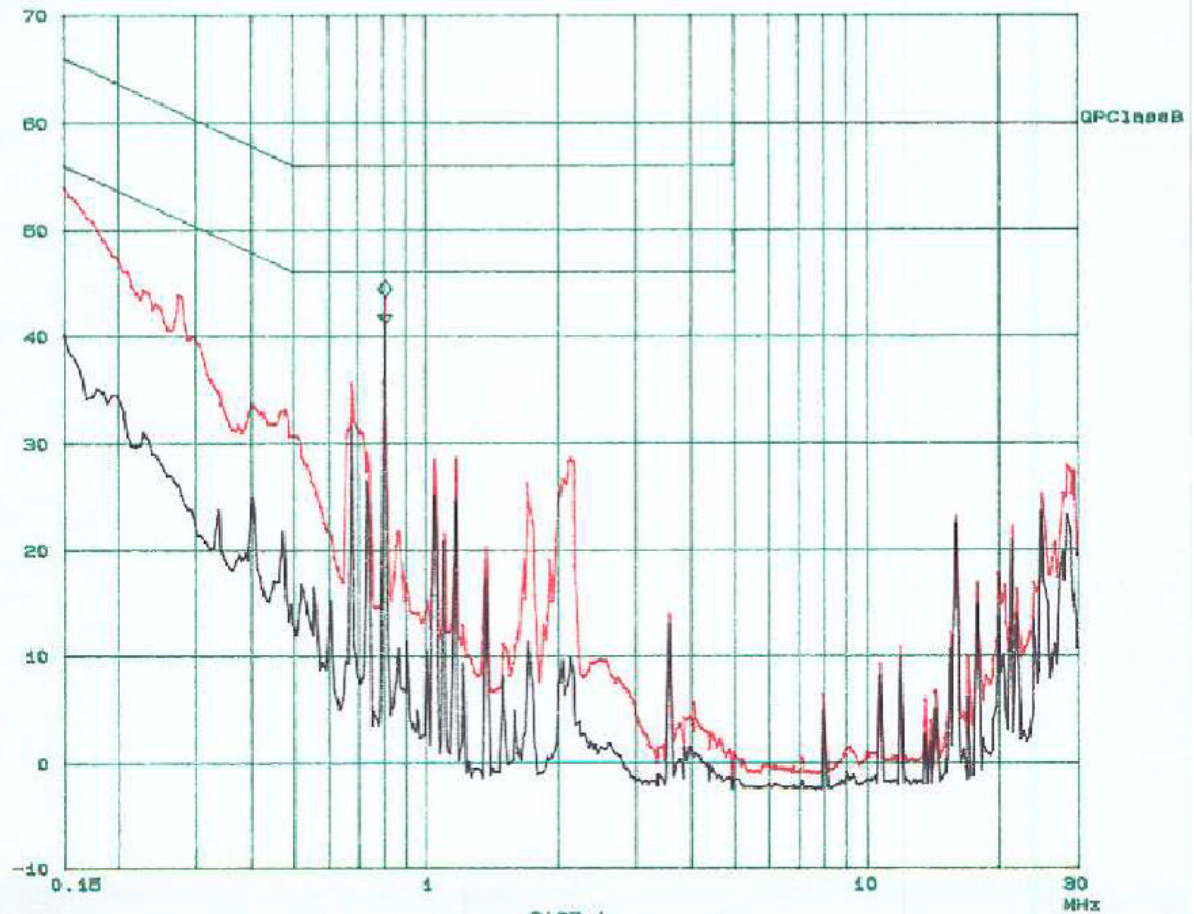
Bay Area Compliance Corporation CISPR CLASS B

EUT: VT-2434
Manuf: VTECH
Op Cond: Normal
Operator: Benjamin
Comment: NEUTRAL

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	H-Time	Atten	Preamp
150k	30M	5k	9k	QP+AV	20ms	10dB LN	OFF

