FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

Lionda Technology Co., Ltd.

Block 2 Laodong 2nd Industrial Area, Xixiang, Baoan,
Shenzhen, Guangdong, P.R.China 518102

FCC ID: O63XG2400ALD03

February 22, 2003

This Report Concerns:	**Equipment Type:**
☒ Original Report	2.4GH Cordless Telephone

Test Engineer: Ming Jing

Report No.: R0302035

Test Date: January 30, 2003

Reviewed By:

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *Lionda Technology Co., Ltd.'s XG2400* or the "EUT" as referred to in this report is a 2.4GHz cordless telephone. EUT was composed of two parts, one is a Handset which is measured approximately 6.0" L x 2.0" W x 1.0"H, and the other is a Base which measures about 6. 5"L x 5.25"W x 3.00"H.

The EUT was supplied with Bell South AC/DC adapter, M/N: U090050D.

** The test data was good for test sample only. It may have deviation for other test samples.*

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 tests were performed in order 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 Submittal(s).

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 Bay Area Compliance Laboratory, Corp. 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 Bay Area Compliance Laboratory Corporation 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 Bay Area Compliance Laboratory Corporation 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, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

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: Bay Area Compliance Laboratory Corp.** Certifies that all calibration has been performed using suitable standards traceable to the NATIONAL INSTITUTE of STANDARDS and TECHNOLOGY.

1.8 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Southern Telecom	Telephone	None	None	None
Teltone Corp	Simulator	TLS-3B-01	80071	None

1.9 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Unshielded RJ 11 telephone cable	2.0	Simulator RJ 11 Port	EUT
Unshielded RJ 11 telephone cable	2.0	Simulator RJ 11 Port	Telephone

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

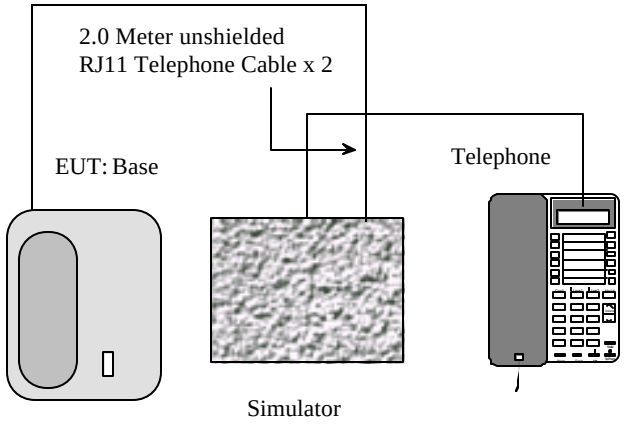
The EUT was configured for testing in a typical fashion (as normally used by a typical user).

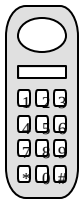
Handset being tested: The Handset unit was placed on the wooden table and tested in three orthogonal axis. The handset was connected to the headset via its headset port. The Low, middle, and high channels were tested. The handset was transmitting to and receiving from the Base unit. The EUT was investigated for emissions while off hook. The 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.

Base being tested: The Base unit was placed on the wooden table. The Low 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.

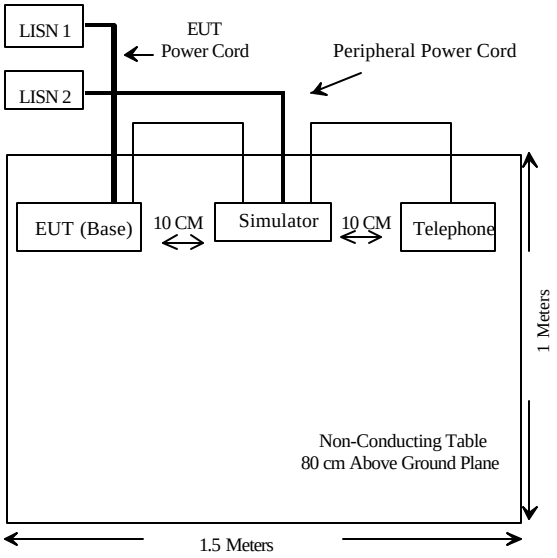
2.2 Configuration of Test System (Base)

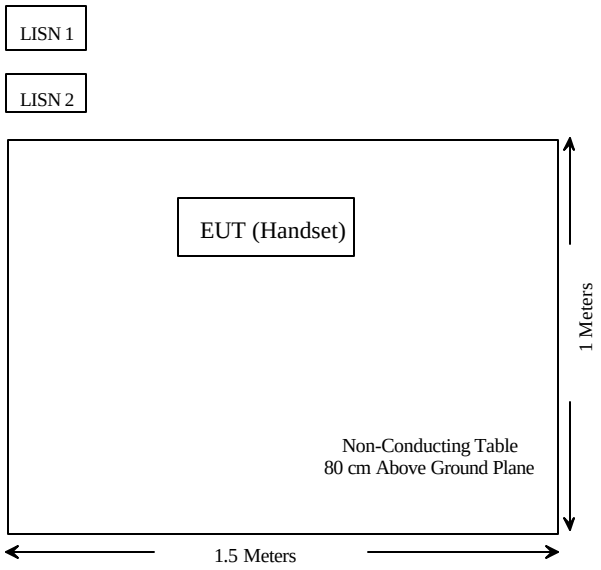
Base Handset





2.3 Test Setup Block Diagram





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 $\pm$2.4 dB.

3.2 EUT Setup

The measurement was performed at the **O**pen **A**rea **T**est **S**ite, using the same setup per ANSI C63.4 - 1992 measurement procedure. Specification used was with the FCC Class B limits.

The Base unit of EUT was connected to a 110 VAC / 60 Hz power source.

The spacing between the peripherals was 10 centimeters.

External Input / Output 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). QuasiPeak 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 FCC 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:

-5.5 dBμV at 0.800 MHz in the Line mode.

3.6 Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.800	40.5	AVG	Line	46	-5.5
0.680	39.9	AVG	Neutral	46	-6.1
0.800	42.0	QP	Line	56	-14.0
0.680	40.3	QP	Neutral	56	-15.7
0.150	49.0	QP	Neutral	66	-17.0
0.350	42.0	QP	Neutral	59	-17.0
0.150	48.0	QP	Line	66	-18.0
0.280	42.0	QP	Neutral	61	-18.8
0.200	33.0	AVG	Line	54	-20.6
0.150	35.2	AVG	Neutral	56	-20.8
0.150	35.0	AVG	Line	56	-21.0
0.200	40.0	QP	Line	64	-23.6

3.7 Plot of Conducted Emissions Test Data

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

BAY Area Compliance Laboratory Corp. 30. Jan 03 11:17

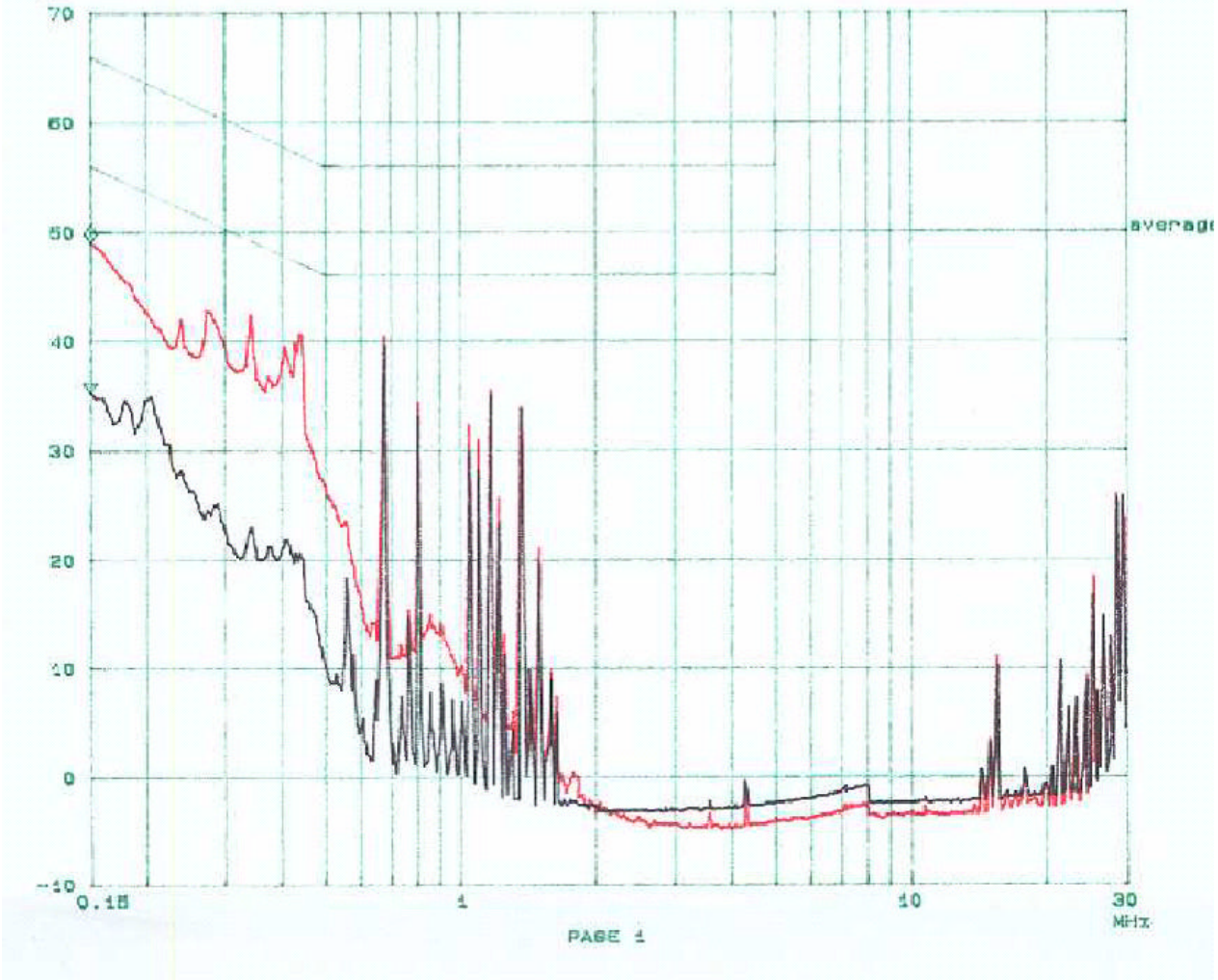
Line Conduction

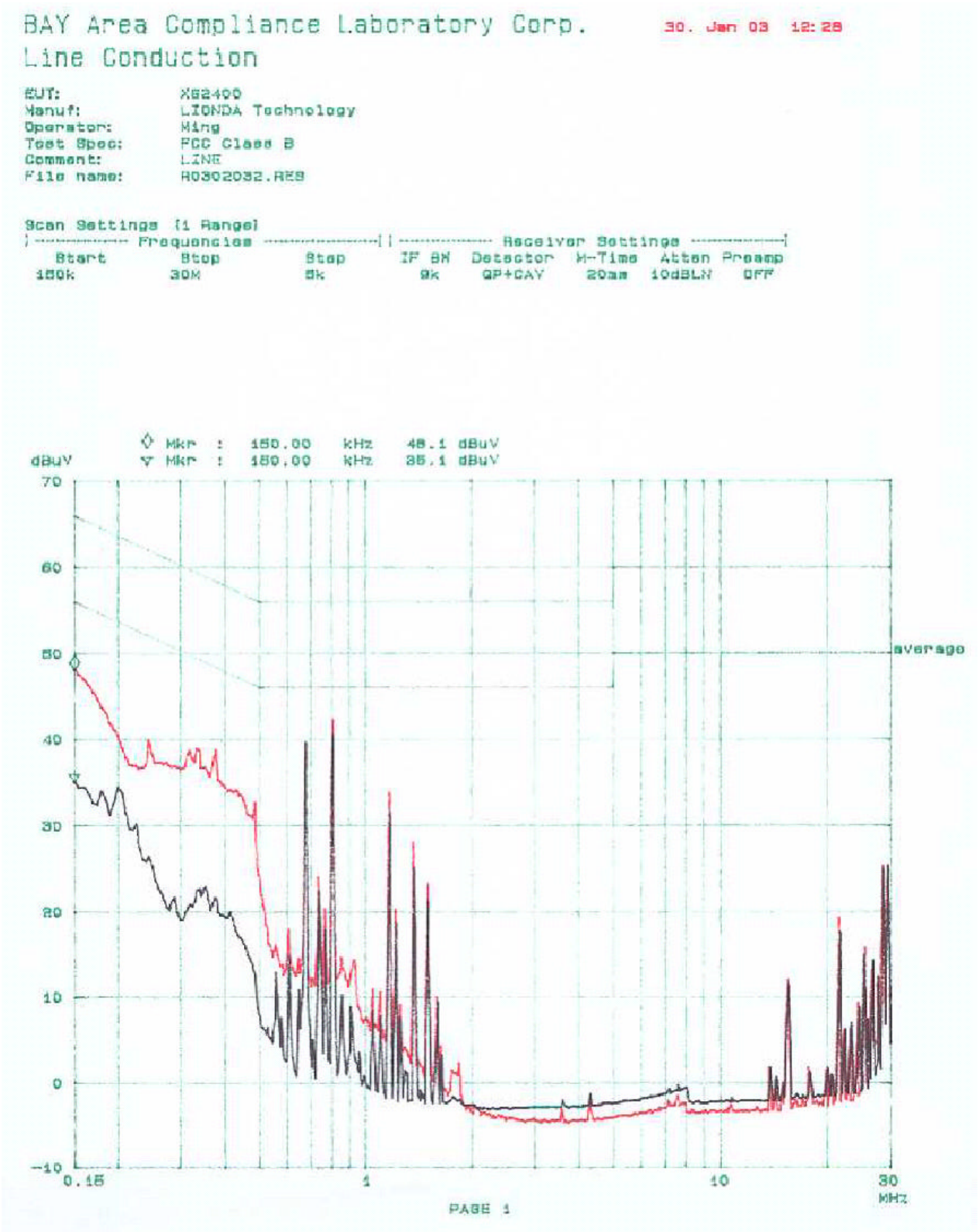
EUT: XG2400
Manuf: LIONDA Technology
Operator: Ming
Test Spec: FCC Class B
Comment: NEUTRAL

Scan Settings (1 Range)

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

◊ Mkr : 150.00 kHz 49.0 dBuV
▽ Mkr : 150.00 kHz 35.2 dBuV




BAY Area Compliance Laboratory Corp.
30. Jan 03 12:28
Line Conduction
EUT: XG2400
Manuf: LIONDA Technology
Operator: Ming
Test Spec: FCC Class B
Comment: LINE
File name: R0302032.RES
Scan Settings (1 Range)
Frequencies
Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp
150k 30M 5k 9k QP+CAV 20ms 10dBLN OFF
Mkr : 150.00 kHz 48.1 dBuV
Mkr : 150.00 kHz 35.1 dBuV
dBuV
70
60
50
40
30
20
10
0
-10
average
0.15
1
10
30
MHz
PAGE 1

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 BACL is $\pm$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 Base of EUT was connected to a 110 VAC / 60 Hz power source.

The spacing between the peripherals was 10 centimeters.

The external Input / Output 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:

Start Frequency	30 MHz
Stop Frequency	25GHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	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 (U090050D) 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:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B 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:

For Base:

-5.1 dBm**V** at **1655.4MHz** in the **Vertical** polarization at Low Frequency, **30 to 25GHz, 3 meters**

-5.1 dBm**V** at **1658.33MHz** in the **Vertical** polarization at High Frequency, **30 to 25GHz, 3 meters**

For Handset:

-10.69 dBm**V** at **3296.22 MHz** in the **Vertical** polarization at Low Frequency, **30 to 25GHz, 3 meters**

-8.55 dBm**V** at **2476.939 MHz** in the **Horizontal** polarization at High Frequency, **30 to 25GHz, 3 meters**

4.7 Radiated Emissions Test Result Data

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											
1655.400	51.0	AVE	225	1.3	V	25.3	2.60	30	48.9	54.0	-5.1
2400.592	86.0	AVE, FUND	0	1.4	H	28.1	3.35	30	87.5	94.0	-6.6
2400.592	86.0	AVE, FUND	340	1.0	V	28.1	3.35	30	87.5	94.0	-6.6
1655.440	46.0	AVE	180	1.0	H	25.3	2.60	30	43.9	54.0	-10.1
4801.180	35.0	AVE	90	1.0	H	32.5	4.91	30	42.4	54.0	-11.6
4801.180	32.0	AVE	180	1.5	V	32.5	4.91	30	39.4	54.0	-14.6
212.000	33.4	/	160	1.5	V	11.9	2.17	25	22.5	43.5	-21.0
66.200	30.7	/	270	1.2	V	9.3	1.20	25	16.2	40.0	-23.8
235.400	31.8	/	0	1.0	V	12.6	2.17	25	21.6	46.0	-24.4
1655.400	51.4	PEAK	225	1.3	V	25.3	2.60	30	49.3	74.0	-24.7
2400.592	87.0	PEAK, FUND	0	1.4	H	28.1	3.35	30	88.5	114	-25.6
2400.590	87.0	PEAK, FUND	340	1.0	V	28.1	3.35	30	88.5	114	-25.6
66.200	28.4	/	210	1.2	H	9.3	1.20	25	13.9	40.0	-26.1
212.00	27.5	/	140	1.2	H	11.9	2.17	25	16.6	43.5	-26.9
235.400	26.2	/	30	1.2	H	12.6	2.17	25	15.6	46.0	-30.0
High Frequency											
1658.330	51.0	AVE	30	1.0	V	25.3	2.60	30	48.9	54.0	-5.1
1658.330	49.0	AVE	180	1.6	H	25.3	2.60	30	46.9	54.0	-7.1
2405.315	84.3	AVE, FUND	90	2.0	H	28.1	3.35	30	85.8	94.0	-8.3
2405.315	84.0	AVE, FUND	90	1.5	V	28.1	3.35	30	85.5	94.0	-8.6
4810.635	36.0	AVE	125	1.3	V	32.5	4.91	30	43.4	54.0	-10.6
212.000	33.4	/	160	1.5	V	11.9	2.17	25	22.5	43.5	-21.0
66.200	30.7	/	270	1.2	V	9.3	1.20	25	16.2	40.0	-23.8
1658.330	52.0	PEAK	30	1.0	V	25.3	2.60	30	49.9	74.0	-24.1
235.400	31.8	/	0	1.0	V	12.6	2.17	25	21.6	46.0	-24.4
66.200	28.4	/	210	1.2	H	9.3	1.20	25	13.9	40.0	-26.1
1658.330	49.8	PEAK	180	1.6	H	25.3	2.60	30	47.7	74.0	-26.3
212.000	27.5	/	140	1.2	H	11.9	2.17	25	16.6	43.5	-26.9
2405.315	85.0	PEAK, FUND	90	1.5	V	28.1	3.35	30	86.5	114.0	-27.6
2405.315	85.0	PEAK, FUND	90	2.0	H	28.1	3.35	30	86.5	114.0	-27.6
235.400	26.2	/	30	1.2	H	12.6	2.17	25	15.9	46.0	-30.0

Handset Unit, Intentional Emission, 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											
3296.220	39.0	AVG	90	1.0	V	30.3	4.01	30	43.31	54.0	-10.69
3296.220	38.0	AVG	45	1.0	H	30.3	4.01	30	42.31	54.0	-11.69
4944.400	33.0	AVG	90	1.0	H	32.5	4.91	30	40.41	54.0	-13.59
4944.396	32.0	AVG	0	1.0	V	32.5	4.91	30	39.41	54.0	-14.59
2472.220	74.8	AVE, FUND	90	1.0	V	28.1	3.35	30	76.25	94.0	-17.75
336.500	33.4	/	310	1.0	H	15.8	2.33	25	26.53	46.0	-19.47
2472.220	72.4	AVG, FUND	60	1.4	H	28.1	3.35	30	73.85	94.0	-20.15
336.500	32.6	/	350	1.2	V	15.8	2.33	25	25.73	46.0	-20.27
214.400	33.4	/	60	1.0	V	11.9	2.17	25	22.47	43.5	-21.03
214.400	31.7	/	90	1.2	H	11.9	2.17	25	20.77	43.5	-22.73
66.200	28.9	/	120	1.5	V	9.3	1.20	25	14.40	40.0	-25.60
66.200	26.1	/	180	1.5	H	9.3	1.20	25	11.60	40.0	-28.40
2472.215	75.0	PEAK, FUND	90	1.0	V	28.1	3.35	30	76.45	114	-37.55
2472.220	73.0	PEAK, FUND	60	1.4	H	28.1	3.35	30	74.45	114	-39.55
High Frequency											
2476.939	84.0	AVE, FUND	0	2.0	H	28.1	3.35	30	85.45	94.0	-8.55
3302.580	41.0	AVG	45	1.0	V	30.3	4.01	30	45.31	54.0	-8.69
3302.580	38.0	AVG	45	1.0	H	30.3	4.01	30	42.31	54.0	-11.69
2476.939	80.8	AVG, FUND	45	1.0	V	28.1	3.35	30	82.25	94.0	-11.75
4953.870	32.0	AVG	90	1.0	V	32.5	4.91	30	39.41	54.0	-14.59
4953.870	31.5	AVE	180	1.0	H	32.5	4.91	30	38.91	54.0	-15.09
7430.800	28.0	AVE	225	1.0	H	35.1	5.65	30	38.75	54.0	-15.26
336.500	33.4	/	310	1.0	H	15.8	2.33	25	26.53	46.0	-19.47
336.500	32.6	/	350	1.2	V	15.8	2.33	25	25.73	46.0	-20.27
214.400	33.4	/	60	1.0	V	11.9	2.17	25	22.47	43.5	-21.03
214.400	31.7	/	90	1.2	H	11.9	2.17	25	20.77	43.5	-22.73
66.200	28.9	/	120	1.5	V	9.3	1.20	25	14.4	40.0	-25.60
2476.939	84.5	PEAK, FUND	0	2.0	H	28.1	3.35	30	85.95	114	-28.05
66.200	26.1	/	180	1.5	H	9.3	1.20	25	11.60	40.0	-28.40
2476.939	81.0	PEAK, FUND	45	1.0	V	28.1	3.35	30	82.45	114.0	-31.55

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

The antenna was removed and a low loss RF cable was connected to the transmitter output. The other end of cable was connected to a spectrum analyzer with the START and STOP frequencies set to the operation band. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the spectrum analyzer reading.

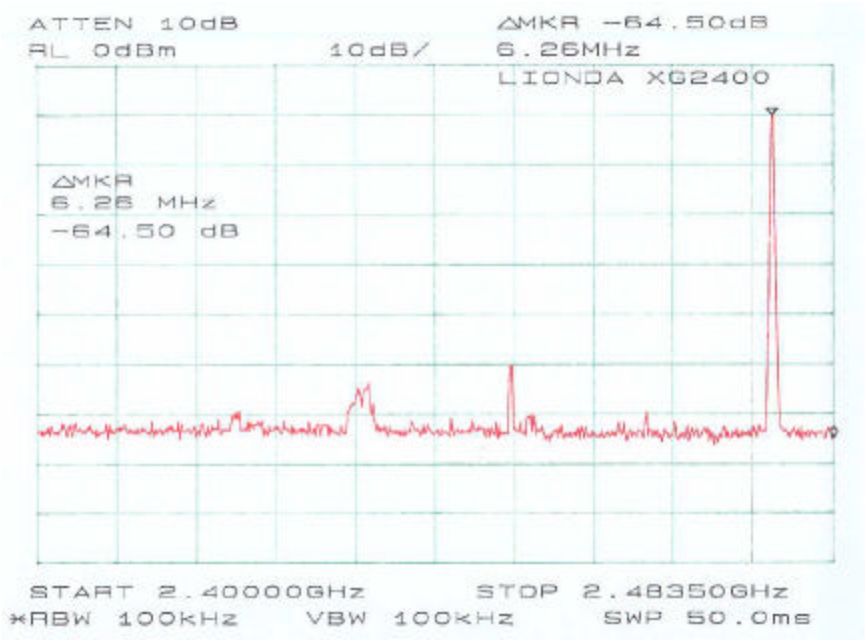
The test was performed for handset and the base respectively.

5.2 Test Equipment

HP 8566B Spectrum Analyzer
HP 7470A Plotter

5.3 Test Results

Please refer to the attached plots.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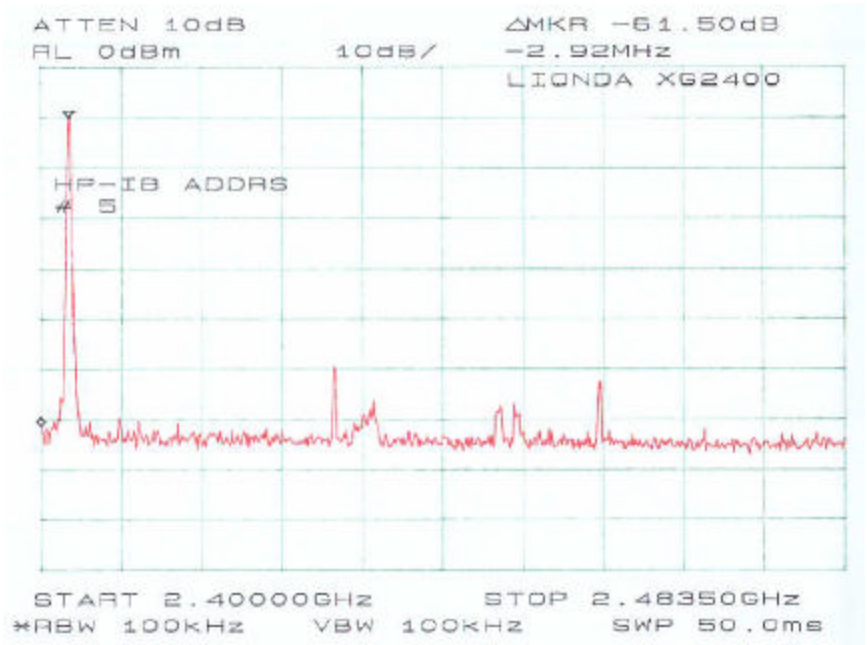
RL 0dBm
10dB/
ΔMKR -64.50dB
6.26MHz
LIONDA XG2400
ΔMKR
6.26 MHz
-64.50 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -61.50dB
-2.92MHz
LIONDA XG2400
HP-IB ADDRS
5
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms