

FCC PART 15 Subpart C

EMI MEASUREMENT AND TEST REPORT

For

LG Electronics, Inc.

LG Kangseo B/D, 36, Munlae-Dong, 6-Ga,
Youngdungpo-Gu, Seoul, 150-096, Korea

FCC ID: BEJCKTU9018-75

April 12, 2002

This Report Concerns: ☒ Original Report	Equipment Type: 2.4GHz Digital Cordless Telephone System - Household Appliances
Test Engineer: Benjamin Jin	
Report Number: R0203256	
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Reviewed By: John Y. Chan - Engineering Manager	
Prepared By: Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164	

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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

LG Electronics, Inc.'s product, FCC ID: BEJCKTU9018-75, Model No.: CKTU-24 or the "EUT" as referred to in this report is a 2.4GHz DSS Cordless Telephone system. The EUT was composed of two parts, one is the base which measures approximately 6.5" L x 4.8" W x 2.8" H, and the other is the handset which measures 7.5" L x 2.0" W x 1.2" H. The EUT utilizes 4-layered 19.2MHz crystal.

1.2 Objective

This type approval report is prepared on behalf of. *LG Electronics, Inc.* 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, Conducted and Spurious Radiated Emission, and processing gain.

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, 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	8568B	2610A02165	12/6/02
HP	Spectrum Analyzer	8593B	2919A00242	12/20/02
HP	Amplifier	8349B	2644A02662	12/20/02
HP	Quasi-Peak Adapter	85650A	917059	12/6/02
HP	Amplifier	8447E	1937A01046	12/6/02
A.H. System	Horn Antenna	SAS0200/571	261	12/27/02
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/02
Com-Power	LISN	LI-200	12208	12/20/02
Com-Power	LISN	LI-200	12005	12/20/02
BACL	Data Entry Software	DES1	0001	12/20/02

*** 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).

1.8 Power Supply and Line Filters of EUT

Manufacturer	Description	Model	Serial Number	FCC ID
LG	AC/DC Adapter	KNU-1250	None	None

1.9 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Unshielded RJ11 Cable	20	RJ11 Port/Telephone	Local Telephone Switcher

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).

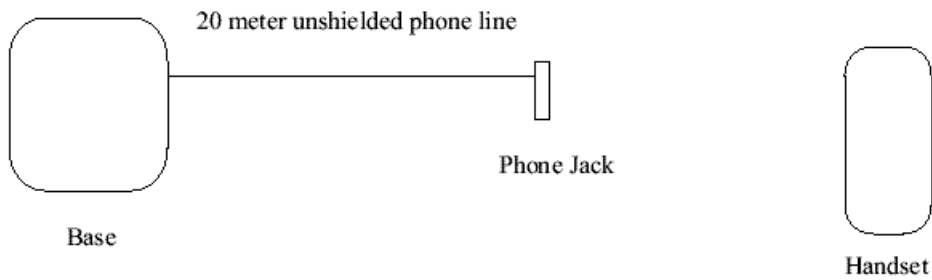
Handset being tested: The Cordless Telephone - Handset, Model CKTU-24 was placed on the wooden table and tested in three orthogonal axis. The handset was connected to the headset via its headset port. The Low, middle, and high channels were tested. The handset was transmitting to and receiving from the 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 Cordless Telephone – Base, Model CKTU-24 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.

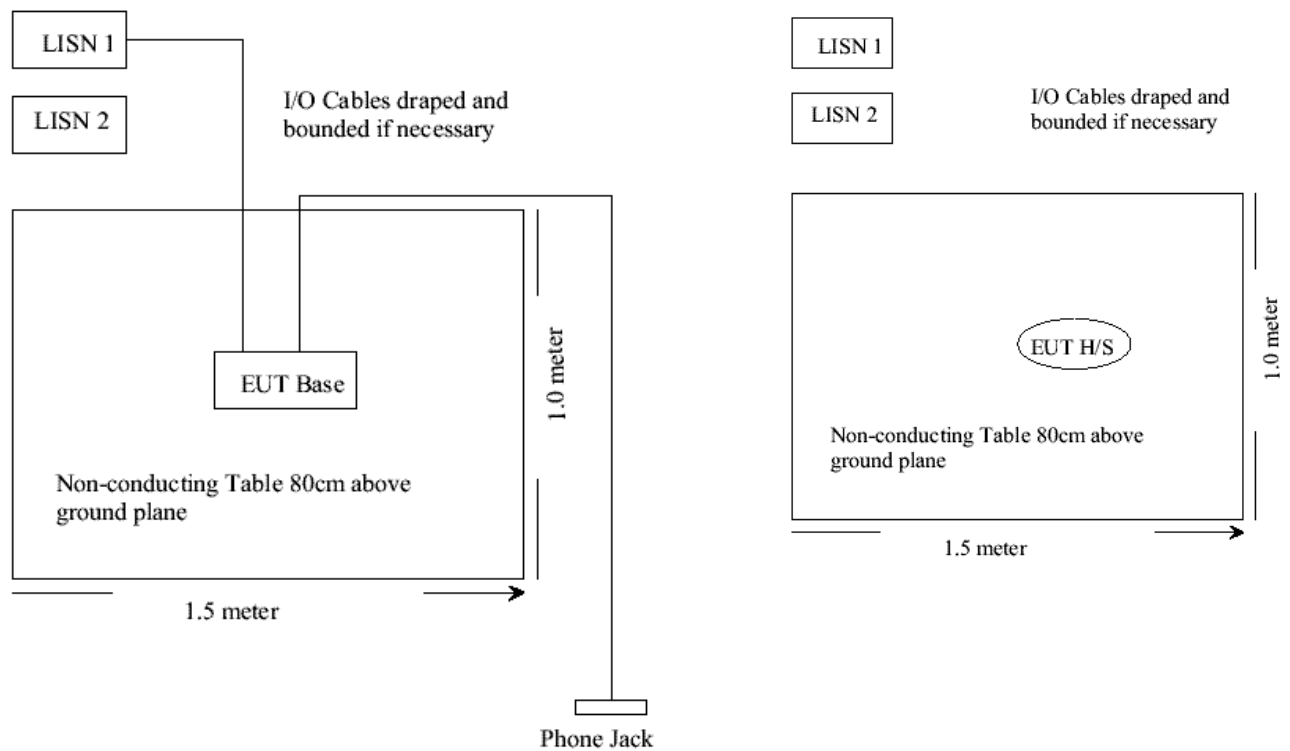
2.2 Equipment Modifications

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



2.4 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	Section Reference
§ 15.205	Restricted Bands	Compliant	Section 12
§ 2.1091	RF Safety Requirements	Compliant	Section 10
§ 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) (2)	Peak Output Power	Compliant	Section 4
§ 15.247 (b) (4)	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
§ 15.247 (e)	Processing Gain	Compliant	Section 13

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (2), for all direct sequence systems, 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 power meter.

4.3 Measurement Result

Please refer to the attached pictures for more information.

Unit	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Standard (W)	Result	Page Reference
Base	2404.80	7.69	0.006	$\leq 1W$	Compliant	Page 10
Base	2439.00	7.69	0.006	$\leq 1W$	Compliant	Page 10
Base	2475.00	9.68	0.009	$\leq 1W$	Compliant	Page 10
Handset	2404.80	7.69	0.006	$\leq 1W$	Compliant	Page 11
Handset	2439.00	7.69	0.006	$\leq 1W$	Compliant	Page 11
Handset	2475.00	9.68	0.009	$\leq 1W$	Compliant	Page 11

4.4 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
Agilent	E4419b	GB40202891	4/8/03
Agilent	E4412a	US38486529	4/8/03





5 - 6 dB BANDWIDTH

5.1 Standard Applicable

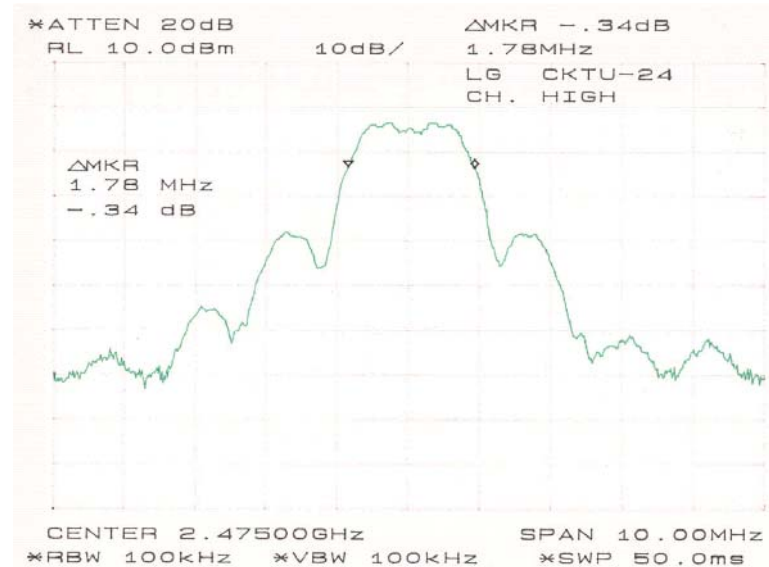
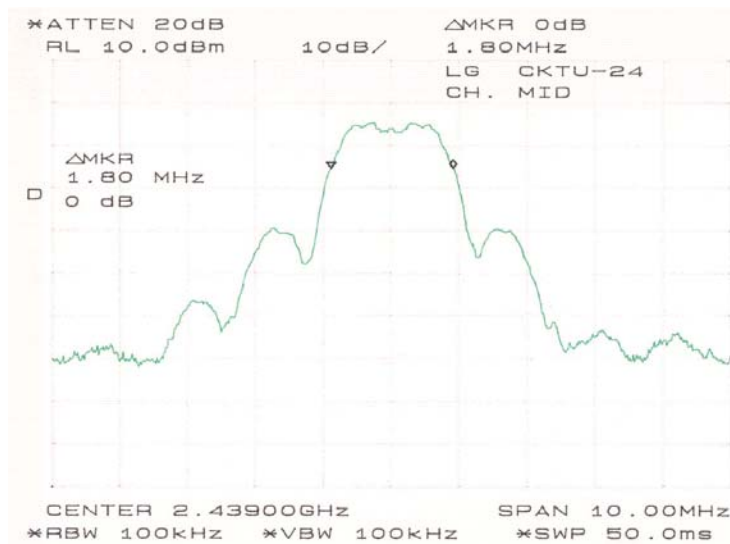
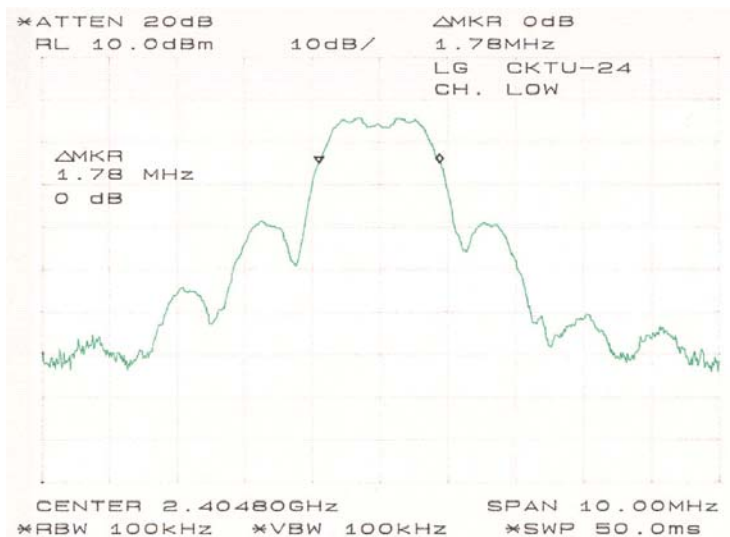
According to §15.247(a)(2), for direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

