FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

Lionda Technology Company Limited

Block 2 Laodong 2nd Industrial Area, Xixian, Baoan,
Shenzhen, Guangdong, China 518102

FCC ID: O63XG2801DLD03

March 17, 2003

This Report Concerns:	Equipment Type:
☒ Original Report	2.4GHz Digital Cordless Telephone System - Household Appliances

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Report Number:	R0302036
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Note: This test report is specially limited to the above client company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Lionda Technology Company Limited's product, FCC ID: O63XG2801DLD03, Model No.: *XG2801* or the "EUT" as referred to in this report is a 2.4GHz 77-Channel Digital Spread Spectrum Cordless Telephone. The EUT was composed of two parts, one is the base which measures approximately 5.2" L x 5.0"W x 2.0" H, and the other is the handset which measures 5.3"L x 1.12" W x 1.2" H.

The base unit of the EUT was fed by the Bell South Adapter, M/N: U090030D.

1.2 Objective

This type approval report is prepared on behalf of. *Lionda Technology Company Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, power density, 100 kHz Bandwidth of Band Edges Measurement, and Conducted and Spurious Radiated Emission.

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 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, CISPR 22: 1997, 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	8568B	2610A02165	12/6/03
HP	Spectrum Analyzer	8593B	2919A00242	12/20/03
HP	Amplifier	8349B	2644A02662	12/20/03
HP	Quasi-Peak Adapter	85650A	917059	12/6/03
HP	Amplifier	8447E	1937A01046	12/6/03
A.H. System	Horn Antenna	SAS0200/571	261	12/27/03
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/03
Com-Power	Biconical Antenna	AB-100	14012	11/2/03
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/03
Com-Power	LISN	LI-200	12208	12/20/03
Com-Power	LISN	LI-200	12005	12/20/03
BACL	Data Entry Software	DES1	0001	12/20/03

*** 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 (NIST).

1.7 Local Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
TELTONE CORP.	SIMULATOR	TLS-3B-01	80071	DOC
Tak Fi	Telephone	T106B	NA	NA

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	From	To
None-Shielded Telephone Cable	2.0	RJ45 Port/EUT	Telephone Simulator RJ45 Port
None-Shielded Telephone Cable	2.0	RJ45 Port/Simulator	Telephone RJ45 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).

Handset being tested: The Cordless Telephone - Handset, Model XG2801was placed on the wooden table and tested in three orthogonal axis. 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.

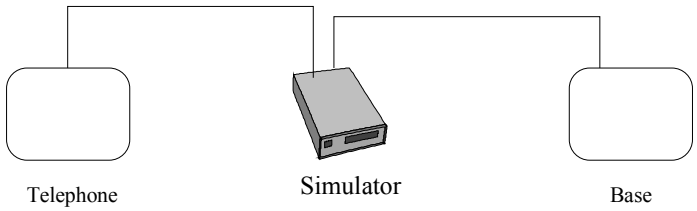
Base being tested: The Cordless Telephone – Base, Model XG2801was placed on the wooden table. The Low, middle, and high channels were tested. The base was connected to the line simulator and an AC adapter via its Tel Line and power ports, respectively. The base was transmitting and receiving from the handset. The conducted as well as radiated data were 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 Equipment Modifications

No modification(s) was made by BACL Corp. to ensure the EUT complies with the applicable limits and standards.

2.3 Configuration of Test System

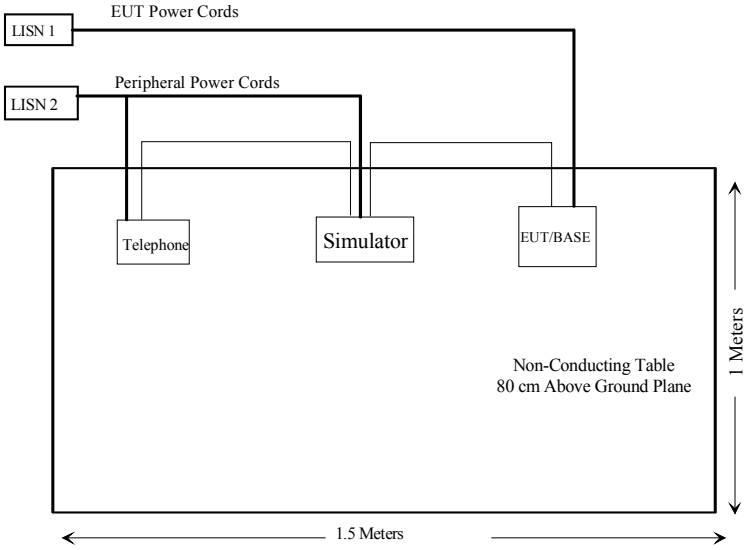
Radiated Setup for Base



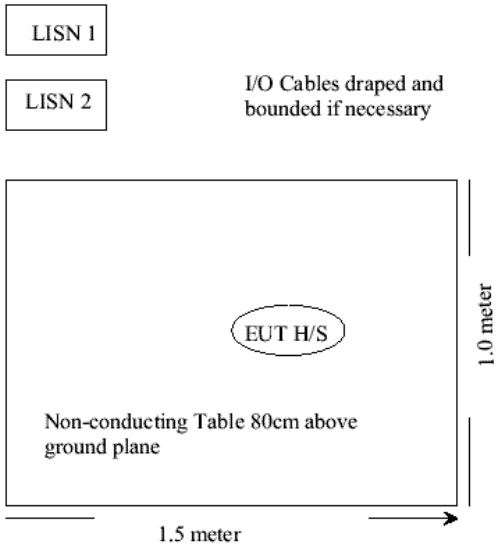
Radiated Setup for Handset

2.4 Test Setup Block Diagram

Radiated Setup for Base



Radiated Setup for Handset



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	Section Reference
§ 15.205	Restricted Bands	Compliant	Section 12
§15.203	Antenna Requirement	Compliant	Section 9
§15.207 (a)	Conducted Emission	Compliant	Section 12
§15.209 (a)	Radiated Emission	Compliant	Section 11
§15.209 (f)	Spurious Emission	Compliant	Section 6
§15.247 (a) (2)	6 dB Bandwidth	Compliant	Section 5
§15.247 (b) (3)	Peak Output Power	Compliant	Section 4
§15.247 (b) (5)	RF Exposure	Compliant	Section 10
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edges	Compliant	Section 7
§15.247 (d)	Peak Power Spectral Density	Compliant	Section 8

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (3), for systems using digital modulation, the maximum peak output power of the intentional radiator shall not exceed 1 Watt.

4.2 Measurement Procedure

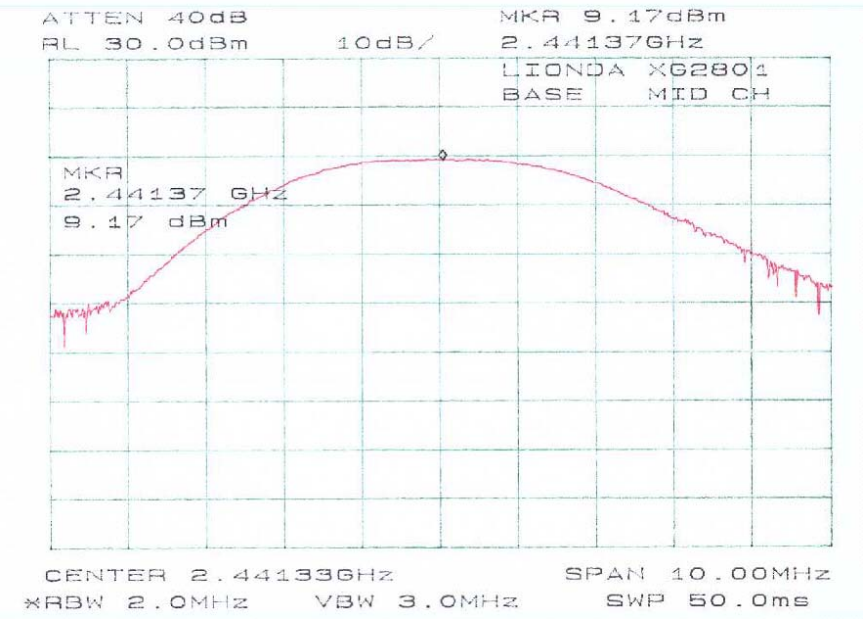
1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

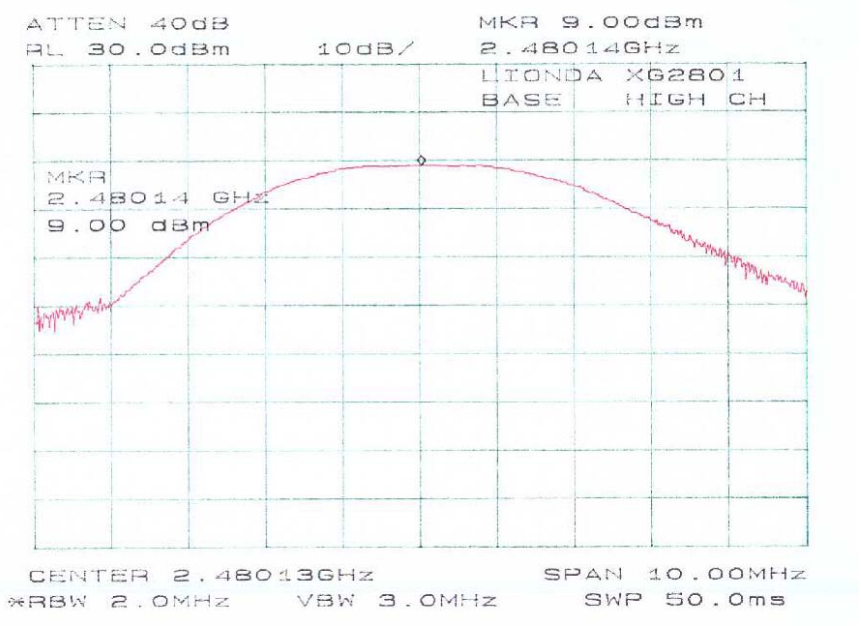
4.3 Measurement Result

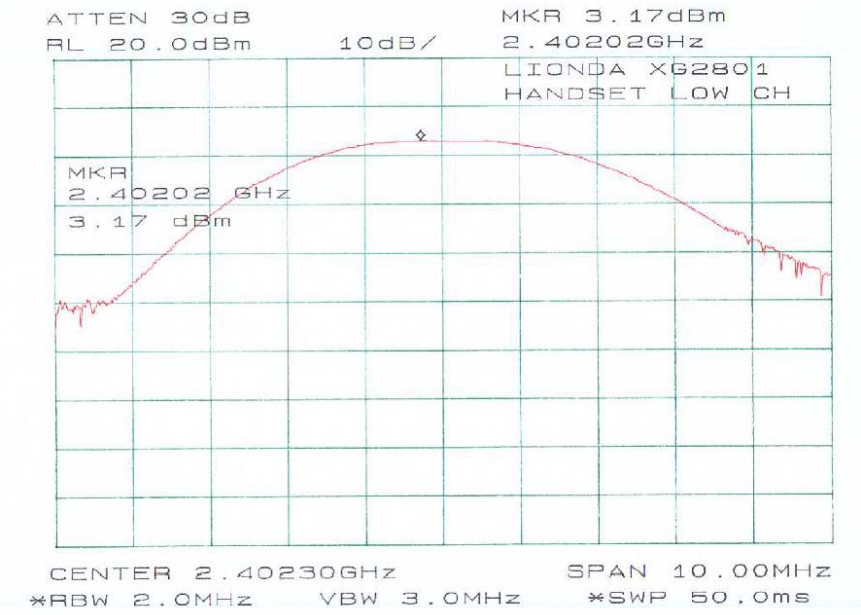
Please refer to the attached pictures for more information.