◇ MKF : 810.00 kHz 43.5 dBuV
▽ MKF : 810.00 kHz 41.2 dBuV

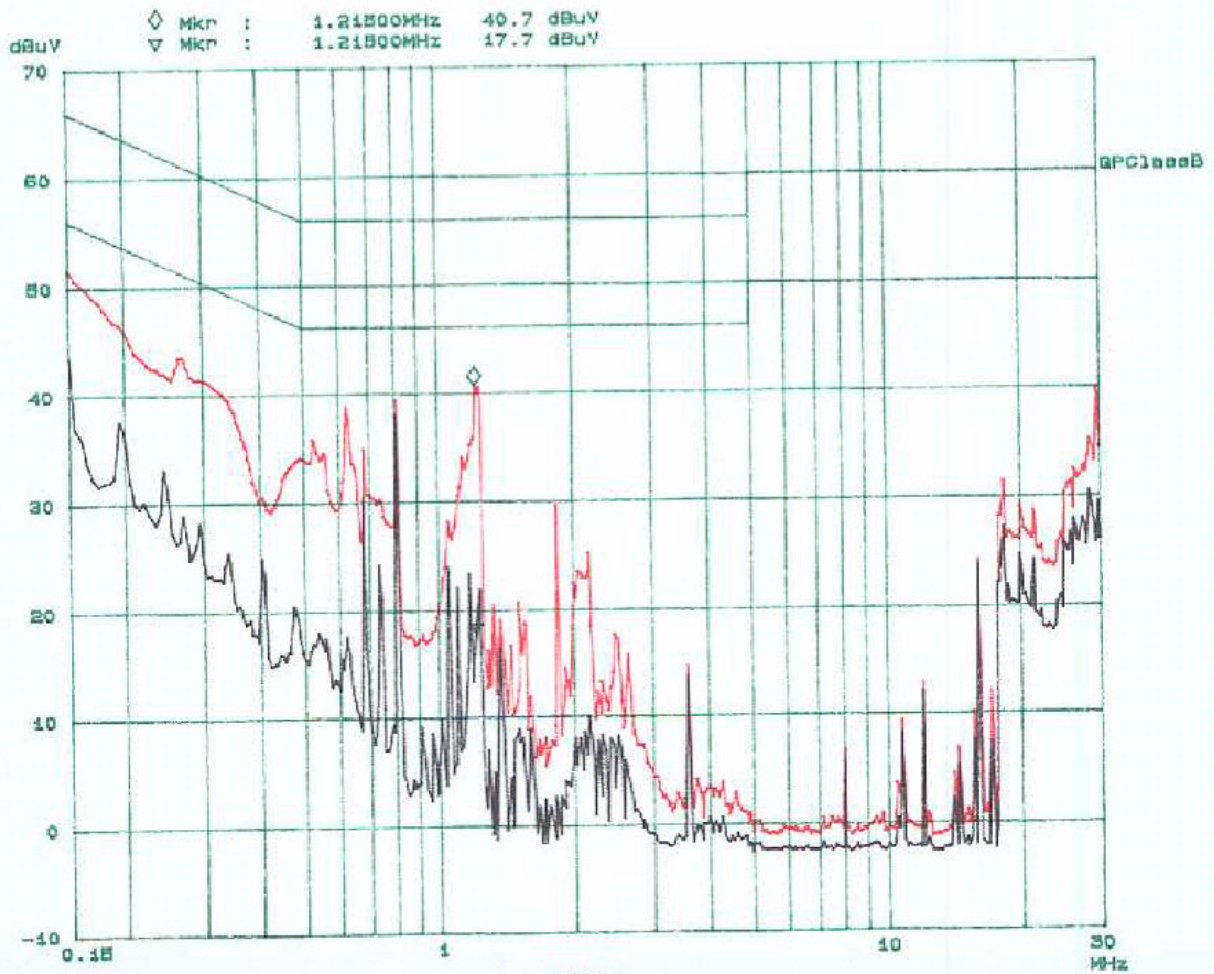


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Bay Area Compliance Corporation
 CISPR CLASS B

EUT: VT-2484
 Manuf: VTECH
 Op Cond: Normal
 Operator: Benjamin
 Comment: LINE

Scan Settings (1 Range)			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150K	30M	5K	9K	QP+AV	20ms	10dB LN	OFF



4 - RADIATED EMISSION DATA

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BAEL is ± 4.0 dB.

4.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4 - 1992. The specification used was the FCC 15 Subpart C limits.

The EUT was connected to 110Vac/60Hz power source and it was placed center and the back edge of the test table.

The spacing between the peripherals was 10 centimeters.

The external I/O cables were draped over edge of the test table and bundle when necessary.

4.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

4.4 Test Procedure

For the radiated emissions test, both the EUT and all support equipment power cords were connected to the AC floor outlet since the power supply used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "Qp" in the data table.

4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of $-7\text{dB}\mu\text{V}$ means the emission is $7\text{dB}\mu\text{V}$ below the maximum limit for applicable limits. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Applicable Limit}$$

4.6 Summary of Test Results

According to the data in section 4.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.249 after tested to 10^{th} harmonics as required by FCC and had the worst margin of:

Base, 30MHz to 25GHz, 3 Meters:

- 10.3 dB at 4820.40 MHz in the Vertical polarization at Low Frequency
- 12.3 dB at 4837.80 MHz in the Horizontal polarization at High Frequency
- 2.3 dB at 50.12 MHz in the Vertical polarization, Unintentional Emission

4.7 Radiated Emissions Test Result Data

4.7.1 Base Unit, 30 MHz to 25GHz, 3 meters

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart C	
Frequency MHz	Ampl. dBµV/m	Comments	Angle Degree	Height Meter	Polar H/ V	Antenna dBµV/m	Cable DB	Amp. dB	Corr. Ampl. dBµV/m	Limit dBµV/m	Margin dB
Low Frequency											
4820.40	36.3	AVG	225	1.2	V	32.5	4.9	30.0	43.7	54	-10.3
4820.40	36.0	AVG	270	1.2	H	32.5	4.9	30.0	43.4	54	-10.6
9640.80	29.2	AVG	225	1.2	V	35.1	5.6	30.0	39.9	54	-14.1
9640.80	29.0	AVG	270	1.2	H	35.1	5.6	30.0	39.7	54	-14.3
7230.60	28.0	AVG	225	1.2	V	35.1	5.6	30.0	38.7	54	-15.3
7230.60	28.0	AVG	270	1.2	H	35.1	5.6	30.0	38.7	54	-15.3
12052.00	26.0	AVG	225	1.2	V	35.1	5.6	30.0	36.7	54	-17.3
12052.00	26.0	AVG	270	1.2	H	35.1	5.6	30.0	36.7	54	-17.3
2410.2	75	AVG, FUND	225	1.2	V	28.1	3.4	30.0	76.5	94	-17.6
9640.80	43.3	PEAK	225	1.2	V	35.1	5.6	30.0	54.1	74	-19.9
7230.60	41.3	PEAK	225	1.2	V	35.1	5.6	30.0	52.0	74	-22.0
2410.2	70.2	AVG, FUND	270	1.2	H	28.1	3.4	30.0	71.7	94	-22.4
9640.80	40.0	PEAK	270	1.2	H	35.1	5.6	30.0	50.7	74	-23.3
7230.60	38.7	PEAK	270	1.2	H	35.1	5.6	30.0	49.4	74	-24.6
12052.00	36.8	PEAK	270	1.2	H	35.1	5.6	30.0	47.5	74	-26.5
4820.40	40.0	PEAK	225	1.2	V	32.5	4.9	30.0	47.4	74	-26.6
12052.00	36.2	PEAK	225	1.2	V	35.1	5.6	30.0	46.9	74	-27.1
4820.40	37.5	PEAK	270	1.2	H	32.5	4.9	30.0	44.9	74	-29.1
2410.2	81.62	PEAK	225	1.2	V	28.1	3.4	30.0	83.1	114	-30.9
2410.2	77.43	PEAK	270	1.2	H	28.1	3.4	30.0	78.9	114	-35.1

INDICATED			TABLE Angle Degree	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE Corr. Ampl. dBμV/m	FCC 15 Subpart C	
Frequency MHz	Ampl. dBμV/m	Comments		Height Meter	Polar H/ V	Antenna dBμV/m	Cable DB	Amp. dB		Limit dBμV/m	Margin dB
High Frequency											
4837.80	34.33	AVG	225	1.0	H	32.5	4.9	30.0	41.74	54	-12.3
4837.80	33.56	AVG	90	1.4	V	32.5	4.9	30.0	40.97	54	-13.0
9675.60	30.20	AVG	225	1.0	H	35.1	5.6	30.0	40.95	54	-13.3
9675.60	30.00	AVG	90	1.4	V	35.1	5.6	30.0	40.75	54	-13.3
7256.70	28.33	AVG	225	1.0	H	35.1	5.6	30.0	39.08	54	-14.9
7256.70	28.20	AVG	90	1.4	V	35.1	5.6	30.0	38.95	54	-15.1
12094.50	26.20	AVG	225	1.0	H	35.1	5.6	30.0	36.95	54	-17.1
12094.50	25.33	AVG	90	1.4	V	35.1	5.6	30.0	36.08	54	-17.9
2418.9	72.83	AVG, FUND	90	1.4	V	28.1	3.4	30.0	74.28	94.00	-19.7
9675.60	43.17	PEAK	225	1.0	H	35.1	5.6	30.0	53.92	74.00	-20.1
9675.60	42.80	PEAK	90	1.4	V	35.1	5.6	30.0	53.55	74.00	-20.5
2418.9	70.83	AVG, FUND	225	1	H	28.1	3.4	30.0	72.28	94.00	-21.7
7256.70	41.50	PEAK	225	1.0	H	35.1	5.6	30.0	52.25	74.00	-21.8
7256.70	40.20	PEAK	90	1.4	V	35.1	5.6	30.0	50.95	74.00	-23.1
12094.50	38.50	PEAK	225	1.0	H	35.1	5.6	30.0	49.25	74.00	-24.8
4837.80	40.33	PEAK	225	1.0	H	32.5	4.9	30.0	47.74	74.00	-26.3
12094.50	36.00	PEAK	90	1.4	V	35.1	5.6	30.0	46.75	74.00	-27.3
4837.80	38.33	PEAK	90	1.4	V	32.5	4.9	30.0	45.74	74.00	-28.3
2418.9	79.68	PEAK	90	1.4	V	28.1	3.4	30.0	81.13	114.00	-32.9
2418.9	77.52	PEAK	225	1	H	28.1	3.4	30.0	78.97	114.00	-35.0
Unintentional Emission, 30MHz to 1000MHz											
50.12	51.2		45	1.0	V	10.5	1.0	25.0	37.7	40	-2.3
287.96	47.0		180	1.0	H	14.6	5.8	25.0	42.4	46	-3.6
182.56	41.3		90	1.2	V	13.6	4.0	25.0	33.9	43.5	-9.6
240.01	46.3		360	1.6	H	12.6	2.3	25.0	36.2	46	-9.8
351.95	41.3		45	1.2	H	15.5	4.3	25.0	36.1	46	-9.9
157.50	40.5		315	1.3	V	13.0	2.0	25.0	30.5	43.5	-13.0
791.99	30.3		135	1.5	H	23.0	3.7	25.0	32.0	46	-14.0
121.72	38.5		360	1.0	V	12.1	2.2	25.0	27.8	43.5	-15.7
146.77	37.5		135	1.0	V	13.4	1.6	25.0	27.5	43.5	-16.0
255.96	37.0		135	1.5	H	13.1	3.0	25.0	28.1	46	-17.9

Note:

AVG: Average
FUND: Fundamental

5 - BAND EDGES TESTING

Requirements: FCC 15.249 (c), the emission power at the START and STOP frequencies shall be at least 50 dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209, whichever is the lesser attenuation.

5.1 Test Procedure

With the EUT's antenna attached, the EUT's radiated emission power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

5.2 Test Equipment

HP 8566B Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

Refer to the attached plots.

Handset - Low Frequency
Handset - High Frequency