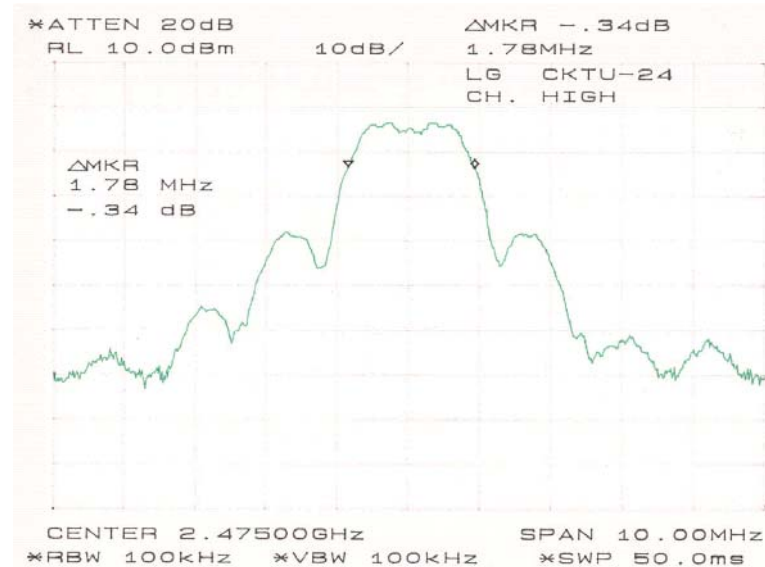
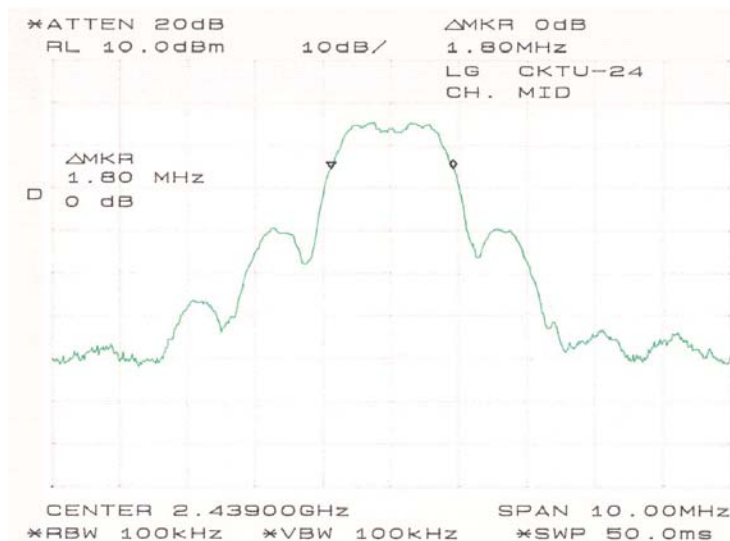
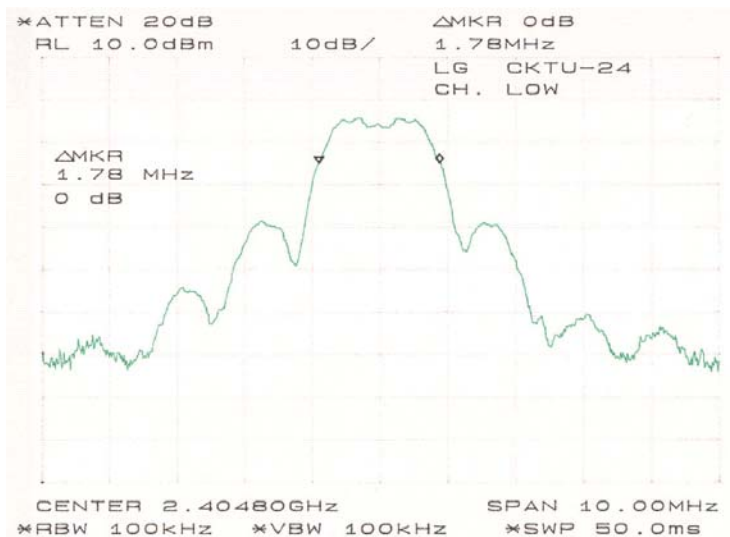
5.2 Measurement Procedure

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 20 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

Channel Bandwidth	Page Reference		Test Result
	Base	Handset	
Low Channel	Page 13	Page 14	Compliant
Middle Channel	Page 13	Page 14	Compliant
High Channel	Page 13	Page 14	Compliant





6 - SPURIOUS EMISSION

6.1 Standard Applicable

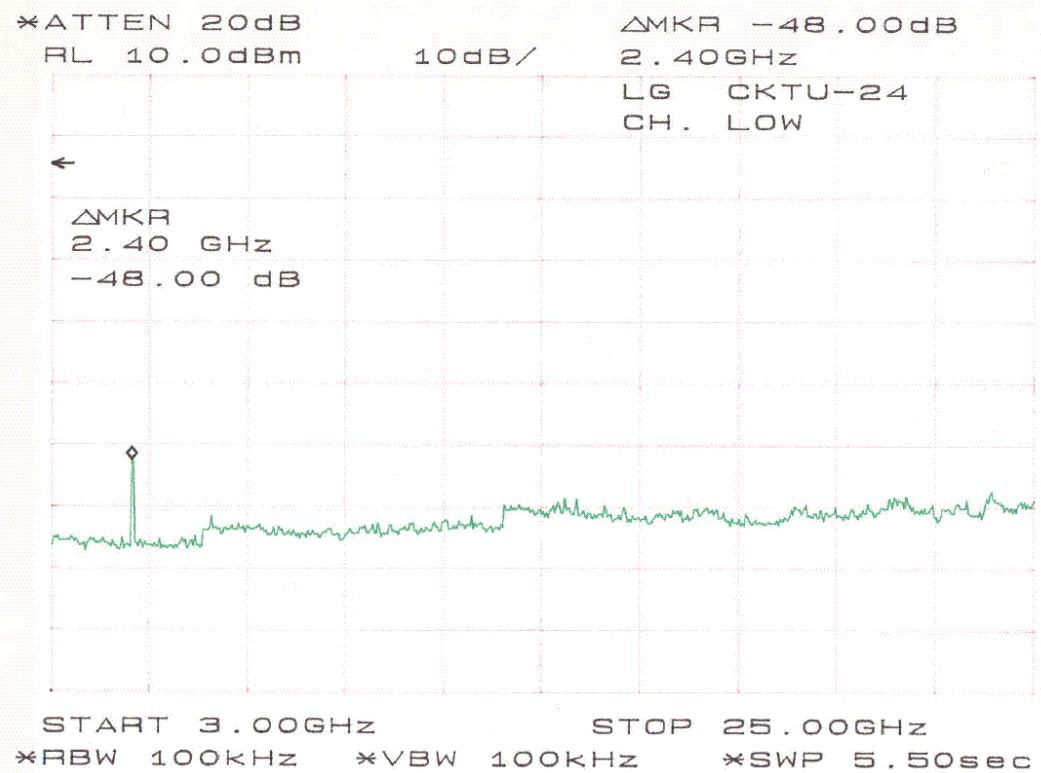
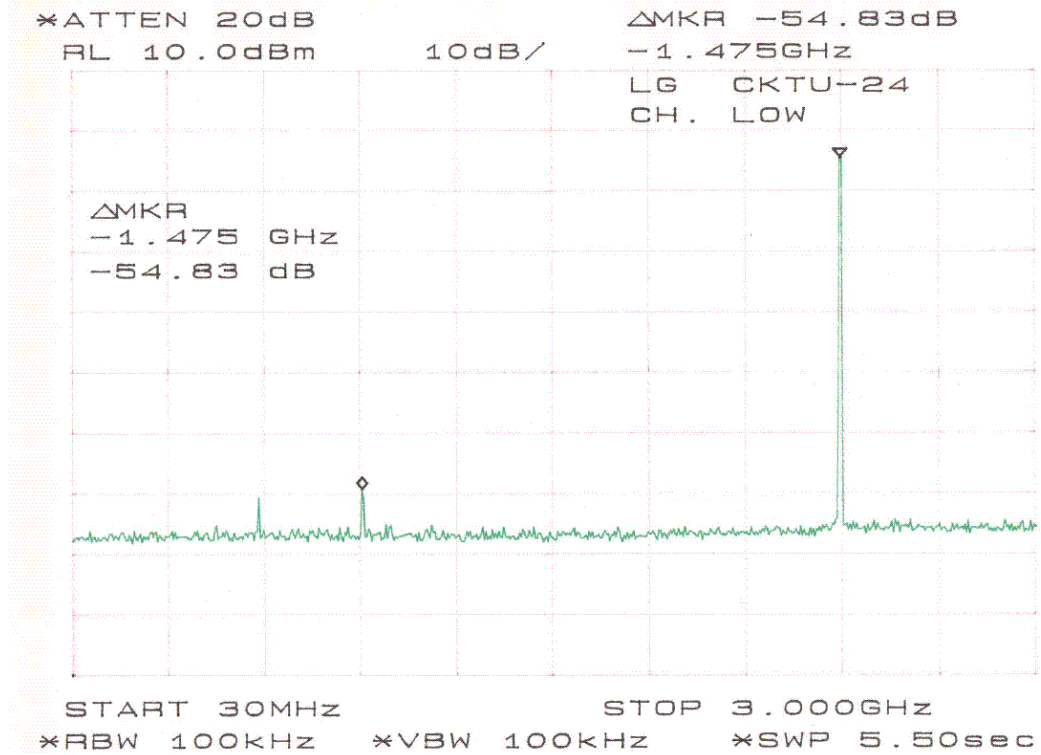
According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above 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.

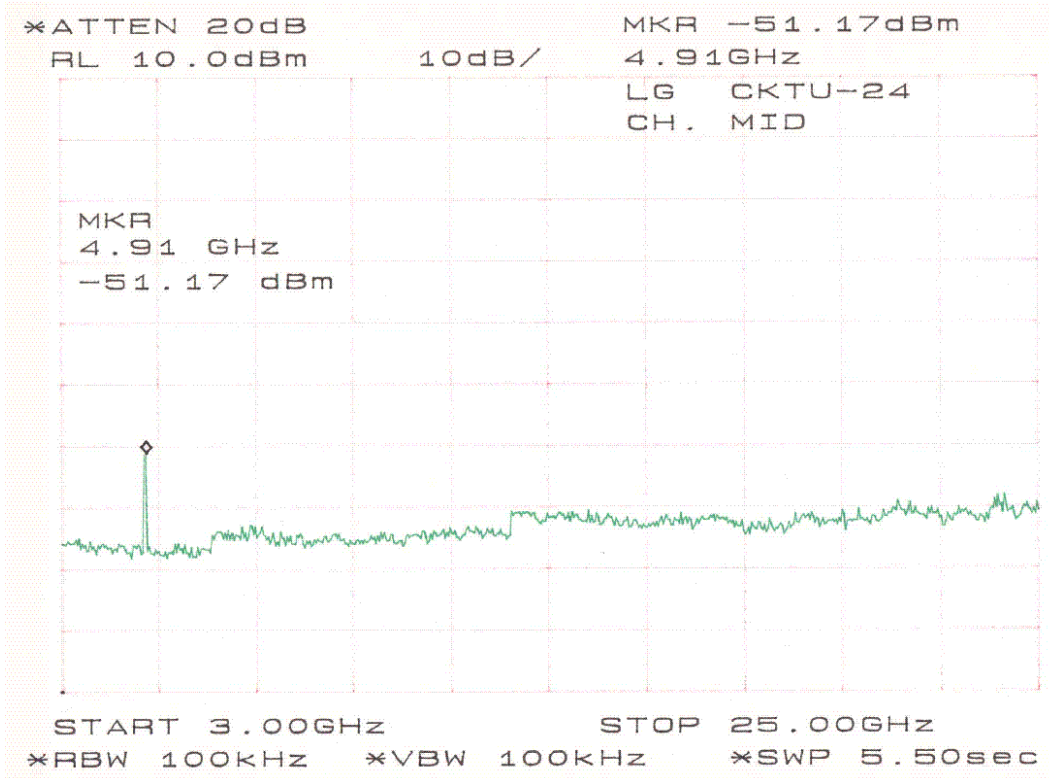
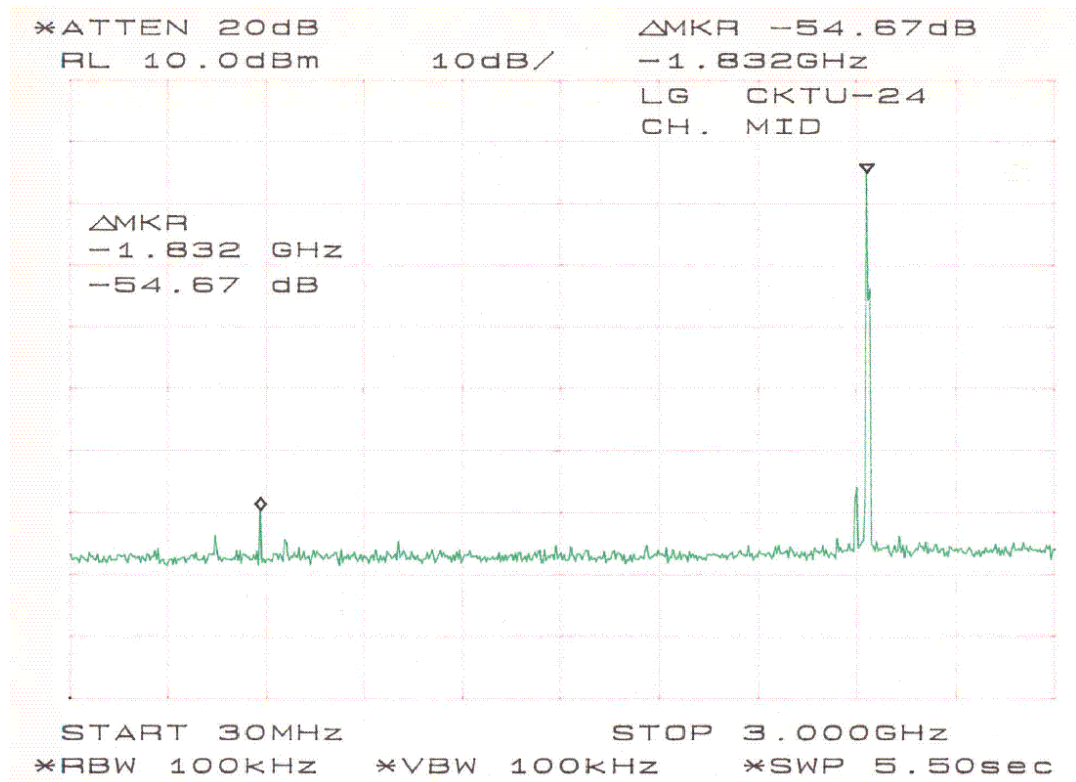
6.2 Measurement Procedure

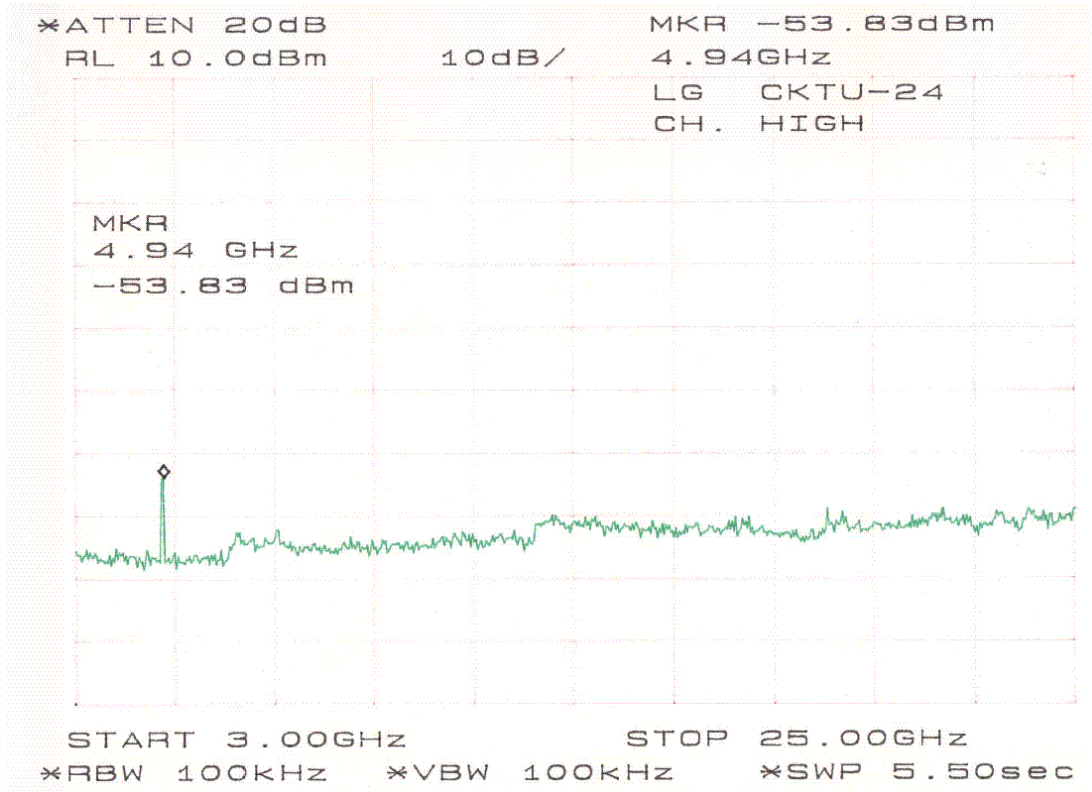
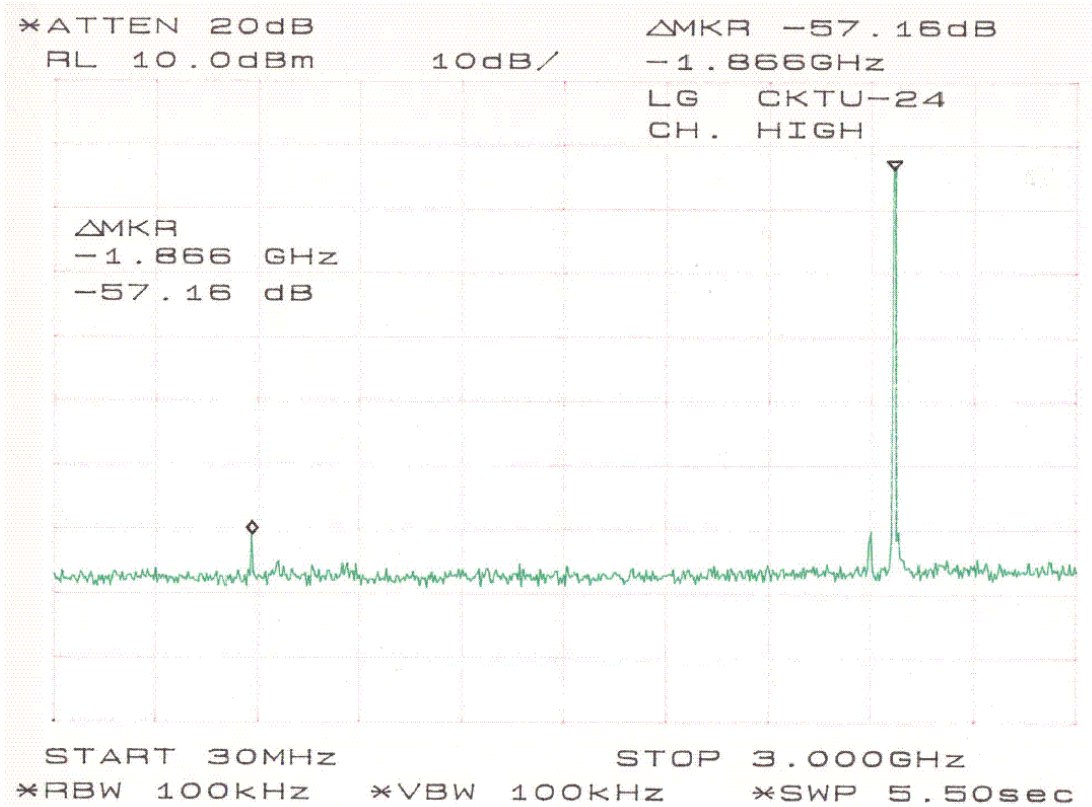
1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument 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.

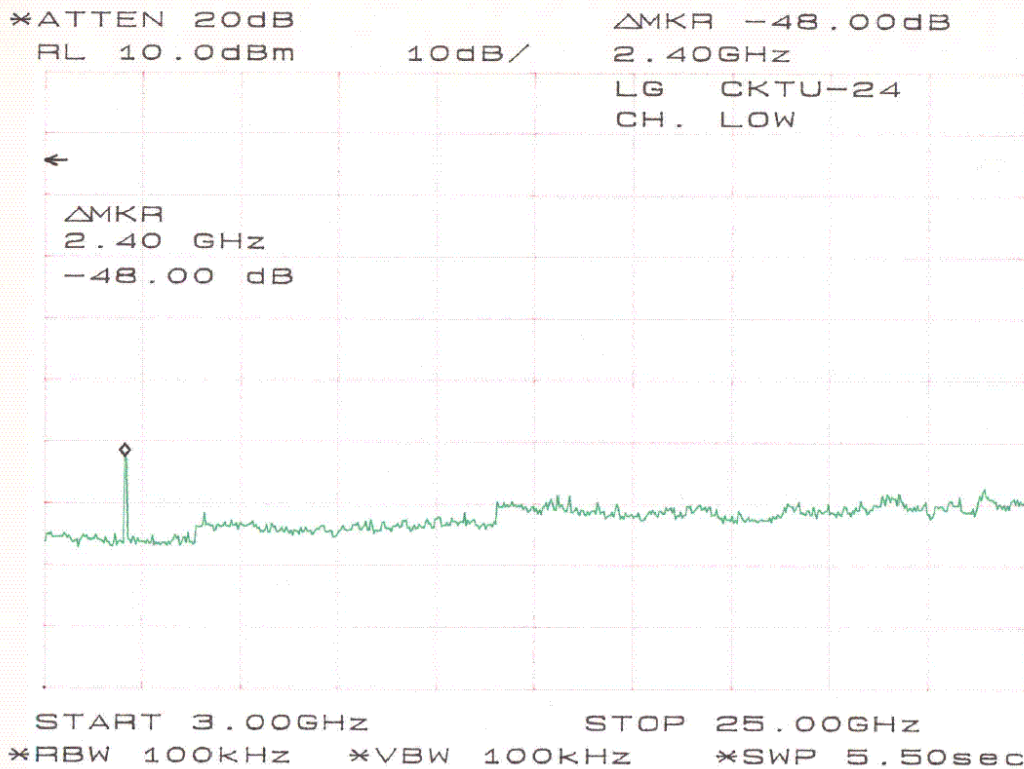
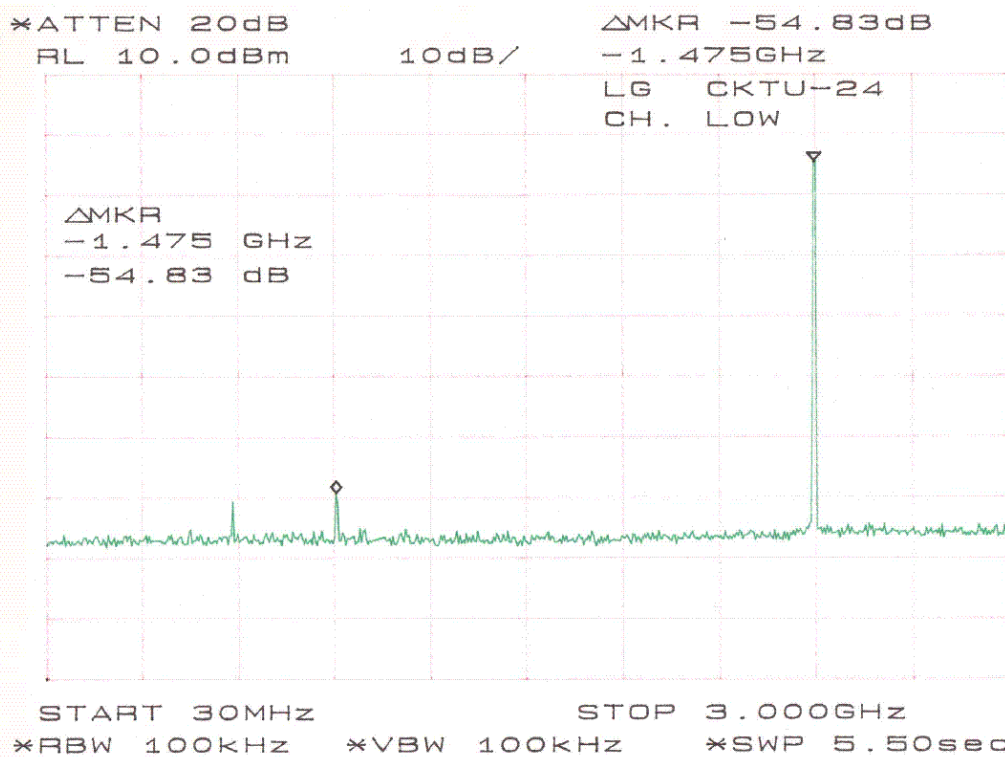
6.3 Measurement Data

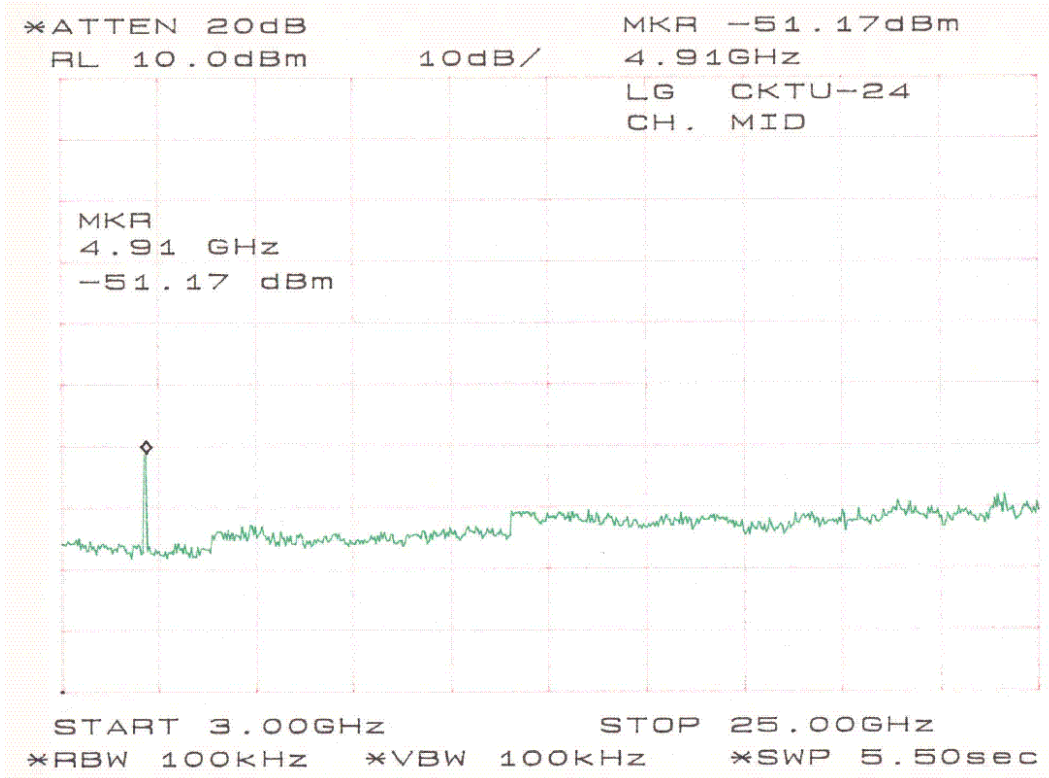
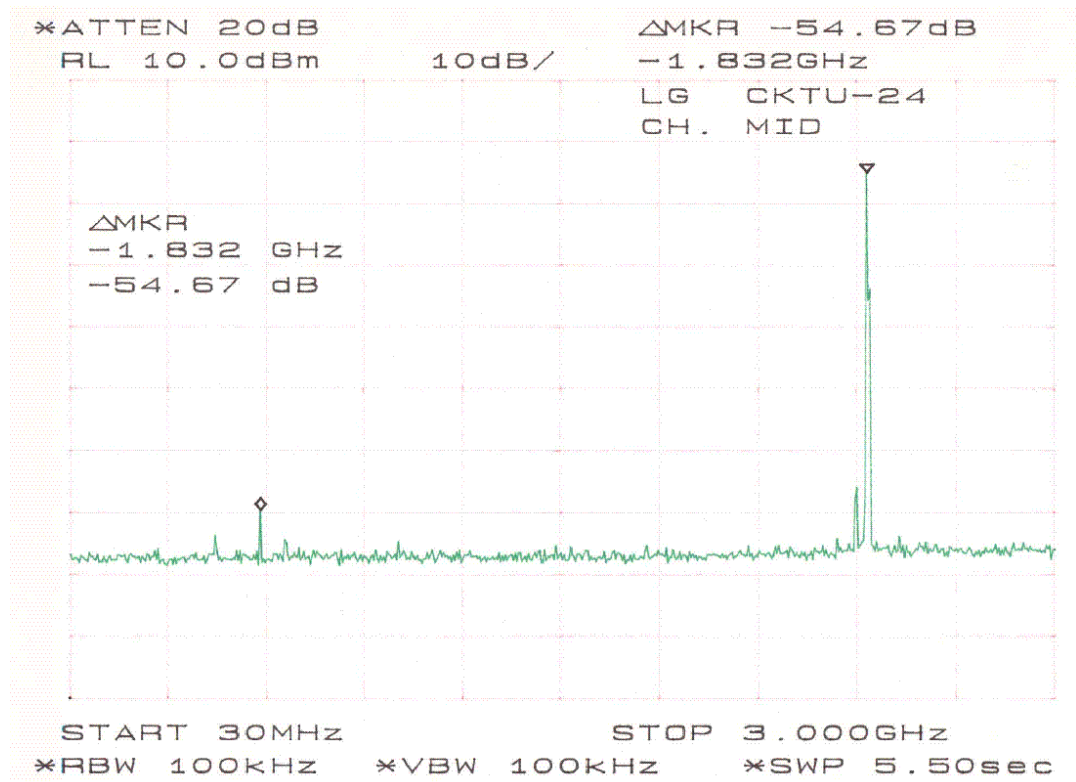
Number of Hopping Channel Frequencies	Page Reference		Test Results
	Base	Handset	
	Page 16 -18	Page 19 - 21	Compliant

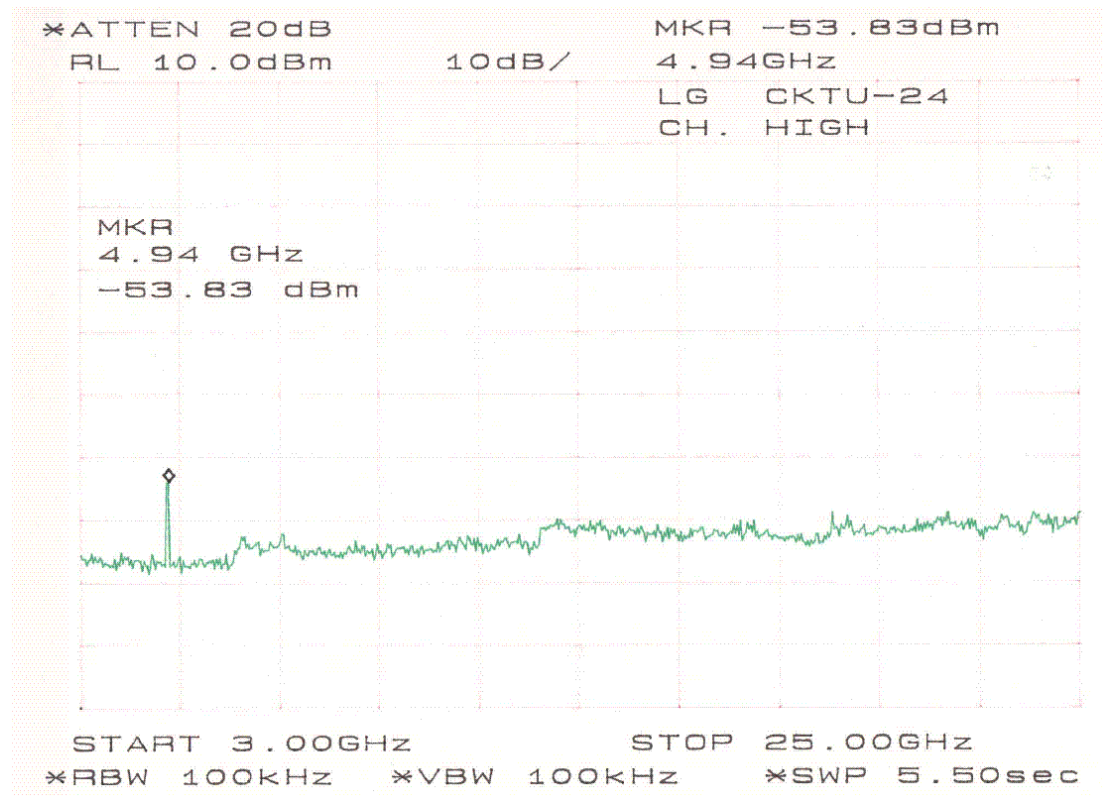
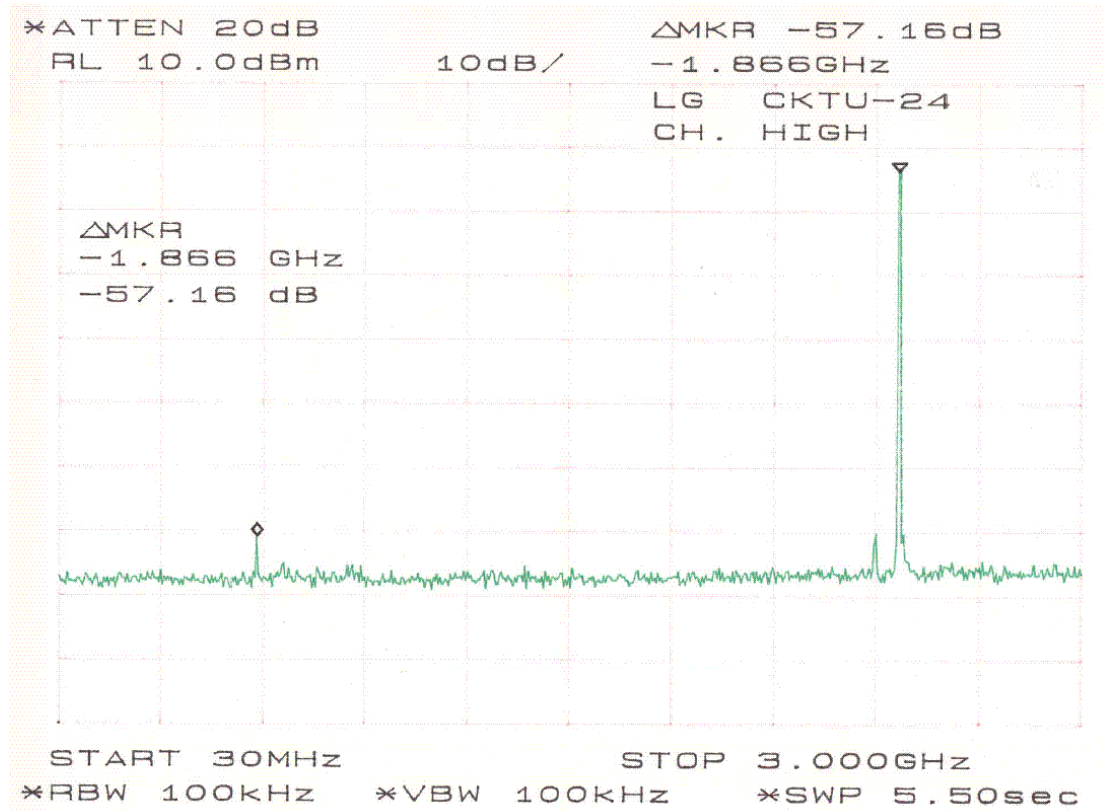












7 - 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

7.1 Standard Applicable

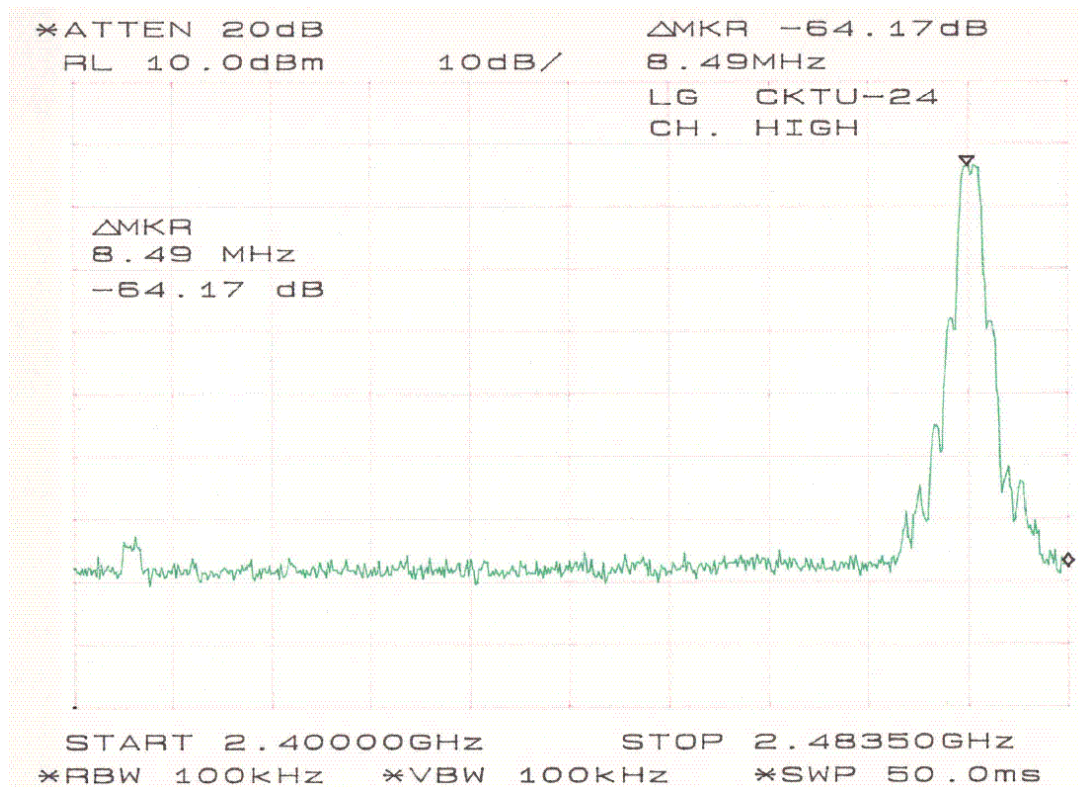
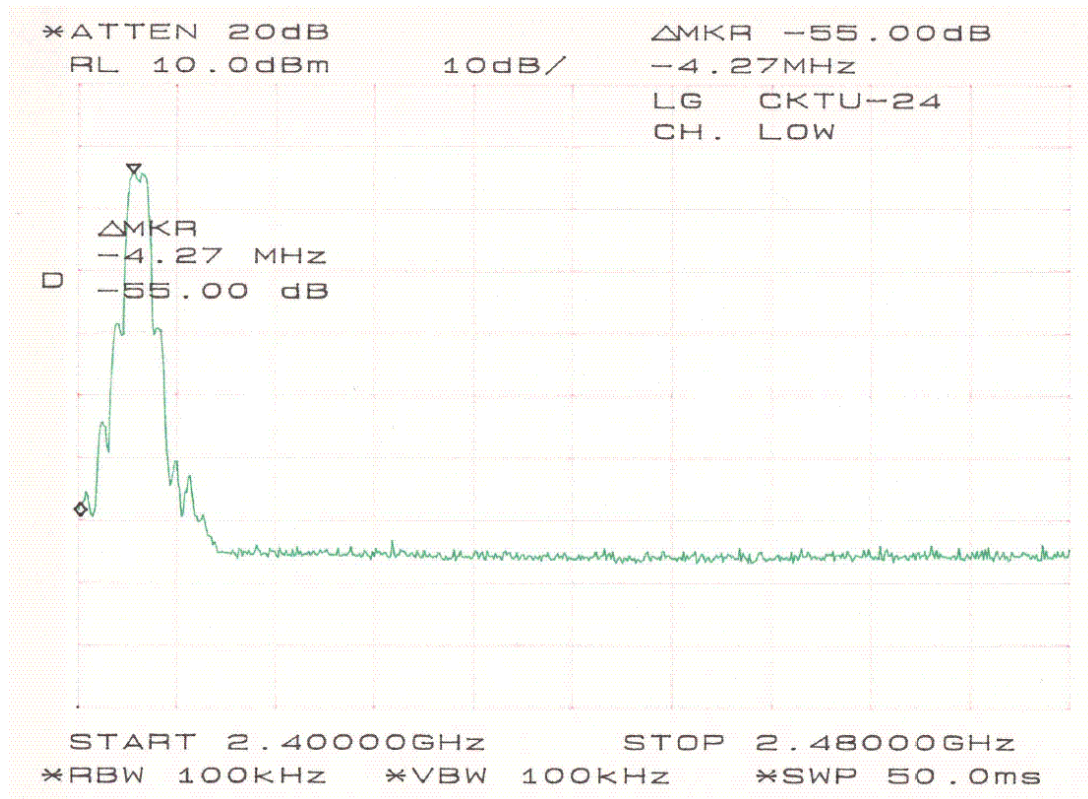
According to §15.247(c), if *any* 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209(a), whichever results in the lesser attenuation.

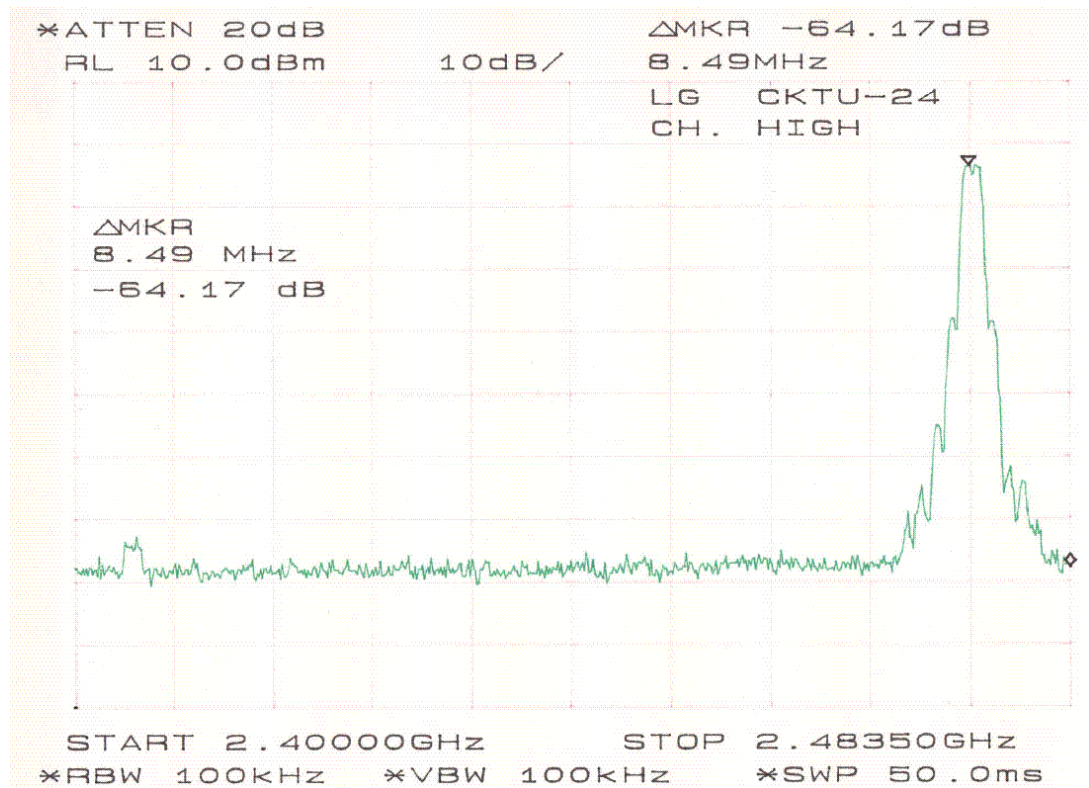
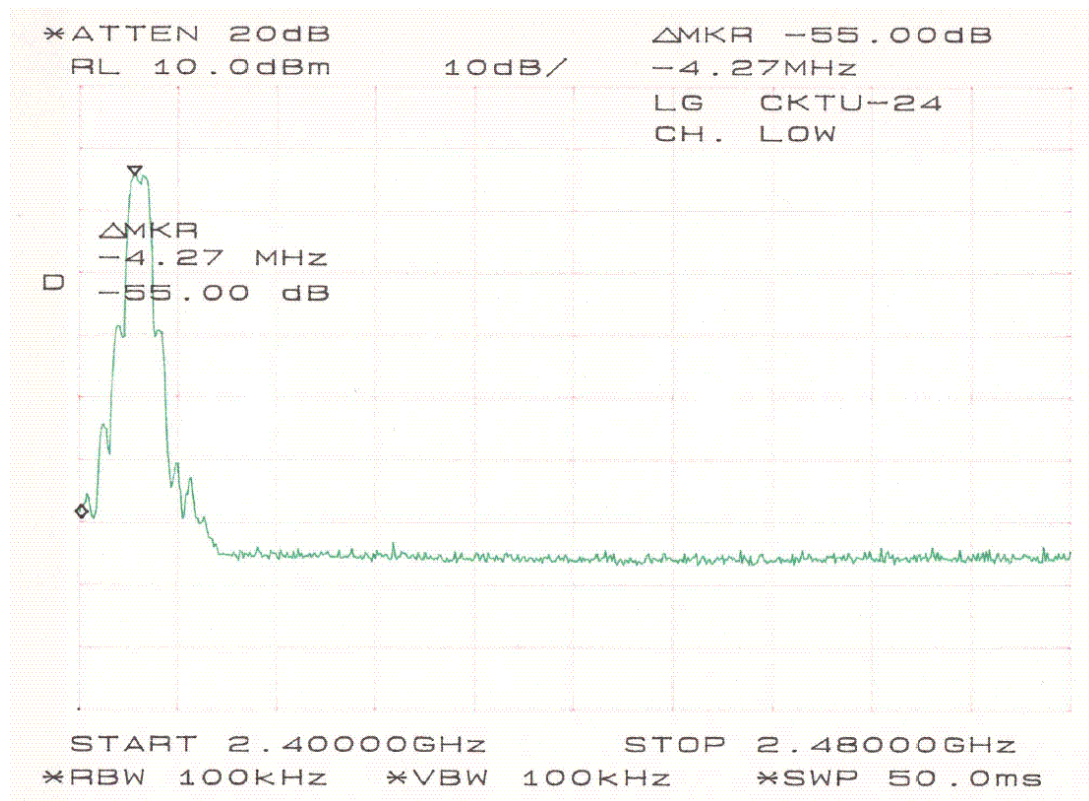
7.2 Measurement Procedure

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 300 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

Band Edge Bandwidth	Page Reference		Test Result
	Base	Handset	
Low Channel	Page 23	Page 24	Compliant
Middle Channel	Page 23	Page 24	Compliant
High Channel	Page 23	Page 24	Compliant





8 - POWER DENSITY

8.1 Standard Applicable

According to §15.247 (d), for direct sequence 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.

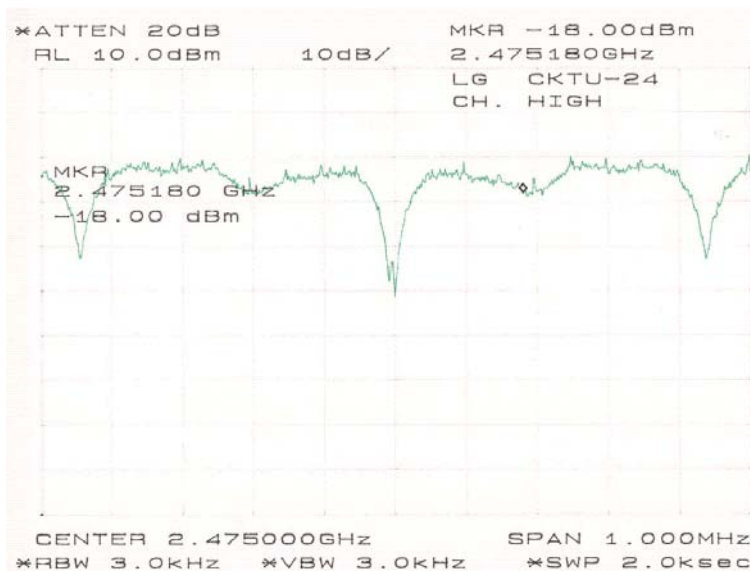
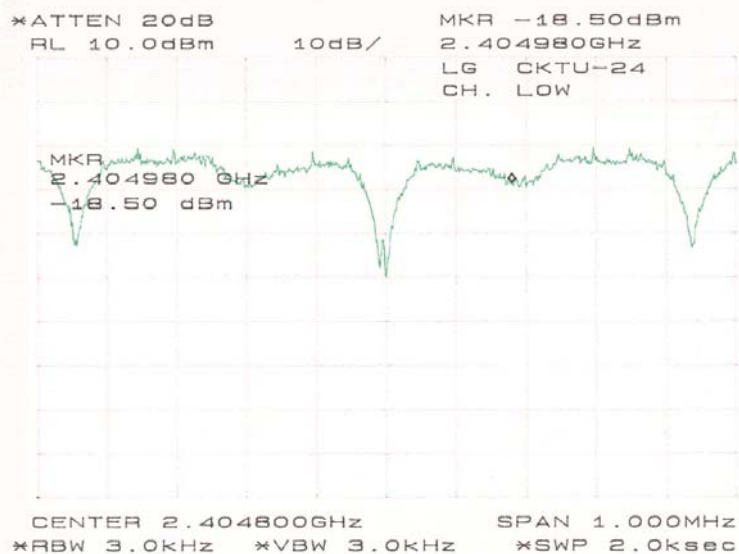
8.2 Measurement Procedure

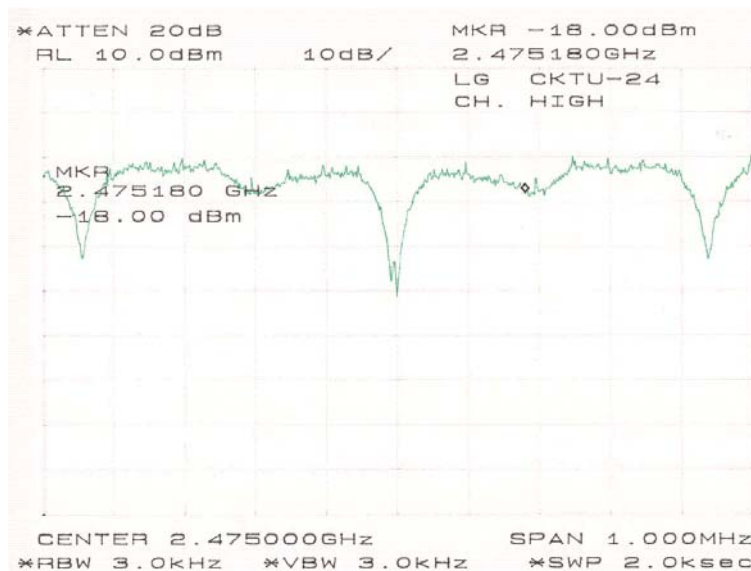
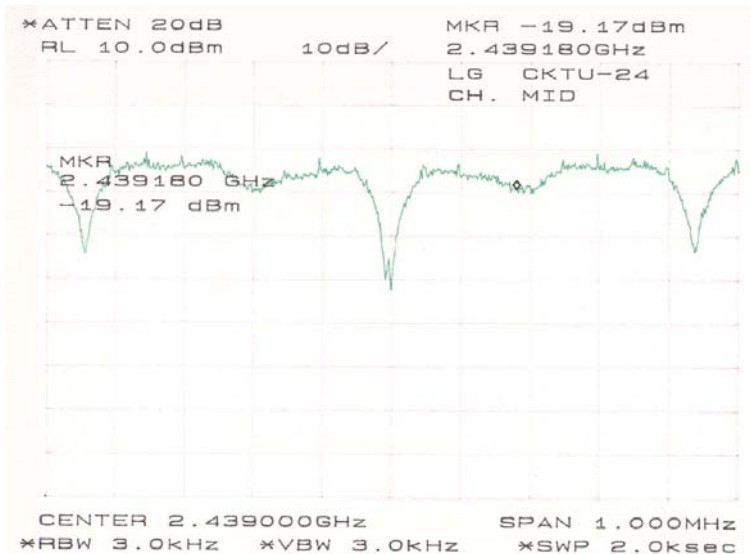
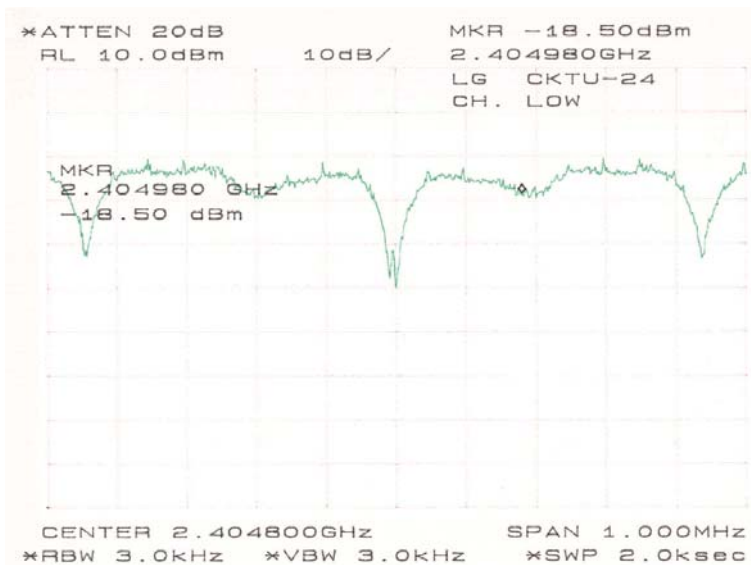
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. 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 zero 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	Page Reference		Test Result
	Base	Handset	
Low Channel	Page 26	Page 27	Compliant
Middle Channel	Page 26	Page 27	Compliant
High Channel	Page 26	Page 27	Compliant





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 Bulletin 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)(4) 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 Permissible 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

Maximum peak output power at antenna input terminal: 9.68 (dBm)

Maximum peak output power at antenna input terminal: 9.29 (mW)

Antenna Gain (typical): 2 (dBi)

Maximum antenna gain: 1.58 (numeric)

Prediction distance: 3 (cm)

Predication frequency: 2400 (MHz)

MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm²)

Power density at predication frequency: 0.13 (mW/cm²)

Maximum allowable antenna gain: 12.17 (dBi)

Test Result

The predicted power density level at 3 cm is 0.13mW/cm². This is below the uncontrolled exposure limit of 1mW/cm² at 2400 MHz.

This base unit is intended to be used at least 20cm away from users and is thus classed as mobile equipment.

This handset unit is intended to be used at least 2.5cm away from users and is thus classed as portable equipment.

** IMPORTANT NOTE**

To comply with FCC RF exposure compliance requirements, the antenna installation and device operating configurations must be satisfied. The Spread Spectrum Portable Transmitter operating with the device and its antenna at a separation distance less than 2.5 cm from all persons.

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 EUT was connected to a 110 VAC / 60 Hz power source and it was placed on the back edge of the test table. The simulator was placed on one side of the EUT, and the telephone was placed on the other side of the EUT. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

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 24000 MHz.

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

Start Frequency	30 MHz
Stop Frequency	24000 MHz
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

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 dB μ V 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:

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

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

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

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, low channel, **-1.7 (Avg.) dB μ V** at **4809.60 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz., **3 meters**

Base, middle channel, **-1.4 (Avg.) dB μ V** at **4878.00 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz., **3 meters**

Base, high channel, **-0.9 (Avg.) dB μ V** at **4950.00 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz., **3 meters**

Base, unintentional emission, **-19.2 dB μ V** at **185.50 MHz** in the **Horizontal** polarization, 30 MHz to 1000 MHz., **3 meters**

Handset, low channel, **-1.1 (Avg.) dB μ V** at **4809.60 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz, **3 meters**

Handset, middle channel, **-1.1 (Avg.) dB μ V** at **4878.00 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz, **3 meters**

Handset, high channel, **-1.5 (Avg.) dB μ V** at **4950.00 MHz** in the **Vertical** polarization, 30 MHz to 24000 MHz, **3 meters**

Handset, unintentional emission, **-20.0 dB μ V** at **336.50 MHz** in the **Horizontal** polarization, 30 MHz to 1000 MHz., **3 meters**

Base Unit

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart B	
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
Base, Low Channel, 30MHz to 24.5GHz, 3 meters											
4809.60	44.9	AVG	130	1.0	V	32.5	4.9	30.0	52.3	54	-1.7
4809.60	42.6	AVG	270	2.5	H	32.5	4.9	30.0	50.0	54	-4.0
Base, Middle Channel, 30MHz to 24.5GHz, 3 meters											
4878.00	45.2	AVG	270	2.0	V	32.5	4.9	30.0	52.6	54	-1.4
4878.00	43.70	AVG	30.00	1.50	H	32.5	4.9	30.0	51.1	54	-2.9
Base, High Channel, 30MHz to 24.5GHz, 3 meters											
4950.00	45.7	AVG	270	1.5	V	32.5	4.9	30.0	53.1	54	-0.9
4950.00	42.2	AVG	90	1.5	H	32.5	4.9	30.0	49.6	54	-4.4
Base, Unintentional Emission, 30MHz to 1000MHz, 3 meters											
185.50	31.6	/	180	1.0	H	13.8	3.9	25.0	24.3	43.5	-19.2
185.50	30.7	/	230	1.0	V	13.8	3.9	25.0	23.4	43.5	-20.1
330.00	31.5	/	270	1.2	H	15.0	2.6	25.0	24.1	46	-21.9
330.00	29.8	/	60	1.5	V	15.0	2.6	25.0	22.4	46	-23.6

* There was no apparent emission after the 2nd harmonics.

Handset Unit

INDICATED			TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 Subpart B	
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
H/S, Low Channel, 30MHz to 24.5GHz, 3 meters											
4809.60	45.5	AVG	270	1.2	V	32.5	4.9	30.0	52.9	54	-1.1
4809.60	45.3	AVG	200	1.5	H	32.5	4.9	30.0	52.7	54	-1.3
H/S, Middle Channel, 30MHz to 24.5GHz, 3 meters											
4870.00	45.5	AVG	270	2.0	V	32.5	4.9	30.0	52.9	54	-1.1
4878.00	43.2	AVG	180	1.0	H	32.5	4.9	30.0	50.6	54	-3.4
H/S, High Channel, 30MHz to 24.5GHz, 3 meters											
4950.00	45.1	AVG	130	2.0	V	32.5	4.9	30.0	52.5	54	-1.5
4950.00	44.90	AVG	270	1.50	H	32.5	4.9	30.0	52.3	54	-1.7
H/S, Unintentional Emission, 30MHz to 1000MHz, 3 meters											
336.50	33.4	/	180	1.2	H	15.0	2.6	25.0	26.0	46	-20.0
210.00	33.4	/	270	1.5	H	12.5	4.7	25.0	25.6	46	-20.4
336.50	32.6	/	60	1.2	V	15.0	2.6	25.0	25.2	46	-20.8
210.00	31.7	/	90	2.0	V	12.5	4.7	25.0	23.9	46	-22.1

* There was no apparent emission after the 2nd harmonics.

12 - CONDUCTED EMISSIONS TEST DATA

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 ± 2.4 dB.

12.2 EUT Setup

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

The EUT was connected to a 110 VAC / 60 Hz power source and it was placed on the back edge of the test table. The simulator was placed on one side of the EUT, and the telephone was placed on the other side of the EUT. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

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.....	450 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 dB μ V 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:

-16.3 dB μ V at 0.780 MHz in the Line mode, 450kHz – 30 MHz

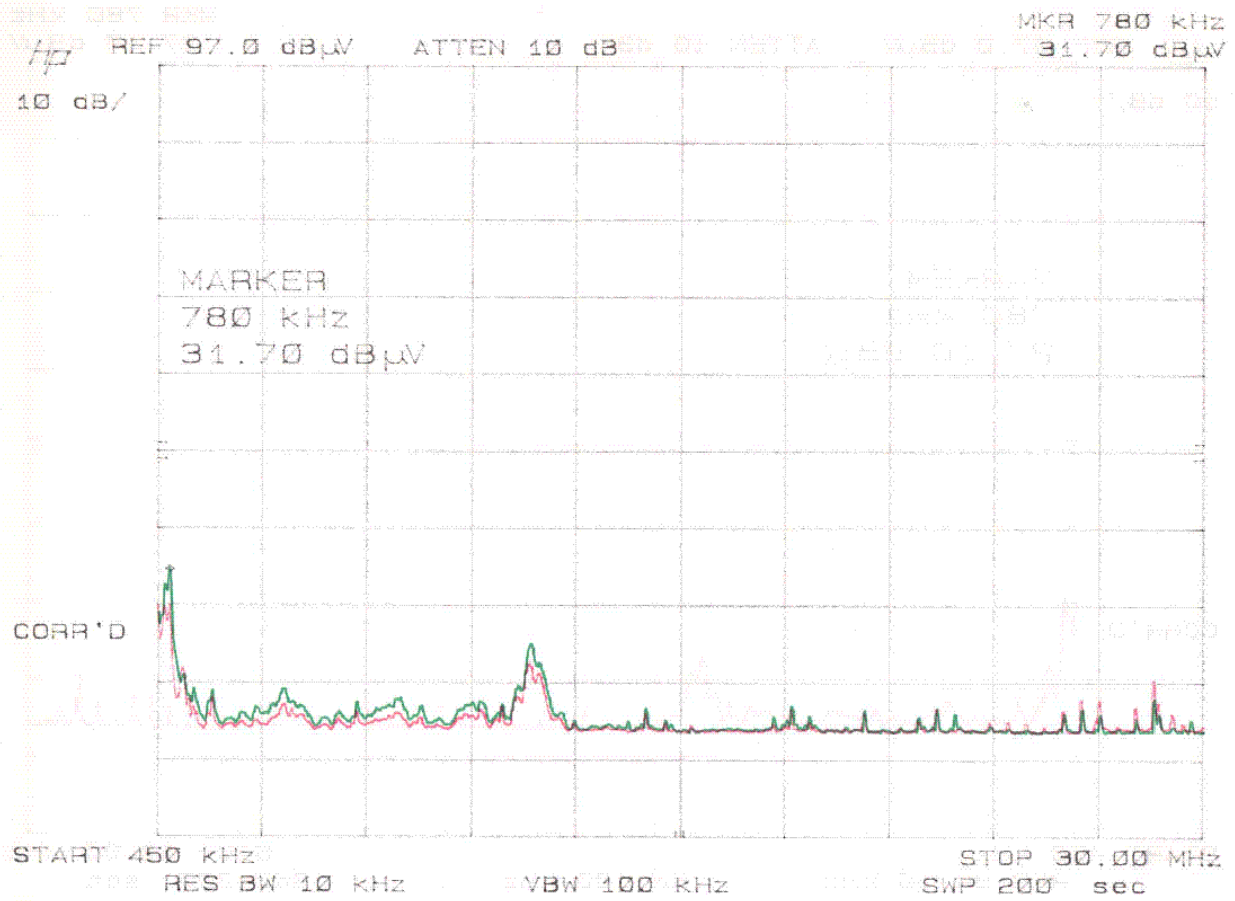
12.6 Conducted Emissions Test Data

12.6.1 Test Data, 0.45 - 30 MHz.

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dB μ V	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dB μ V	Margin dB
0.780	31.7	Qp	Line	48	-16.3
11.000	22.0	Qp	Line	48	-26.0
1.190	18.8	Qp	Neutral	48	-29.2
11.240	18.0	Qp	Neutral	48	-30.0
4.030	16.1	Qp	Line	48	-31.9
1.990	15.0	Qp	Neutral	48	-33.0

12.7 Plot of Conducted Emissions Test Data

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



13 - PROCESSING GAIN

According to §15.247(e), the processing gain of a direct sequence system shall be at least 10 dB. The processing gain represents the improvement to the received signal-to-noise ratio, after filtering to the information bandwidth, from the spreading/dispreading function.

13.1 Brief Explanations on Processing Gain Data

Please refer to the attached file.

13.2 Test Data for Processing Gain

Please refer the attached file.

13.3 Test Setup - Processing Gain

Please refer to the attached file.