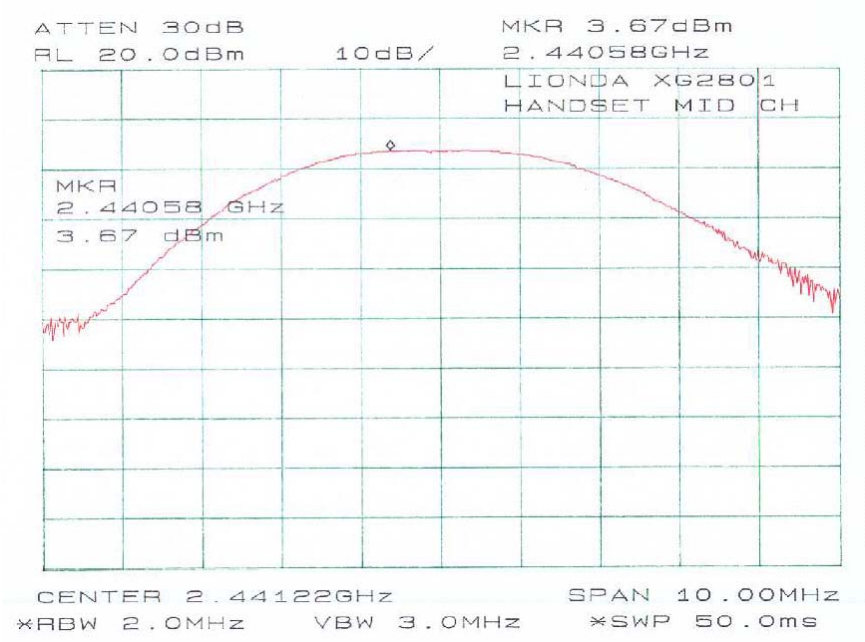
Unit	Channel	Output Power (dBm)	Output Power (W)	Standard (W)	Result
Base	Low	5.50	0.0035	≤ 1W	Compliant
Base	Mid	9.17	0.0083	≤ 1W	Compliant
Base	High	9.00	0.0079	≤ 1W	Compliant
Handset	Low	3.17	0.0021	≤ 1W	Compliant
Handset	Mid	3.67	0.0023	≤ 1W	Compliant
Handset	High	2.33	0.0017	≤ 1W	Compliant

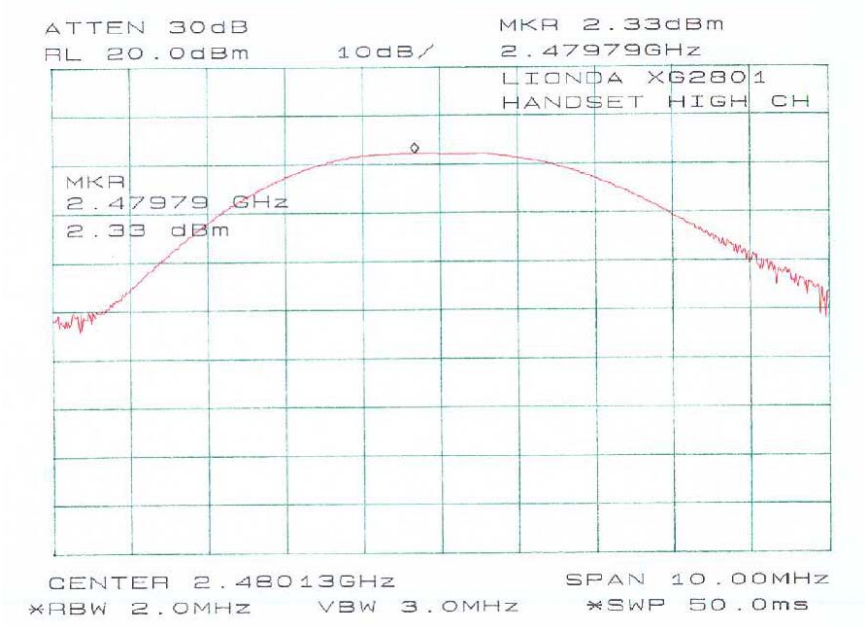
ATTEN 40dB
RL 30.0dBm
10dB/
MKR 5.50dBm
2.40237GHz
LIONDA XG2801
BASE LOW CH
MKR
2.40237 GHz
5.50 dBm
CENTER 2.40230GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 9.17dBm
2.44137GHz
LIONDA XG2801
BASE MID CH
MKR
2.44137 GHz
9.17 dBm
CENTER 2.44133GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 9.00dBm
2.48014GHz
LIONDA XG2801
BASE HIGH CH
MKR
2.48014 GHz
9.00 dBm
CENTER 2.48013GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 3.17dBm
2.40202GHz
LIONDA XG2801
HANDSET LOW CH
MKR
2.40202 GHz
3.17 dBm
CENTER 2.40230GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 3.67dBm
2.44058GHz
LIONDA XG2801
HANDSET MID CH
MKR
2.44058 GHz
3.67 dBm
CENTER 2.44122GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
MKR 2.33dBm
2.47979GHz
LIONDA XG2801
HANDSET HIGH CH
MKR
2.47979 GHz
2.33 dBm
CENTER 2.48013GHz
SPAN 10.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms

5 - 6 DB BANDWIDTH

5.1 Standard Applicable

According to §15.247(a)(2), for digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

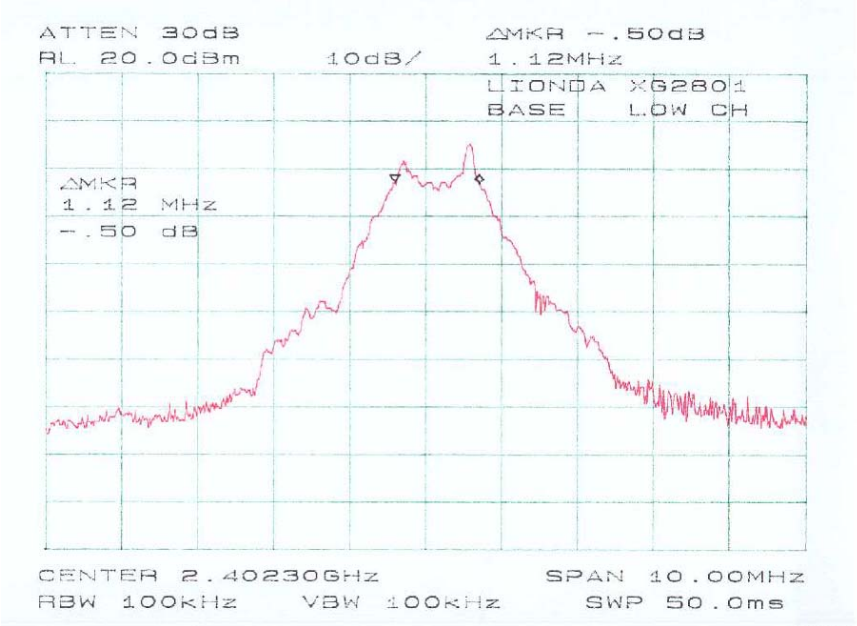
5.2 Measurement Procedure

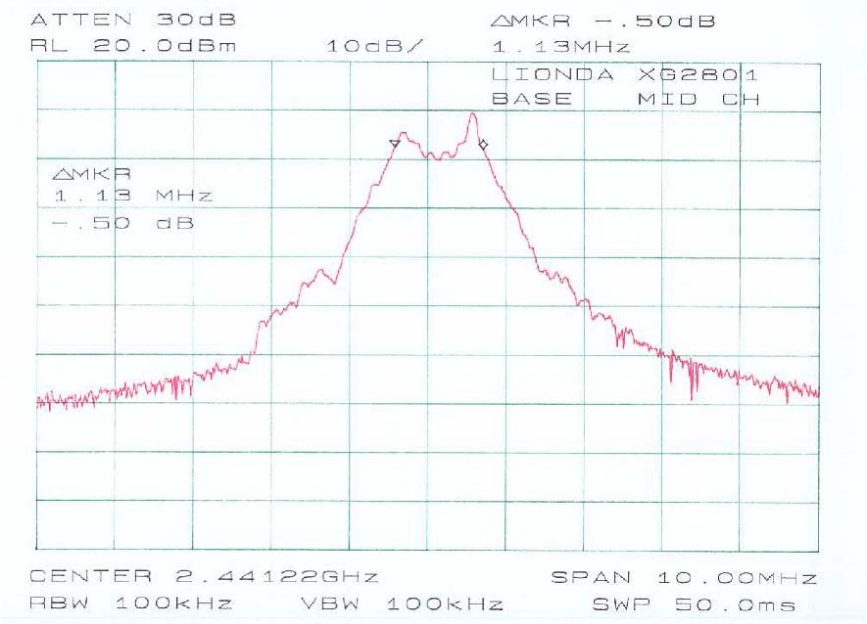
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

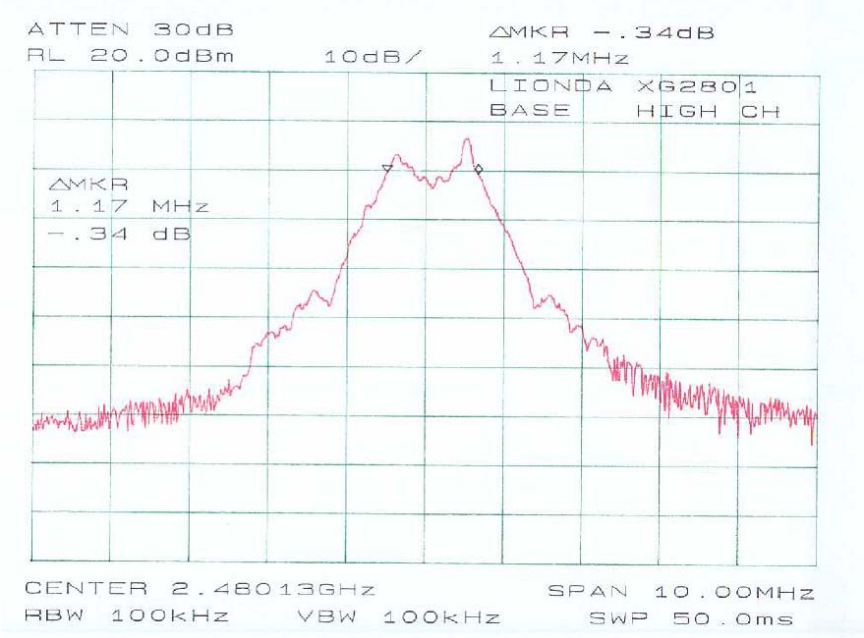
5.3 Measurement Data

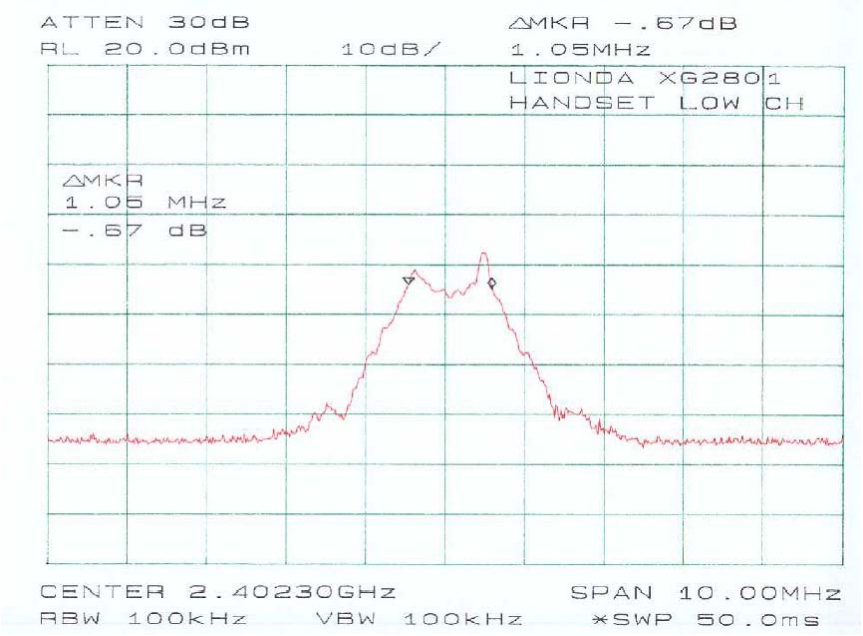
Please refer to the following pages.

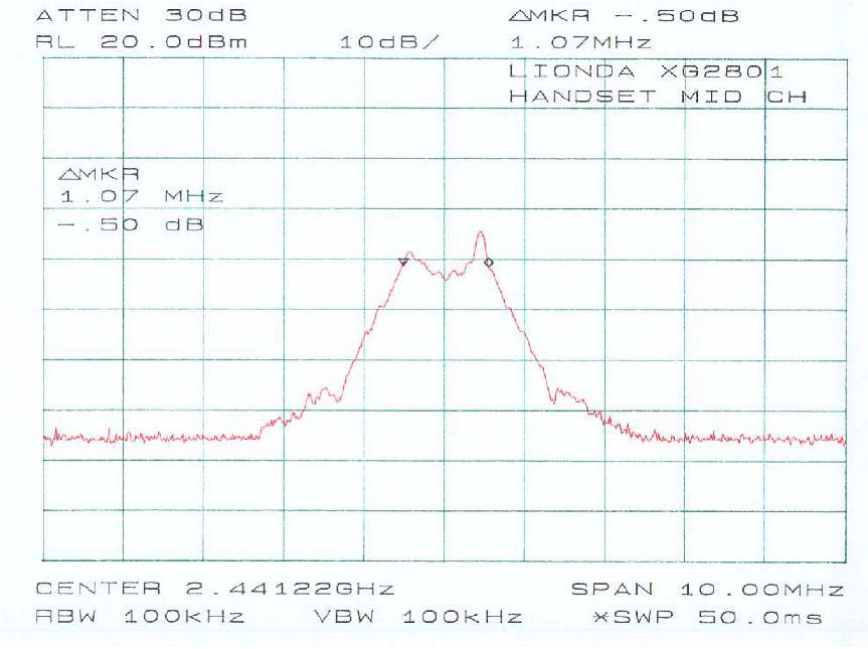
Unit	Channel	6 DB Bandwidth (MHz)	6 DB Bandwidth (kHz)	Standard (kHz)	Result
Base	Low	1.12	1120	≥ 500	Compliant
Base	Mid	1.13	1130	≥ 500	Compliant
Base	High	1.17	1170	≥ 500	Compliant
Handset	Low	1.05	1050	≥ 500	Compliant
Handset	Mid	1.07	1070	≥ 500	Compliant
Handset	High	1.10	1100	≥ 500	Compliant

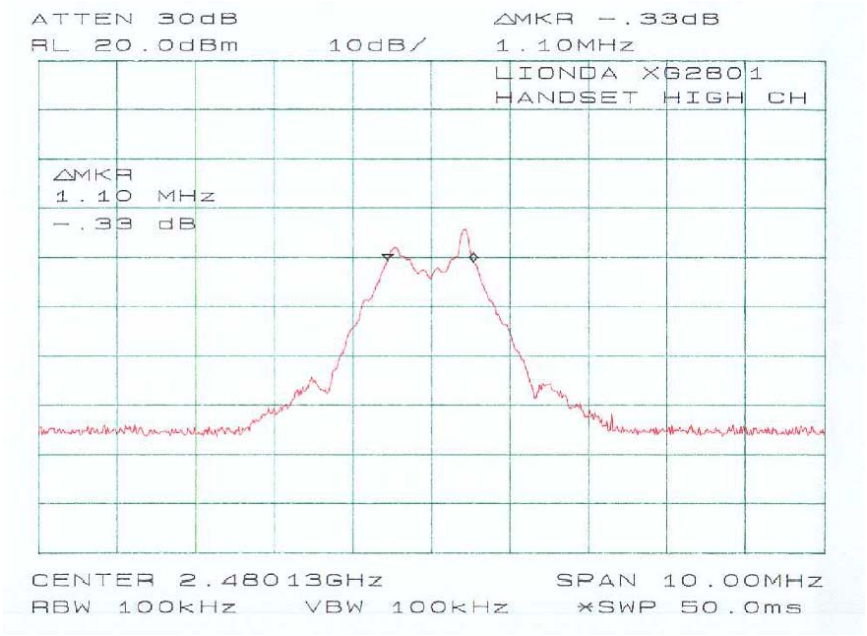

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.50dB
1.12MHz
LIONDA XG2801
BASE LOW CH
ΔMKR
1.12 MHz
-.50 dB
CENTER 2.40230GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.50dB
1.13MHz
LIONDA XG2801
BASE MID CH
ΔMKR
1.13 MHz
-.50 dB
CENTER 2.44122GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.34dB
1.17MHz
LIONDA XG2801
BASE HIGH CH
ΔMKR
1.17 MHz
-.34 dB
CENTER 2.48013GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.67dB
1.05MHz
LIONDA XG2801
HANDSET LOW CH
ΔMKR
1.05 MHz
-.67 dB
CENTER 2.40230GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.50dB
1.07MHz
LIONDA XG2801
HANDSET MID CH
ΔMKR
1.07 MHz
-.50 dB
CENTER 2.44122GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -.33dB
1.10MHz
LIONDA XG2801
HANDSET HIGH CH
ΔMKR
1.10 MHz
-.33 dB
CENTER 2.48013GHz
SPAN 10.00MHz
RBW 100kHz
VBW 100kHz
*SWP 50.0ms

6 - SPURIOUS EMISSION

6.1 Standard Applicable

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation f a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

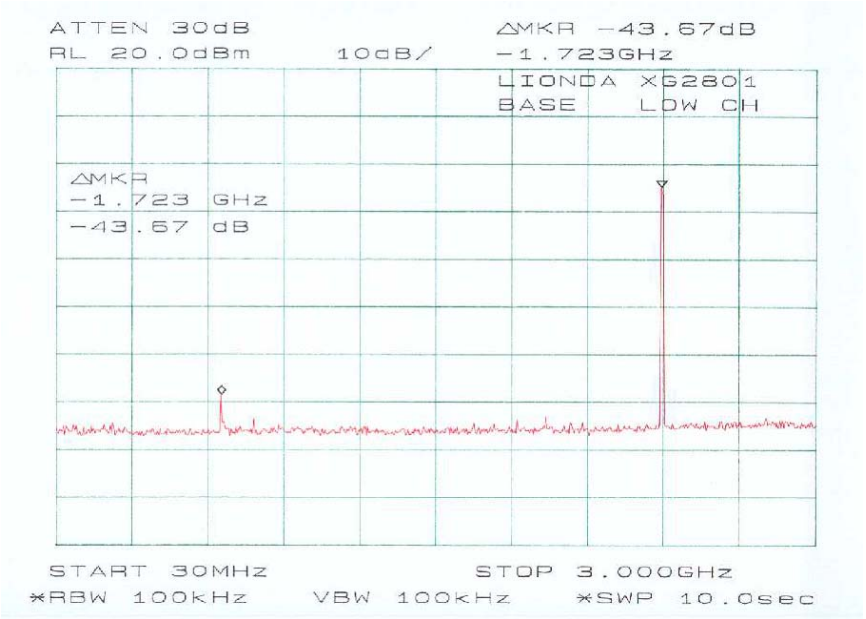
6.2 Measurement Procedure

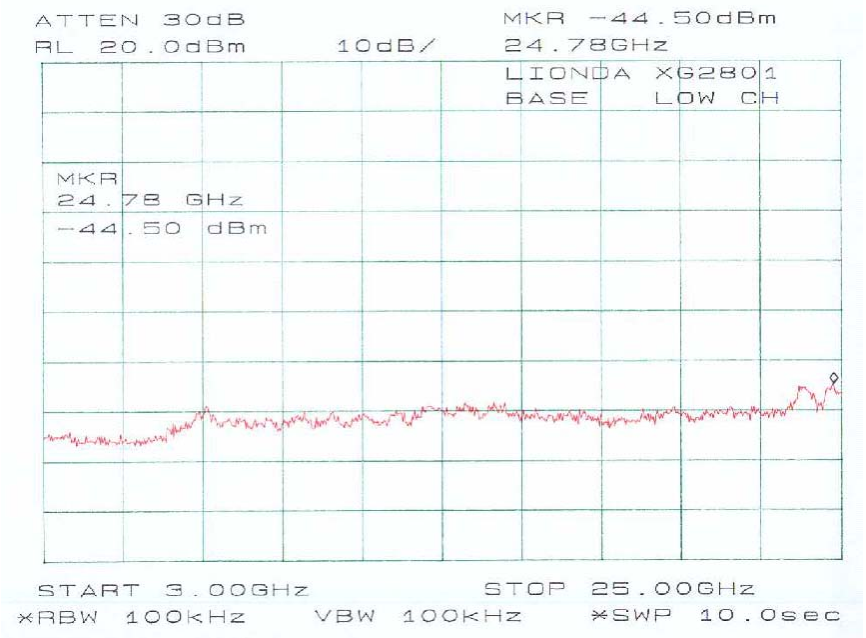
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

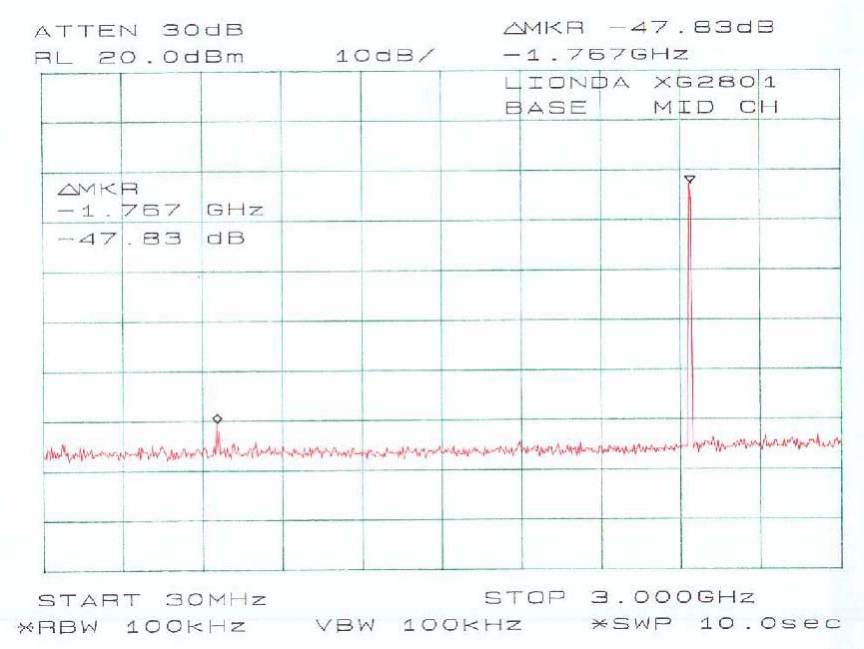
6.3 Measurement Data

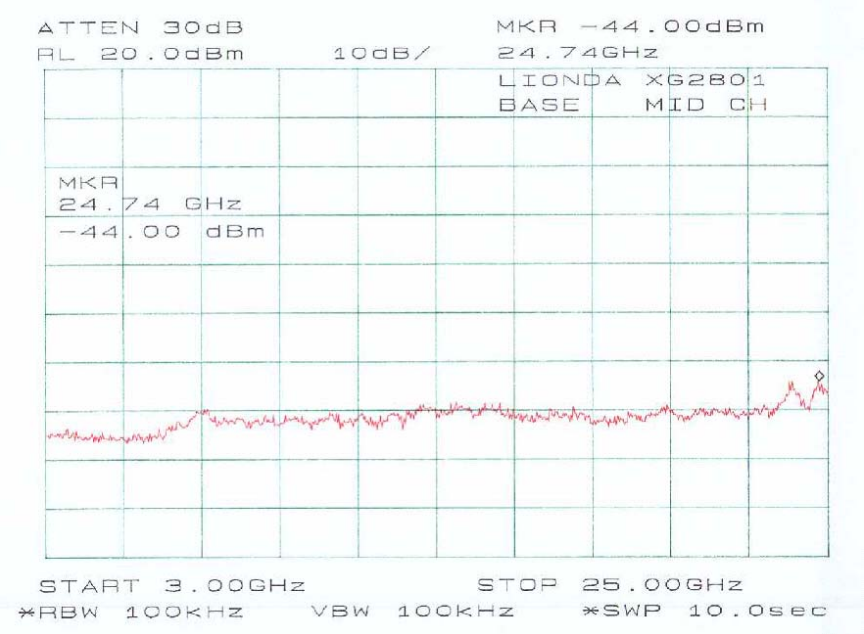
Please refer to the following pages.

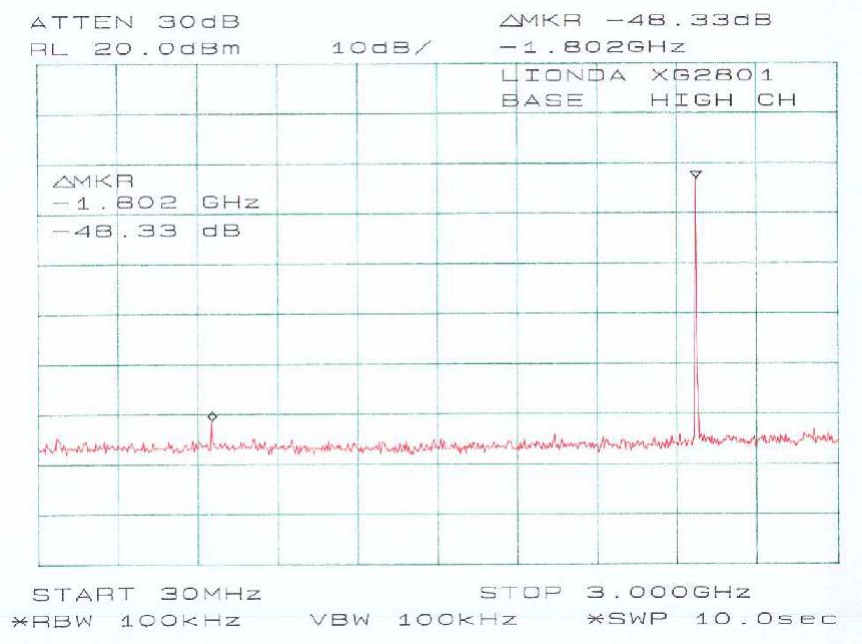
Spurious Emission	Test Result (base and handset)
Low Channel	Compliant
Middle Channel	Compliant
High Channel	Compliant

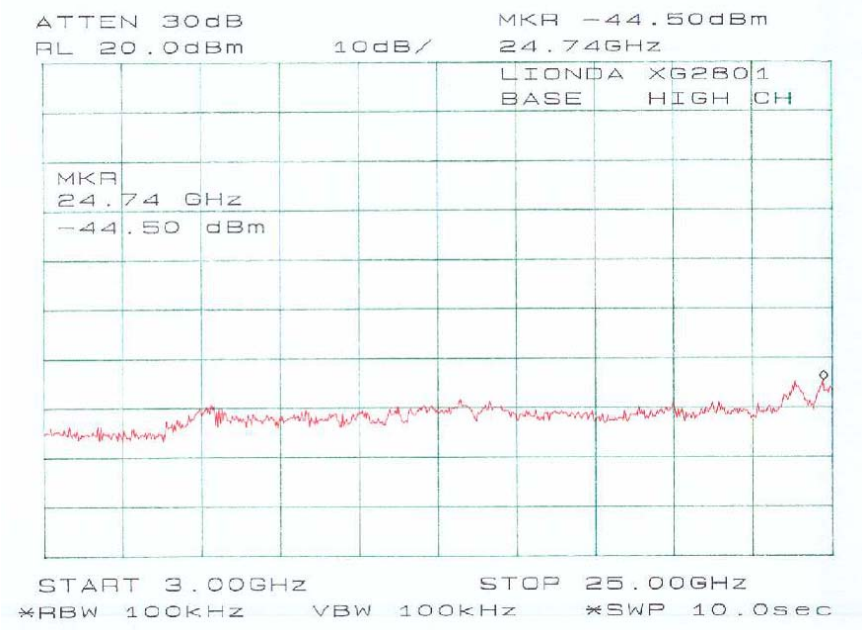

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -43.67dB
-1.723GHz
LIONDA XG2801
BASE LOW CH
ΔMKR
-1.723 GHz
-43.67 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

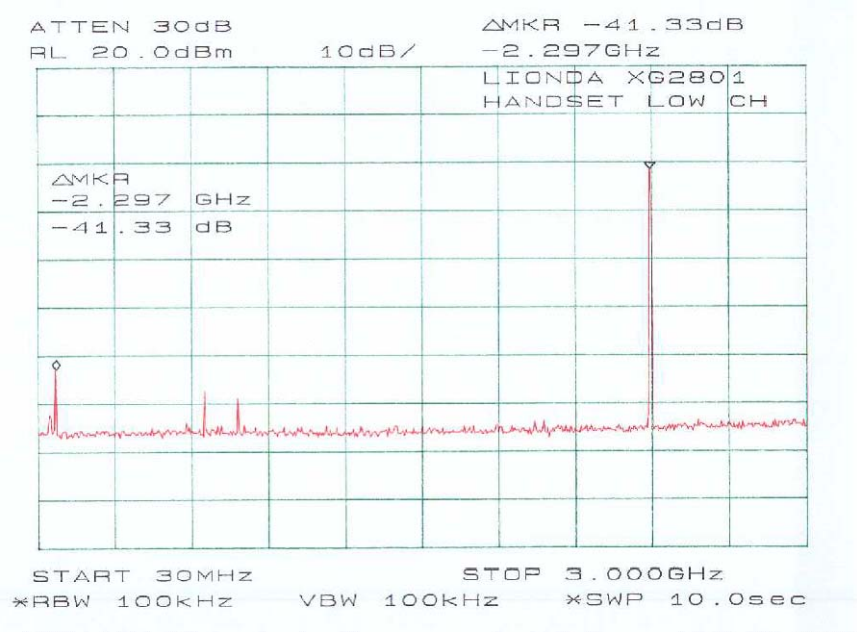

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -44.50dBm
24.78GHz
LIONDA XG2801
BASE LOW CH
MKR
24.78 GHz
-44.50 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

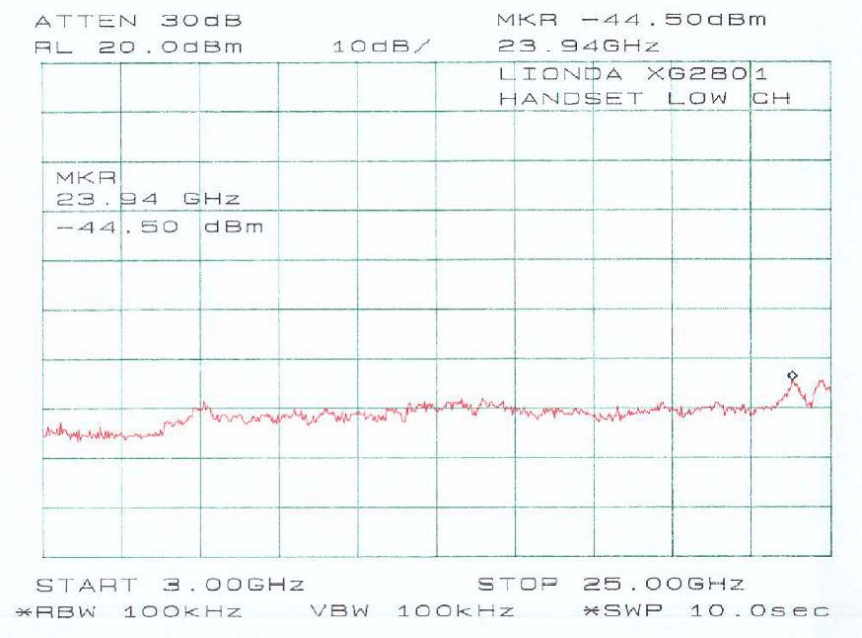

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -47.83dB
-1.767GHz
LIONDA XG2801
BASE MID CH
ΔMKR
-1.767 GHz
-47.83 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

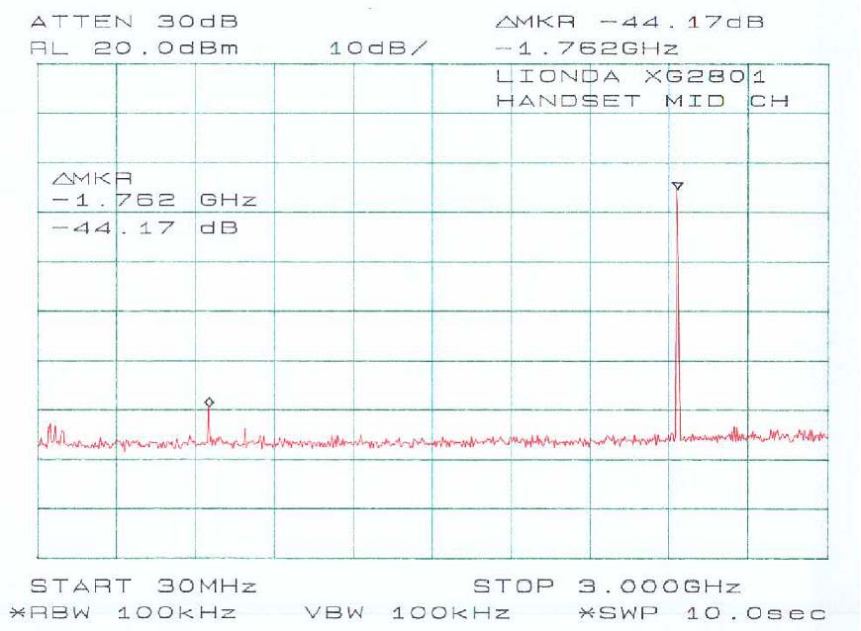

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -44.00dBm
24.74GHz
LIONDA XG2801
BASE MID CH
MKR
24.74 GHz
-44.00 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

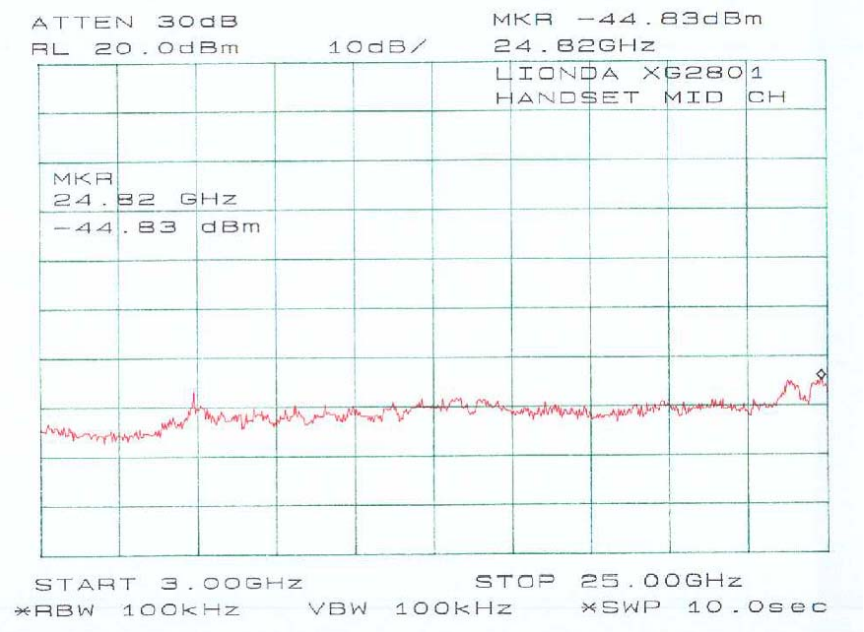

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -48.33dB
-1.802GHz
LIONDA XG2801
BASE HIGH CH
ΔMKR
-1.802 GHz
-48.33 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

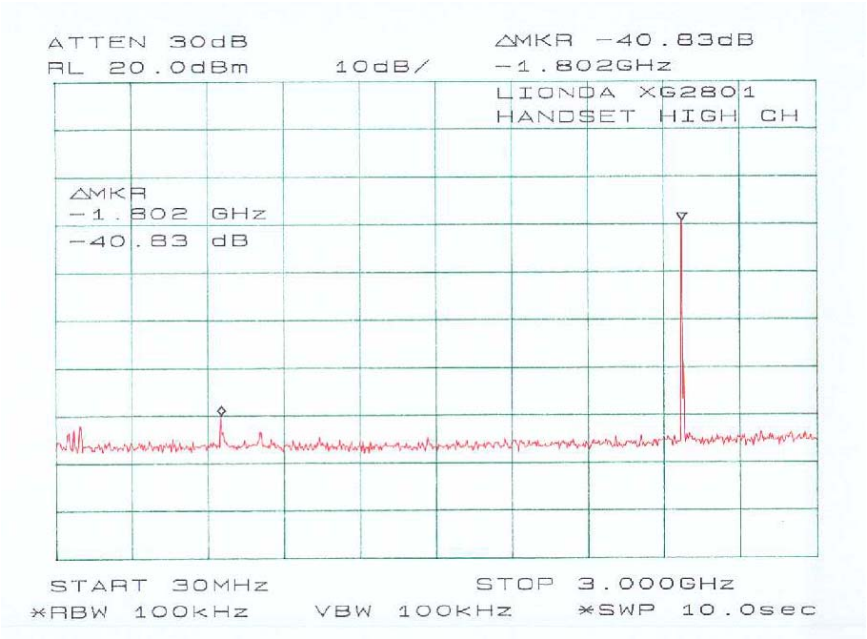

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -44.50dBm
24.74GHz
LIONDA XG2801
BASE HIGH CH
MKR
24.74 GHz
-44.50 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

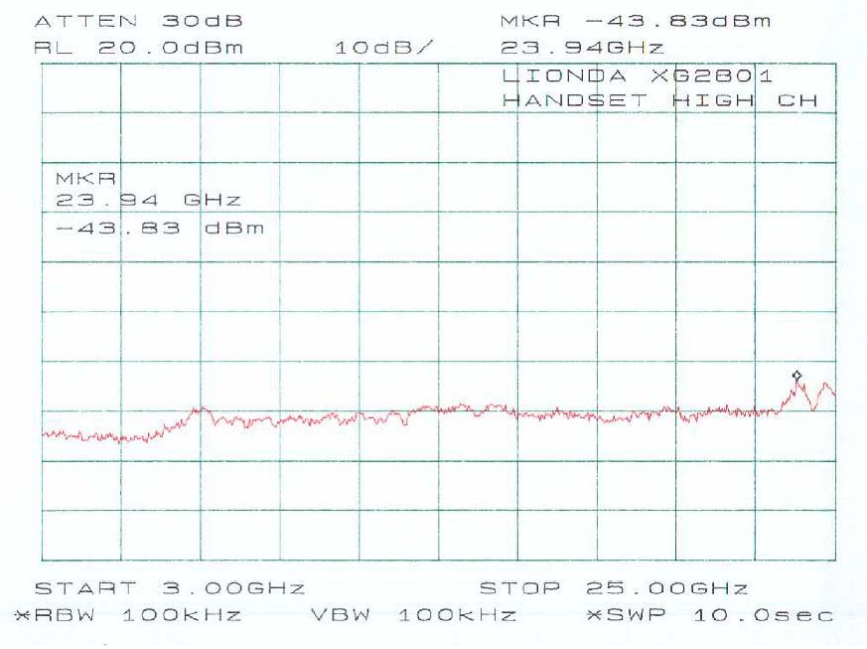

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -41.33dB
-2.297GHz
LIONDA XG2801
HANDSET LOW CH
ΔMKR
-2.297 GHz
-41.33 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -44.50dBm
23.94GHz
LIONDA XG2801
HANDSET LOW CH
MKR
23.94 GHz
-44.50 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -44.17dB
-1.762GHz
LIONDA XG2801
HANDSET MID CH
ΔMKR
-1.762 GHz
-44.17 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -44.83dBm
24.82GHz
LIONDA XG2801
HANDSET MID CH
MKR
24.82 GHz
-44.83 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR -40.83dB
-1.802GHz
LIONDA XG2801
HANDSET HIGH CH
ΔMKR
-1.802 GHz
-40.83 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -43.83dBm
23.94GHz
LIONDA XG2801
HANDSET HIGH CH
MKR
23.94 GHz
-43.83 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

7 - 100 KHZ BANDWIDTH OF BAND EDGES MEASUREMENT

7.1 Standard Applicable

According to §15.247(c), if *any* 100 kHz bandwidth outside these frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, must also comply wit the radiated emission limits specified in § 15.209(a).

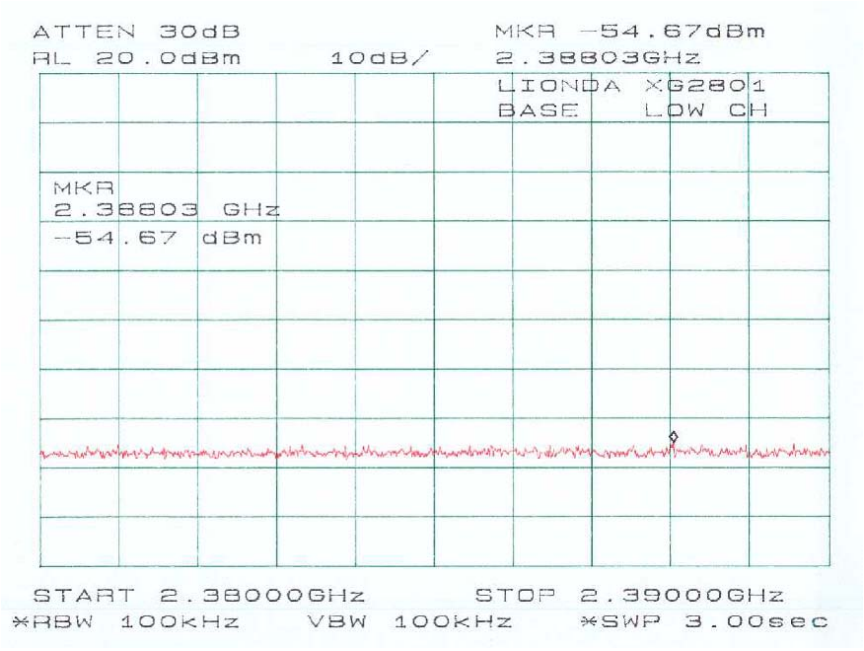
7.2 Measurement Procedure

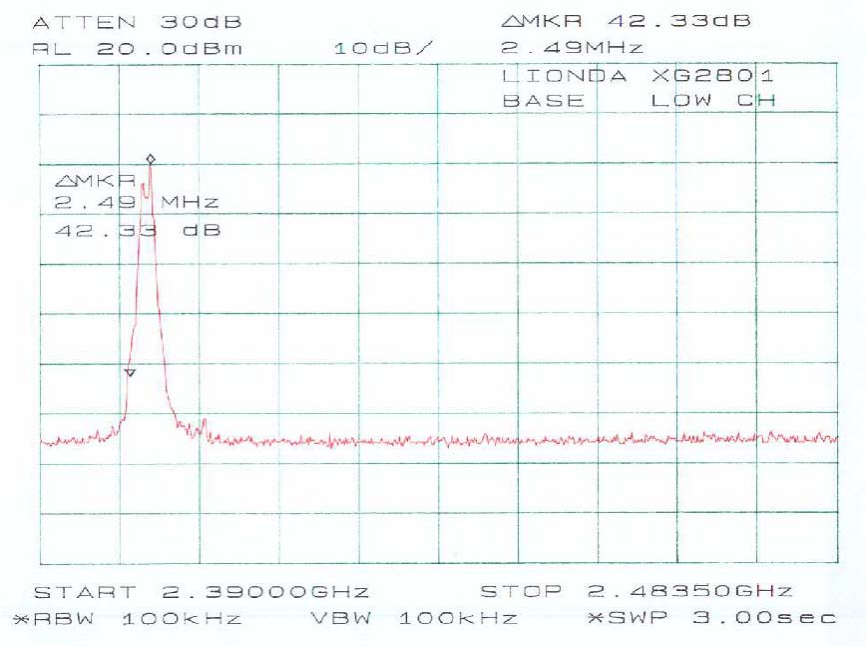
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

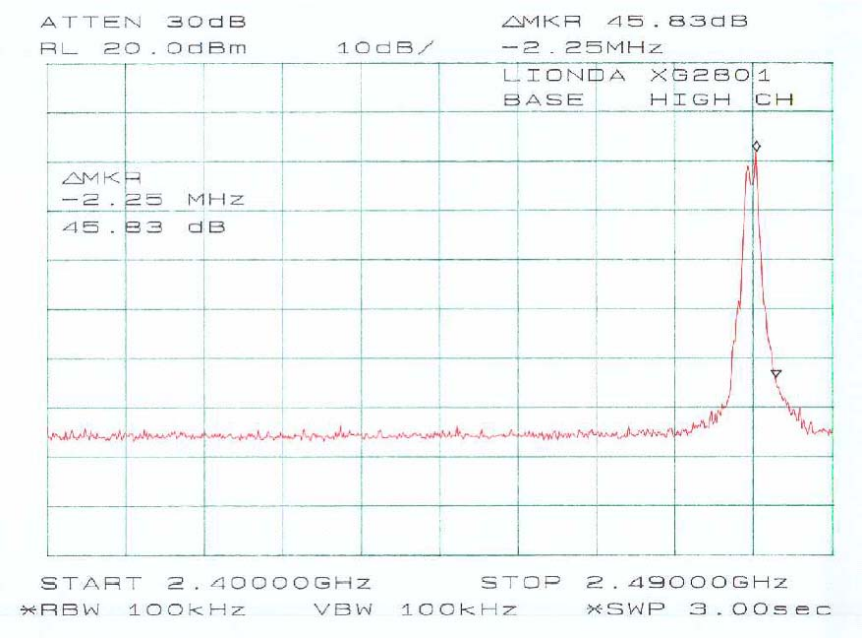
7.3 Test Results

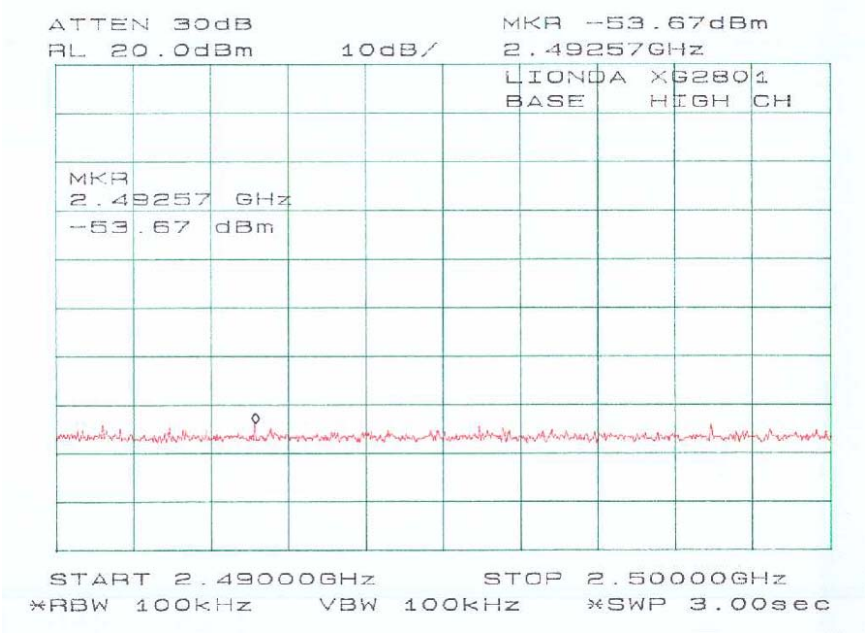
Please refer to the following pages.

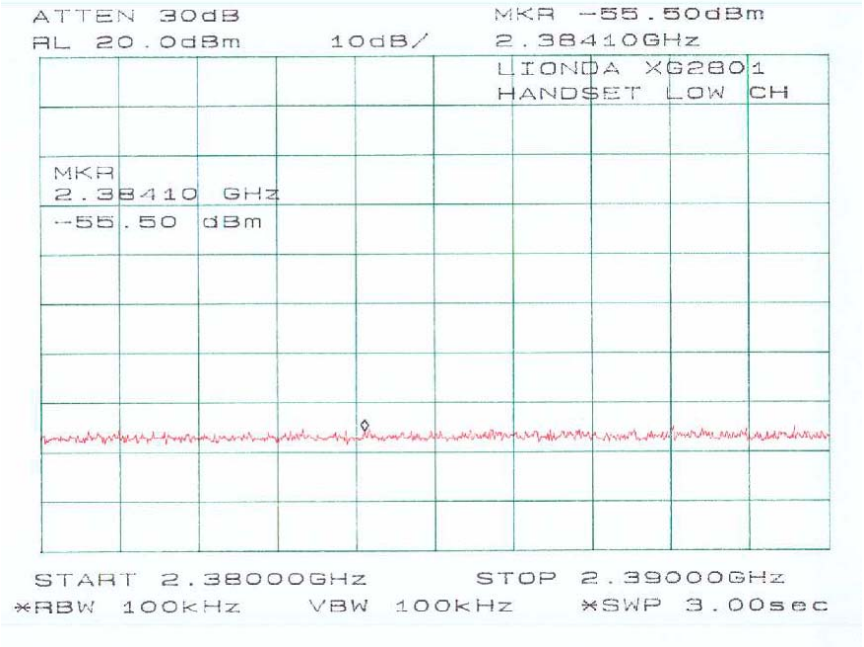
Band Edge Bandwidth	Test Result (base and handset)
Low Channel	Compliant
Middle Channel	Compliant
High Channel	Compliant

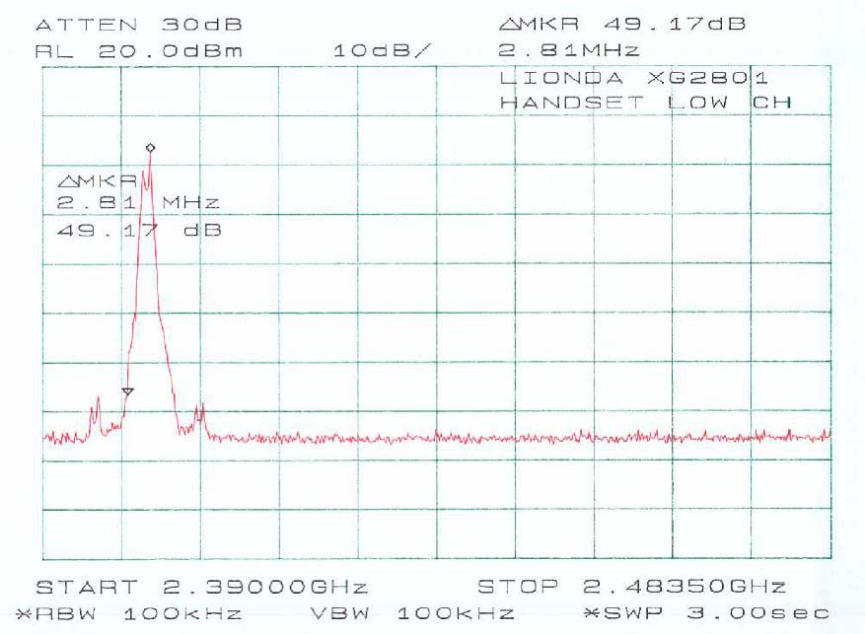

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -54.67dBm
2.38803GHz
LIONDA XG2801
BASE LOW CH
MKR
2.38803 GHz
-54.67 dBm
START 2.38000GHz
STOP 2.39000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec

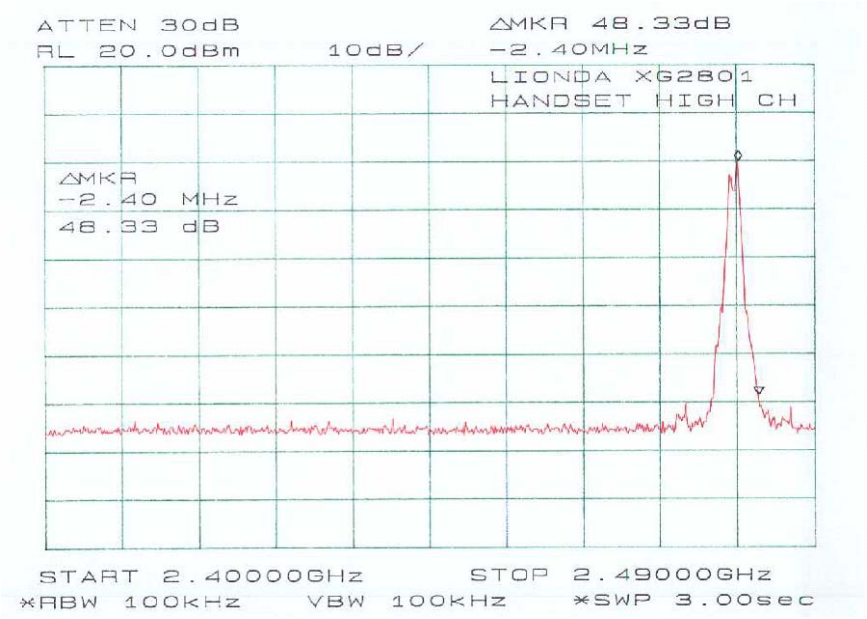

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 42.33dB
2.49MHz
LIONDA XG2801
BASE LOW CH
ΔMKR
2.49 MHz
42.33 dB
START 2.39000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec

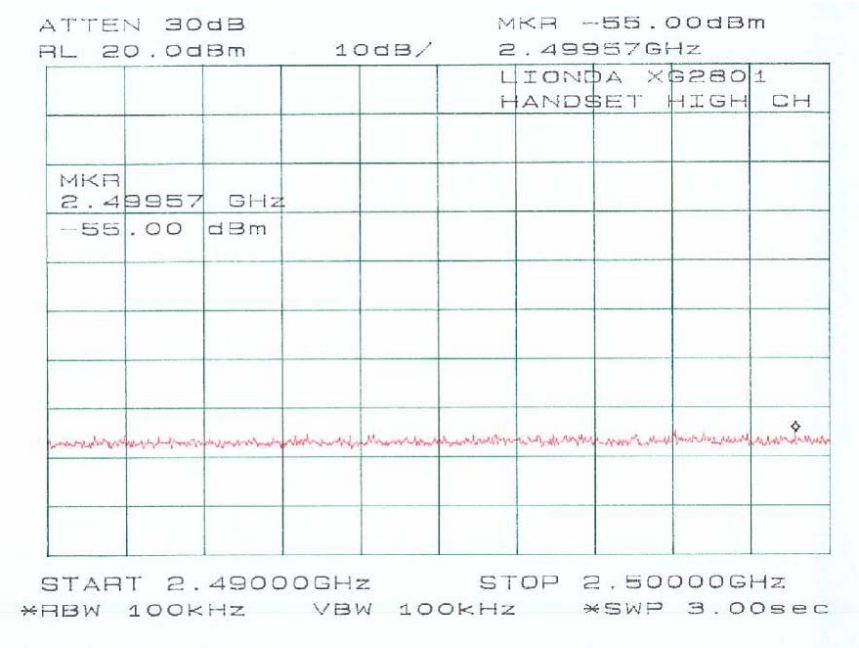

ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 45.83dB
-2.25MHz
LIONDA XG2801
BASE HIGH CH
ΔMKR
-2.25 MHz
45.83 dB
START 2.40000GHz
STOP 2.49000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -53.67dBm
2.49257GHz
LIONDA XG2801
BASE HIGH CH
MKR
2.49257 GHz
-53.67 dBm
START 2.49000GHz
STOP 2.50000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -55.50dBm
2.38410GHz
LIONDA XG2801
HANDSET LOW CH
MKR
2.38410 GHz
-55.50 dBm
START 2.38000GHz
STOP 2.39000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 49.17dB
2.81MHz
LIONDA XG2801
HANDSET LOW CH
ΔMKR
2.81 MHz
49.17 dB
START 2.39000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 30dB
RL 20.0dBm
10dB/
ΔMKR 48.33dB
-2.40MHz
LIONDA XG2801
HANDSET HIGH CH
ΔMKR
-2.40 MHz
48.33 dB
START 2.40000GHz
STOP 2.49000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -55.00dBm
2.49957GHz
LIONDA XG2801
HANDSET HIGH CH
MKR
2.49957 GHz
-55.00 dBm
START 2.49000GHz
STOP 2.50000GHz
*RBW 100kHz
VBW 100kHz
*SWP 3.00sec

8 - POWER SPECTRAL DENSITY

8.1 Standard Applicable

According to §15.247 (d), for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

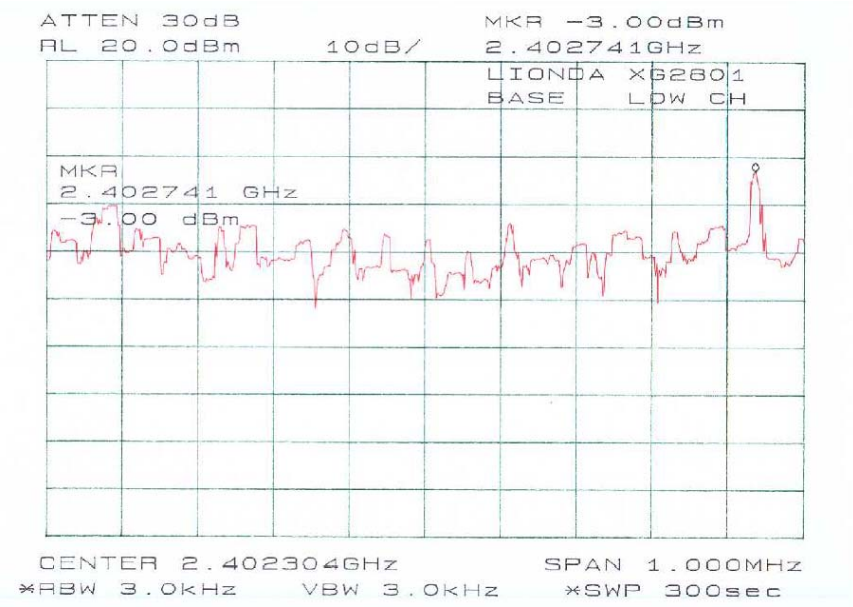
8.2 Measurement Procedure

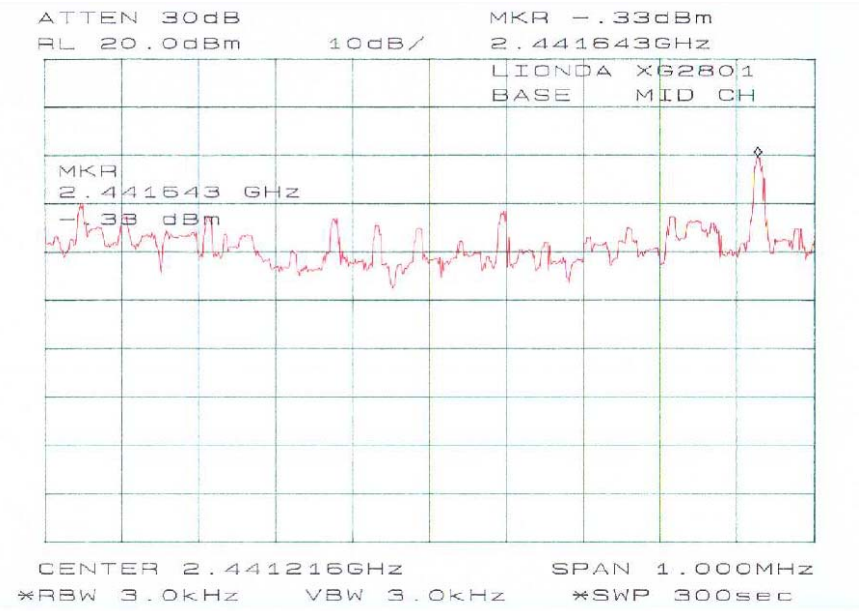
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.

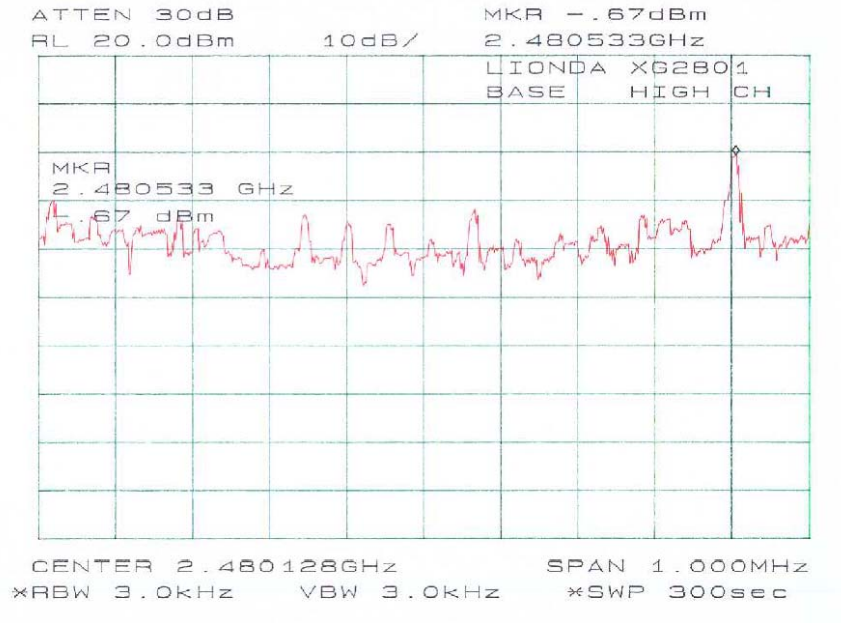
8.3 Test Results

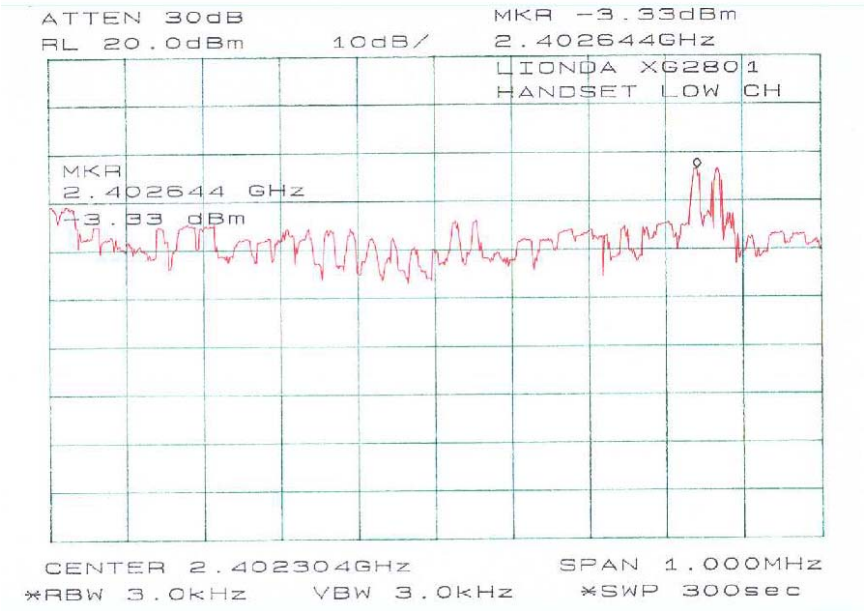
Please refer to the following plot(s).

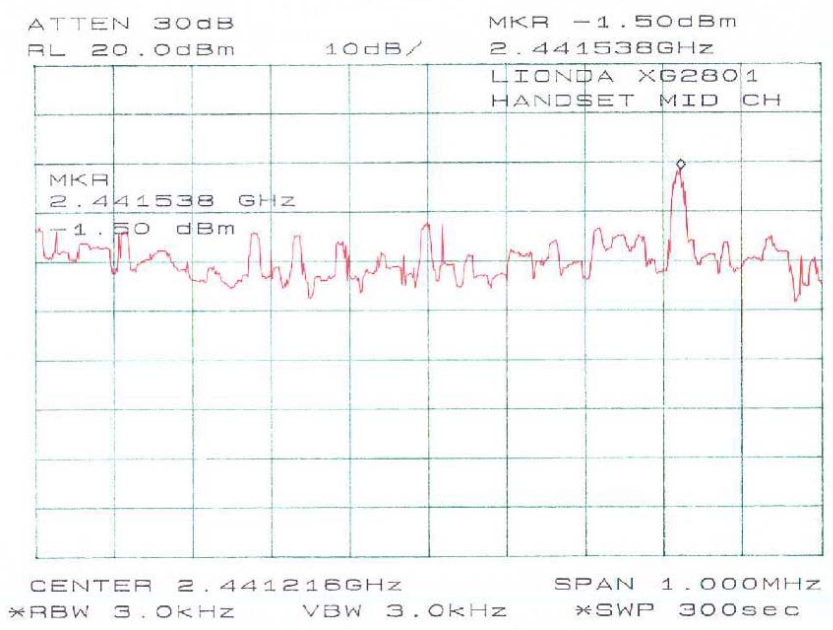
Power Density	Test Result (Base and Handset)
Low Channel	Compliant
Middle Channel	Compliant
High Channel	Compliant

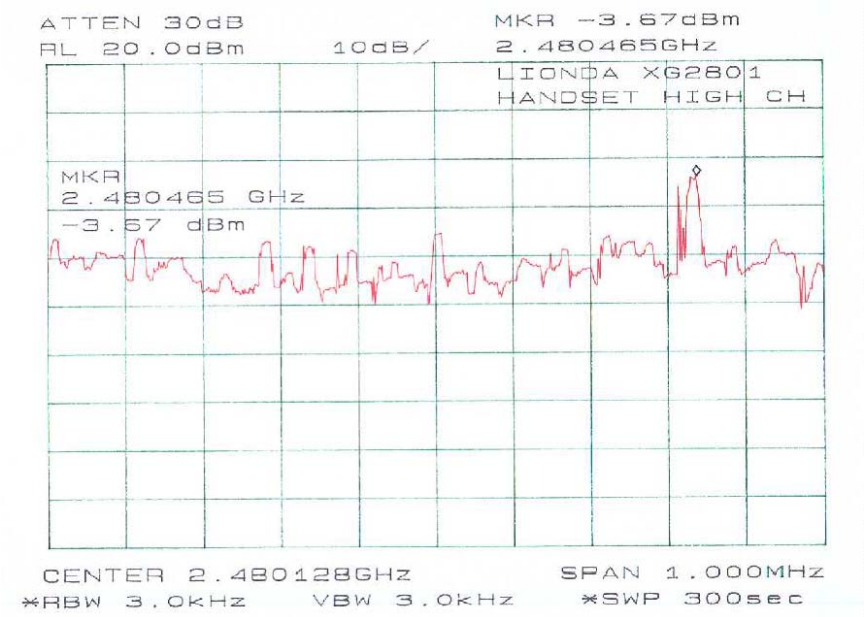

ATTEN 30dB
RL 20.0dBm
10dB/
MKR -3.00dBm
2.402741GHz
LIONDA XG2801
BASE LOW CH
MKR
2.402741 GHz
-3.00 dBm
CENTER 2.402304GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -.33dBm
2.441643GHz
LIONDA XG2801
BASE MID CH
MKR
2.441643 GHz
-.33 dBm
CENTER 2.441216GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -.67dBm
2.480533GHz
LIONDA XG2801
BASE HIGH CH
MKR
2.480533 GHz
-.67 dBm
CENTER 2.480128GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -3.33dBm
2.402644GHz
LIONDA XG2801
HANDSET LOW CH
MKR
2.402644 GHz
-3.33 dBm
CENTER 2.402304GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -1.50dBm
2.441538GHz
LIONDA XG2801
HANDSET MID CH
MKR
2.441538 GHz
-1.50 dBm
CENTER 2.441216GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -3.67dBm
2.480465GHz
LIONDA XG2801
HANDSET HIGH CH
MKR
2.480465 GHz
-3.67 dBm
CENTER 2.480128GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 300sec

9 - ANTENNA REQUIREMENT

9.1 Standard Applicable

For intentional device, according to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

9.2 Antenna Connected Construction

The directional gain of antenna used for transmitting is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

10 - RF SAFETY REQUIREMENTS TO 2.1091

According to section 3 of Supplement C to OET Bulleting 65, Part 15 Transmitters are categorically excluded from Routine Environmental Evaluation by measurement or precise computations unless otherwise required by the Commissions.

According to §15.247(b)(5) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-15000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

For handset of the EUT:
Maximum peak output power at antenna input terminal: 9.17 (dBm)
Maximum peak output power at antenna input terminal: 8.3 (mW)
Antenna Gain (typical): 0 (dBi)
Maximum antenna gain: 1 (numeric)
Prediction distance: 3 (cm)
Predication frequency: 2400 (MHz)
MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm^2)
Power density at predication frequency: 0.073 (mW/cm^2)

Test Result

The predicted power density level at 3 cm is 0.073mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2400 MHz.

11 - SPURIOUS RADIATED EMISSION DATA

11.1 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 ±4.0 dB.

11.2 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 the EUT was connected to a 120 VAC / 60 Hz power source.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped along the edge of the test table and bundle when necessary.

11.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25000 MHz.

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

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10KHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

11.4 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 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

11.5 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

11.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

Base, 30MHz to 25000MHz, 3 meters

-17.6 dBμV at 7206.90 MHz in the Vertical polarization, Low Channel
-17.2 dBμV at 7323.66 MHz in the Horizontal polarization, Middle Channel
-17.6 dBμV at 7440.39 MHz in the Horizontal polarization, High Channel
-3.8 dBμV at 603.23 MHz in the Vertical polarization, Unintentional Emission

Handset, 30MHz to 25000MHz, 3 meters

-11.7 dBμV at 7206.90 MHz in the Vertical polarization, Low Channel
-11.9 dBμV at 7323.66 MHz in the Horizontal polarization, Middle Channel
-12.1 dBμV at 7440.39 MHz in the Horizontal polarization, High Channel
-3.6 dBμV at 603.25 MHz in the Horizontal polarization, Unintentional Emission

11.6.1 Radiated Emission Test Data for Base, 30MHz to 25000MHz, 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 Channel											
2402.30	70.5	AVG, FUND	60	1.8	V	28.1	3.4	30.0	72.0		
2402.30	71.0	AVG, FUND	180	1.2	H	28.1	3.4	30.0	72.5		
2402.30	102.8	PEAK, FUND	60	1.8	V	28.1	3.4	30.0	104.3		
2402.30	100.3	PEAK, FUND	180	1.2	H	28.1	3.4	30.0	101.8		
7206.90	25.7	AVG	30	1.8	V	35.1	5.6	30.0	36.4	54	-17.6
7206.90	25.3	AVG	45	1.0	H	35.1	5.6	30.0	36.0	54	-18.0
7206.90	43.8	PEAK	45	1.0	V	35.1	5.6	30.0	54.5	74	-19.5
4804.60	26.8	AVG	120	1.0	H	32.5	4.9	30.0	34.2	54	-19.8
4804.60	26.5	AVG	90	1.5	V	32.5	4.9	30.0	33.9	54	-20.1
7206.90	42.7	PEAK	30	1.8	V	35.1	5.6	30.0	53.4	74	-20.6
4804.60	41.6	PEAK	120	1.0	H	32.5	4.9	30.0	49.0	74	-25.0
4804.60	40.9	PEAK	90	1.5	V	32.5	4.9	30.0	48.3	74	-25.7
Middle Channel											
2441.22	70.3	AVG, FUND	30	1.0	V	28.1	3.4	30.0	71.8		
2441.22	71.5	AVG, FUND	90	1.5	H	28.1	3.4	30.0	73.0		
2441.22	101.9	PEAK, FUND	30	1.0	V	28.1	3.4	30.0	103.4		
2441.22	104.8	PEAK, FUND	90	1.5	H	28.1	3.4	30.0	106.3		
7323.66	26.1	AVG	90	1.2	H	35.1	5.6	30.0	36.8	54	-17.2
7323.66	25.9	AVG	30	1.0	V	35.1	5.6	30.0	36.6	54	-17.4
7323.66	43.8	PEAK	90	1.2	H	35.1	5.6	30.0	54.6	74	-19.4
4882.44	26.9	AVG	130	1.2	H	32.5	4.9	30.0	34.3	54	-19.7
4882.44	26.3	AVG	60	1.0	V	32.5	4.9	30.0	33.7	54	-20.3
7323.66	42.5	PEAK	30	1.0	V	35.1	5.6	30.0	53.2	74	-20.8
4882.44	41.5	PEAK	130	1.2	H	32.5	4.9	30.0	48.9	74	-25.1
4882.44	40.1	PEAK	60	1.0	V	32.5	4.9	30.0	47.5	74	-26.5

Radiated Emission Test Data for Base, 30MHz to 25000MHz, 3 meters (Continued)

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
High Channel											
2480.13	70.1	AVG, FUND	180	2.0	V	28.1	3.4	30.0	71.6		
2480.13	70.4	AVG, FUND	200	1.5	H	28.1	3.4	30.0	71.9		
2480.13	102.2	PEAK, FUND	180	2.0	V	28.1	3.4	30.0	103.6		
2480.13	101.7	PEAK, FUND	200	1.5	H	28.1	3.4	30.0	103.1		
7440.39	25.7	AVG	60	1.5	H	35.1	5.6	30.0	36.4	54	-17.6
7440.39	25.4	AVG	150	2.0	V	35.1	5.6	30.0	36.1	54	-17.9
7440.39	44.5	PEAK	280	1.0	H	35.1	5.6	30.0	55.2	74	-18.8
7440.39	44.3	PEAK	90	1.2	V	35.1	5.6	30.0	55.0	74	-19.0
4960.26	26.2	AVG	90	1.5	H	32.5	4.9	30.0	33.6	54	-20.4
4960.26	26.0	AVG	30	1.0	V	32.5	4.9	30.0	33.4	54	-20.6
4960.26	42.0	PEAK	90	1.5	H	32.5	4.9	30.0	49.4	74	-24.6
4960.26	41.8	PEAK	30	1.0	V	32.5	4.9	30.0	49.2	74	-24.8
Unintentional Emission, 30MHz to 1000MHz											
603.23	44.2		60	1.2	V	19.7	3.3	25.0	42.2	46	-3.8
675.23	42.3		30	1.5	V	21.2	3.2	25.0	41.8	46	-4.2
876.34	38.5		180	1.5	V	22.4	3.8	25.0	39.7	46	-6.3
471.24	41.5		220	1.5	V	17.8	3.1	25.0	37.4	46	-8.6
199.25	34.3		280	1.2	H	14.2	2.1	25.0	25.7	43.5	-17.9
105.70	30.8		45	1.5	H	11.0	1.5	25.0	18.3	43.5	-25.2

11.6.2 Radiated Emission Test Data for Handset, 30MHz to 25000MHz, 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 Channel											
2402.30	70.00	AVG, FUND	45	1.2	V	28.1	3.4	30.0	71.5		
2402.30	66.2	AVG, FUND	0	1.5	H	28.1	3.4	30.0	67.6		
2402.30	93.17	PEAK, FUDN	45	1.2	V	28.1	3.4	30.0	94.6		
2402.30	86.5	PEAK, FUND	0	1.5	H	28.1	3.4	30.0	88.0		
7206.90	31.6	AVG	270	2.0	V	35.1	5.6	30.0	42.3	54	-11.7
7206.90	31.0	AVG	30	1.2	H	35.1	5.6	30.0	41.7	54	-12.3
4804.60	29.5	AVG	180	2.0	V	32.5	4.9	30.0	36.9	54	-17.1
4804.60	28.0	AVG	30	1.5	H	32.5	4.9	30.0	35.4	54	-18.6
7206.90	42.8	PEAK	270	2.0	V	35.1	5.6	30.0	53.5	74	-20.5
7206.90	41.5	PEAK	30	1.2	H	35.1	5.6	30.0	52.2	74	-21.8
4804.60	42.5	PEAK	180	1.2	V	32.5	4.9	30.0	49.9	74	-24.1
4804.60	41.3	PEAK	30	1.5	H	32.5	4.9	30.0	48.7	74	-25.3
Middle Channel											
2441.22	66.8	AVG, FUND	0	1.2	V	28.1	3.4	30.0	68.3		
2441.22	65.5	AVG, FUND	170	2.0	H	28.1	3.4	30.0	67.0		
2441.22	90.3	PEAK, FUND	0	1.2	V	28.1	3.4	30.0	91.8		
2441.22	84.5	PEAK, FUND	170	2.0	H	28.1	3.4	30.0	86.0		
7323.66	31.3	AVG	30	1.5	H	35.1	5.6	30.0	42.1	54	-11.9
7323.66	31.2	AVG	270	1.5	V	35.1	5.6	30.0	41.9	54	-12.1
4882.44	27.7	AVG	180	1.0	H	32.5	4.9	30.0	35.1	54	-18.9
4882.44	27.5	AVG	90	1.2	V	32.5	4.9	30.0	34.9	54	-19.1
7323.66	44.2	PEAK	30	1.5	H	35.1	5.6	30.0	54.9	74	-19.1
7323.66	40.5	PEAK	270	1.5	V	35.1	5.6	30.0	51.2	74	-22.8
4882.44	41.0	PEAK	180	1.0	H	32.5	4.9	30.0	48.4	74	-25.6
4882.44	40.5	PEAK	90	1.2	V	32.5	4.9	30.0	47.9	74	-26.1

Radiated Emission Test Data for Handset, 30MHz to 25000MHz, 3 meters (Continued)

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
High Channel											
2480.13	67.3	AVG, FUND	60	1.0	V	28.1	3.4	30.0	68.8		
2480.13	62.2	AVG, FUND	150	2.0	H	28.1	3.4	30.0	63.6		
2480.13	88.5	PEAK, FUND	245	1.0	V	28.1	3.4	30.0	90.0		
2480.13	85.2	PEAK, FUND	150	2.0	H	28.1	3.4	30.0	86.6		
7440.39	31.2	AVG	30	1.5	H	35.1	5.6	30.0	41.9	54	-12.1
7440.39	30.9	AVG	270	1.2	V	35.1	5.6	30.0	41.6	54	-12.4
4960.26	27.3	AVG	240	1.5	H	32.5	4.9	30.0	34.7	54	-19.3
7440.39	43.9	PEAK	30	1.5	H	35.1	5.6	30.0	54.6	74	-19.4
4960.26	26.9	AVG	45	1.0	V	32.5	4.9	30.0	34.3	54	-19.7
7440.39	40.8	PEAK	270	1.2	V	35.1	5.6	30.0	51.5	74	-22.5
4960.26	41.2	PEAK	180	1.5	H	32.5	4.9	30.0	48.6	74	-25.4
4960.26	40.5	PEAK	45	1.0	V	32.5	4.9	30.0	47.9	74	-26.1
Unintentional Emission, 30MHz to 1000MHz											
603.25	44.3		45	1.20	H	19.7	3.3	25	42.4	46.0	-3.6
679.71	35.8		220	1.20	H	21.2	3.2	25	35.3	46.0	-10.7
471.27	38.8		230	1.5	H	17.8	3.1	25.0	34.7	46	-11.3
475.74	35.5		180	1.0	V	17.8	3.1	25.0	31.4	46	-14.6
507.21	34.2		140	1.2	V	18.6	3.2	25.0	30.9	46	-15.1
199.28	34.3		60	1.2	H	14.2	2.1	25.0	25.7	43.5	-17.9
97.73	33.2		110	1.5	H	10.4	1.4	25.0	20.0	43.5	-23.5

12 – CONDUCTED EMISSIONS

12.1 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.

12.2 EUT Setup

The measurement was performed at shield room, using the same setup per ANSI C63.4 – 1992 measurement procedure. The specification used was FCC Class B limits.

The base of the EUT was connected to a 120 VAC / 60 Hz power source.

The spacing between the peripherals was 10 centimeters.

Input / Output cables were draped along the edge of the test table and bundle when necessary.

12.3 Spectrum Analyzer Setup

The spectrum analyzer was set with the following configurations during the conduction 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

12.4 Test Procedure

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with 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 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

12.5 Summary of Test Results

According to the data in section 12.6, the EUT complied with the FCC Conducted margin for a Class B device and these test results is deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, with the *worst* margin reading of:

-20.5 dBμV at 1.37 MHz in the Line mode, 150kHz – 30 MHz

12.6 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
1.370	25.5	AVE	Line	46	-20.5
1.370	24.8	AVE	Neutral	46	-21.2
13.110	23.2	AVE	Line	50	-26.8
13.110	22.5	AVE	Neutral	50	-27.5
1.370	27.8	QP	Neutral	56	-28.2
1.370	27.5	QP	Line	56	-28.5
21.500	21.4	AVE	Neutral	50	-28.6
25.540	20.7	AVE	Line	50	-29.3
21.500	22.9	QP	Neutral	60	-37.1
25.540	22.8	QP	Line	60	-37.2
13.110	22.5	QP	Neutral	60	-37.5
13.110	22.5	QP	Line	60	-37.5

12.7 Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

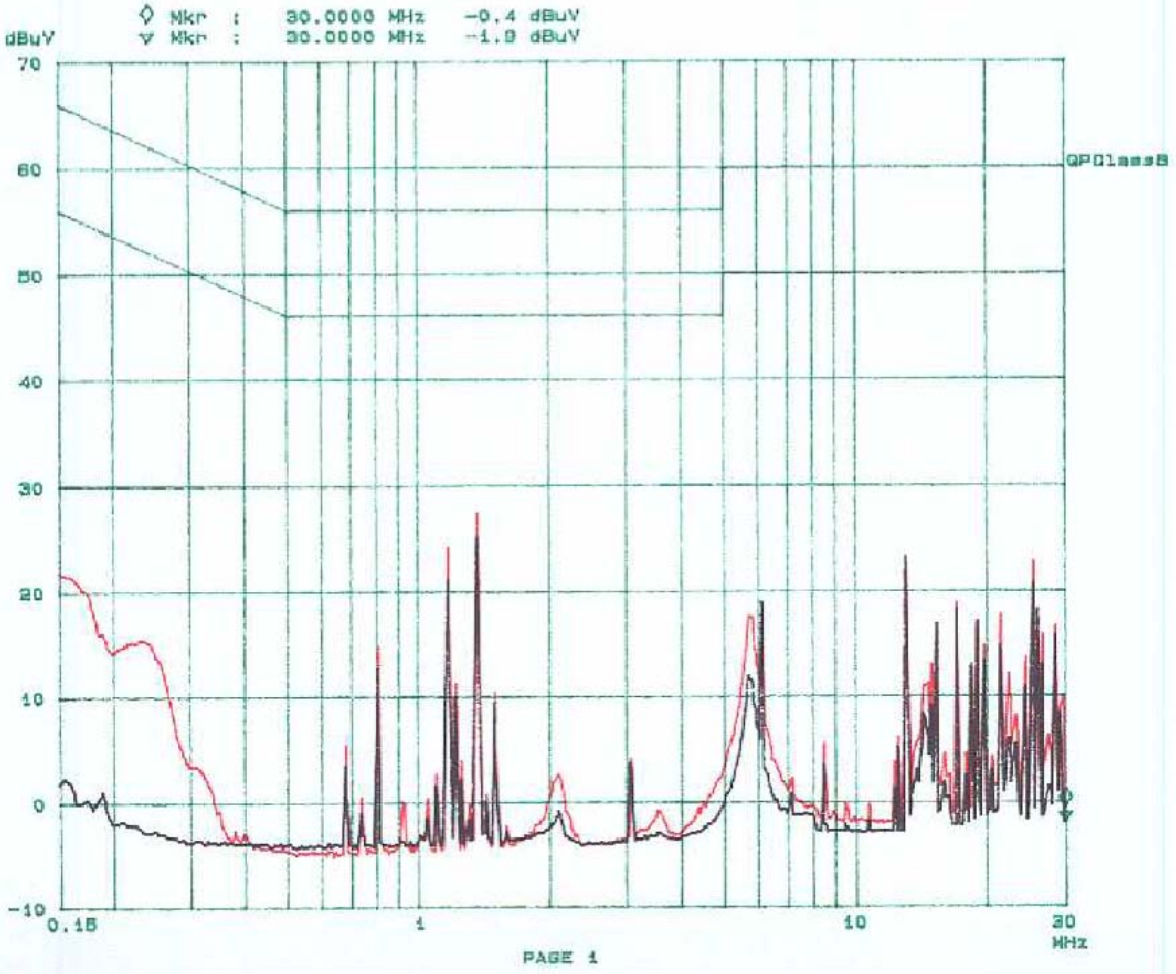
Bay Area Compliance Corporation
CISPR CLASS B

EUT: XG2801
Manuf: LIONDA
Op Cond: Normal
Operator: LING
Test Spec: +
Comment: L

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

Final Measurement: x QP / + CAV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



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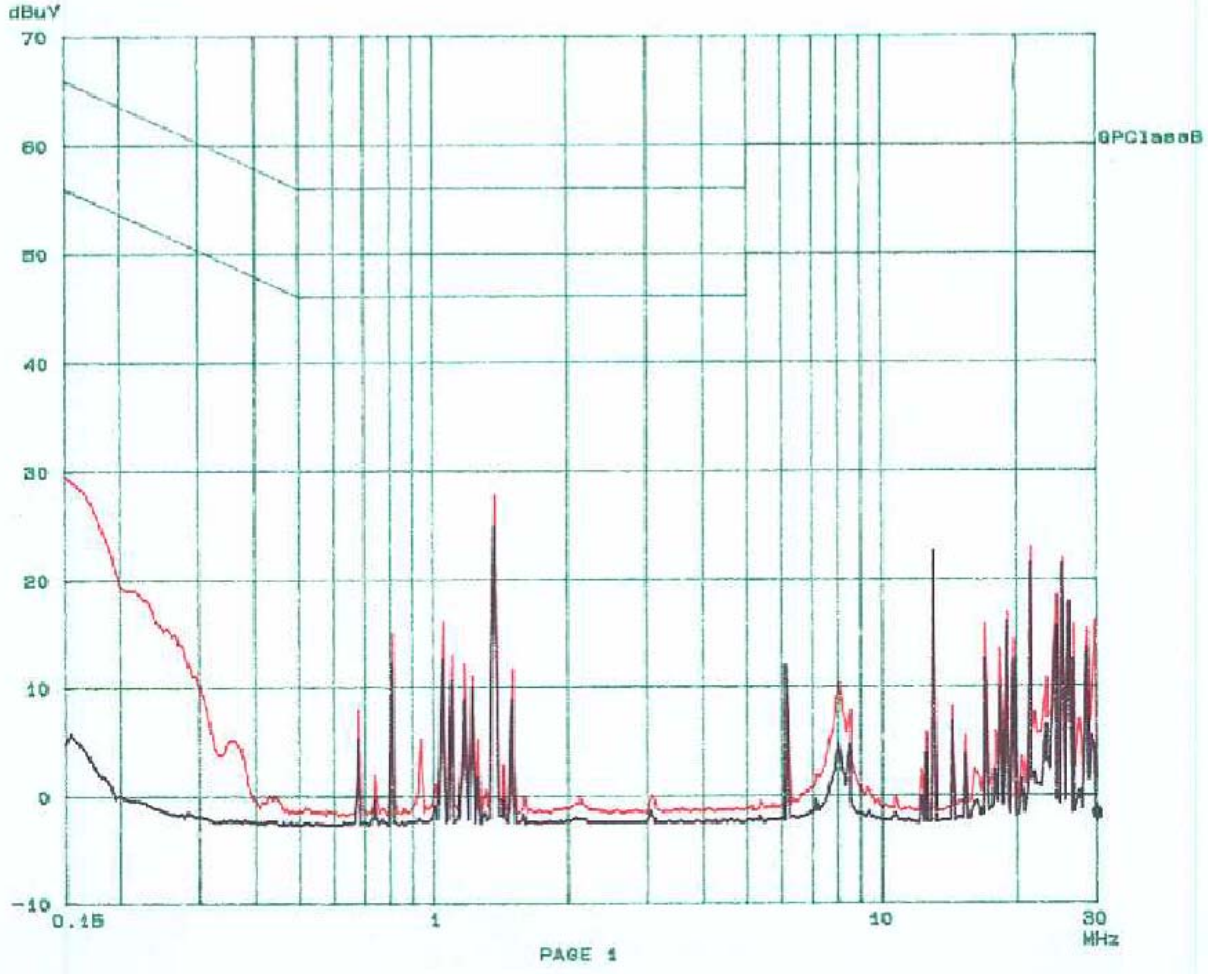
Bay Area Compliance Corporation
CISPR CLASS B

EUT: XG2801
Manuf: LIONDA
Op Cond: Normal
Operator: LING
Test Spec: +
Comment: N
File name: LIVETVN.AES

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

Final Measurement: x QP / + CAV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB