ITS Intertek Testing Services
ETL SEMKO

Giant Electronics Limited

Application
For
Permissive Change

2.4GHz Frequency Hopping Spread Spectrum Cordless Phone with Caller ID and DAM

(FCC ID: K7G2G4DSSL2400)

WO# 03050471
TL/Ann Choy
May 16, 2003

FCC ID: K7G2G4DSSL2400

Intertek Testing Services Hong Kong Ltd.
2/F., Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.
Tel: (852) 2173 8888 Fax: (852) 2741 1693

LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Giant Electronics Limited- MODEL: OL2410
FCC ID: K7G2G4DSSL2400

This report concerns (check one) Original Grant_____ Class II Change _X__

Equipment Type: DSS-Part 15 Spread Spectrum Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes___ No X_____

If yes, defer until : _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes_____ No_X__

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [08-20-02 Edition] provision.

Report prepared by:

Tommy Leung
Intertek Testing Services
2/F., Garment Centre,
576 Castle Peak Road,
Kowloon, Hong Kong.
Phone: 852-2173-8538
Fax: 852-2741-1693

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Test Report	Out Band Antenna Conducted Emission Plot	bobantcon.pdf
Test Report	Duty Cycle Calculation and Measurement	bdcc.pdf
Test Setup Photo	Conducted Emission	config photos.doc
Test Report	Conducted Emission Test Result	conduct.pdf
External Photo	External Photo	external photos.doc
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Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label/Location	Label Artwork and Location	label.pdf

EXHIBIT 1
SUMMARY OF TEST RESULTS

1.0 Summary of Test

Giant Electronics Limited- MODEL: OL2410
FCC ID: K7G2G4DSSL2400

TEST	REFERENCE	RESULTS
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Radiated Emission in Restricted Bands	15.247(c)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses a permanently attached antenna which, in accordance to Section 15.203, is considered sufficient to comply with the provisions of this section.

EXHIBIT 2
GENERAL DESCRIPTION

2.0 **General Description**

2.1 Product Description

The OL2410 is a 2.4GHz Frequency Hopping Spread Spectrum Cordless Phone with Caller ID and DAM. It operates at frequency range of 2401.056 MHz to 2482.272 MHz with 95 hopping frequencies. The unit is capable of either tone or pulse dialing. The internal power supply's isolation is accomplished through a power transformer having an adequate dielectric rating. The circuit wiring is consistent under the requirement of part 68.

The handset unit consists of a keypad with twelve standard keys (0,...9,*,#), nine function keys (Mem, Clear/Del, Int, Redial/Pause, Flash, Prog, Cancel, Up, Down). A Phone key is provided to control pick/release telephone line in a toggle base.

The base unit has a intercom key, which is used to communicate with handset unit.

The antennas used in base unit and handset are integral, and the test sample is a prototype.

The circuit description is saved with filename: descri.pdf

The hopping engine steps through a sequence, which is taken form a look-up table in Flash/ROM. All 95 channels are exercised once after a period of approximately 1 second (95 x 10ms); therefore, usage of channels are equal on average.

The receiver is a single conversion superheterodyne receiver. The channel filtering is realized by a fully integrated low IF band-pass filter at a center frequency of 864kHz (inside the IC). When locked to the transmitter, the receiver is able to predict the next slot channel based on the received RFPI (Radio Fixed Part Identity).

Connection between the device and the telephone network is accomplished through the use of USOC RJ11C in the 2-wire loop calling central office line.

2.2 Purpose of Application

The product of application is saved with filename: product change.pdf.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

EXHIBIT 3
SYSTEM TEST CONFIGURATION

3.0 **System Test Configuration**

3.1 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions. The handset was powered by a fully charged battery.

For the measurements, the EUT is attached to a cardboard box if necessary and placed on the wooden turntable. If the base unit attaches to peripherals, they are connected and operational (as typical as possible). The handset is remotely located as far from the antenna and the base as possible to ensure full power transmission from the base. Else, the base is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1MHz or greater for frequencies above 1000MHz.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9kHz to 25GHz.

Only base unit has been modified except its RF module; therefore, all data is derived from base unit.

3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.3 Support Equipment List and Description

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (included inserted cards, which have grants) are:

HARDWARE:

The unit was operated standalone. An AC adapter (provided with the unit) was used to power the device. Its description is listed below.

(1) AC adapter with two meter unshielded power cord permanently affixed.

CABLES:

(1) Telecommunication cable with RJ11C connectors (1m, unshielded), terminated

OTHERS:

(1) A headset for telephone use with 1.2m unshielded cable permanently affixed. (Supplied by ITS)

3.4 Equipment Modification

Any modifications installed previous to testing by Giant Electronics Limited will be incorporated in each production model sold/leased in the United States.

No modifications were installed by ETL Division, Intertek Testing Services Hong Kong Ltd.

All the items listed under section 2.0 of this report are confirmed by:

Confirmed by:

Tommy Leung
Supervisor
Intertek Testing Services Hong Kong Ltd.
Agent for Giant Electronics Limited

Signature

May 16, 2003 Date

EXHIBIT 4
MEASUREMENT RESULTS

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.1 Out of Band Radiated Emissions, FCC Rule 15.247(c):

In any 100kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the following plots for out of band conducted emissions data:

Base Unit: Plot B6a.1 - B6a.2 : Low Channel Emissions
Plot B6b.1 - B6b.2 : Middle Channel Emissions
Plot B6c.1 - B6c.2 : High Channel Emissions
Plot B6d.1 - B6d.2 : Modulation Products Emissions

The plots showed the 2nd harmonic and modulation products at the band edges of 2400 MHz and 2483.5 MHz. In addition, all spurious emission and up to the tenth harmonic was measured and they were found to be at least 26 dB below the highest level of the desired power in the passband.

Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

For electronic filing, the above plots are saved with filenames: bobantcon.pdf.

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.2 Out of Band Radiated Emissions (for emissions in 4.1 above that are less than 26dB below carrier), FCC Rule 15.247(c):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, all emission more than 26dB below fundamental
[ ] See attached data sheet

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.3 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.4 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Example
Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dBµV/m

Level in mV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.5 Radiated Emission Configuration Photograph - Base Unit

Worst Case Radiated Emission
at
7324.992MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: config photos.doc

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

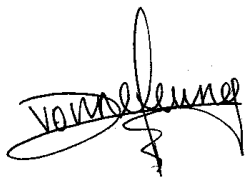
4.6 Radiated Emission Data - Base Unit

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Judgement : Passed by 17.2 dB

****

TEST PERSONNEL:



Tester Signature

Yvonne Leung, Engineer
Typed/Printed Name

May 16, 2003
Date

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410
Mode : TX-Channel 0

Table 1, Base Unit

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net 3m at (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	*4802.112	42.3	34.0	34	10.2	32.1	54	-21.9
V	*12005.280	40.4	40.2	34	10.2	36.4	54	-17.6
V	*19208.448	24.5	45.3	34	10.2	25.6	54	-28.4

NOTES: 1. Peak Detector data

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Test Engineer: Yvonne Leung

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410
Mode : TX-Channel 47

Table 2, Base unit

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net 3m at (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	*4883.328	43.8	34.0	34	10.2	33.6	54	-20.4
V	*7324.992	44.0	37.0	34	10.2	36.8	54	-17.2
V	*12208.320	30.4	40.2	34	10.2	26.4	54	-27.6
V	*19533.312	22.6	45.3	34	10.2	23.7	54	-30.3

NOTES: 1. Peak Detector data

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Test Engineer: Yvonne Leung

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410
Mode : TX-Channel 94

Table 3, Base unit

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Facotr (-dB)	Net 3m at (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	**2482.272	119.1	29.1	34	10.2	104.0	---	---
V	*4964.544	43.0	34.0	34	10.2	32.8	54	-21.2
V	*7446.816	42.0	37.0	34	10.2	34.8	54	-19.2
V	*12411.360	30.6	40.2	34	10.2	26.6	54	-27.4
V	*19858.176	21.7	45.3	34	10.2	22.8	54	-31.2

NOTES: 1. Peak Detector data

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of part 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

** Fundamental emission was measured for determining band-edge compliance of using delta measurement technique.

Test Engineer: Yvonne Leung

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.7 AC Line Conducted Emission, FCC Rule 15.207:

[ ] Not required; battery operation only

[×] Test data attached

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.8 Line Conducted Configuration Photograph - Base Unit

Worst Case Line-Conducted Configuration

For electronic filing, the worst case line conducted configuration photographs are saved with filename: config photos.doc

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

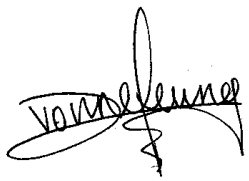
4.9 Line Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit, and the margin of compliance.

Judgement : Passed by more than 20 dB margin

For electronic filing, the worst case line conducted emission data are saved with filename: conduct.pdf

TEST PERSONNEL:



Tester Signature

Yvonne Leung, Engineer
Typed/Printed Name

May 16, 2003
Date

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.10 Radiated Emissions from Digital Section of Transceiver (Transmitter), FCC Ref: 15.109

[ ] Not required - No digital part

[×] Test results are attached

[ ] Included in the separated DOC report.

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

Table 4, Base

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Magin (dB)
V	49.870	34.1	11.9	16	30.0	40.0	-10.0
H	133.330	33.9	12.3	16	30.2	43.5	-13.3
H	168.320	30.5	13.8	16	28.3	43.5	-15.2
H	214.073	38.3	11.8	16	34.1	43.5	-9.4
H	225.360	38.9	11.4	16	34.3	46.0	-11.7
H	254.310	39.1	12.4	16	35.5	46.0	-10.5
H	259.170	41.8	12.4	16	38.2	46.0	-7.8
H	290.278	42.3	13.3	16	39.6	46.0	-6.4
H	311.021	40.5	14.3	16	38.8	46.0	-7.2
H	386.327	34.6	15.4	16	34.0	46.0	-12.0

NOTES: 1. Quasi-peak data is used for the emission below or equal to 1000MHz

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna and average detector are used for the emission over 1000MHz.

Test Engineer: Yvonne Leung

Company: Giant Electronics Limited Date of Test: April 13, 2003 to April 24, 2003
Model: OL2410

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time is 771.4µs x 4 = 3.09msec/10msec for four handsets operation

Base Unit: Duty cycle correction, dB = 20* log (DC)
= 20* log (0.309)
= -10.2dB

X	See attached spectrum analyzer chart (s) for transmitter timing (Base Unit: Plot B7)
	See transmitter timing diagram provided by manufacturer
	Not applicable, duty cycle was not used.

For electronic filing, the above plots are saved with filename: bdcc.pdf.

EXHIBIT 5
EQUIPMENT PHOTOGRAPHS

5.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.doc & internal photos.doc

EXHIBIT 6
PRODUCT LABELLING

6.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf

EXHIBIT 7
TECHNICAL SPECIFICATIONS

7.0 **Technical Specifications**

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf, and circuit.pdf respectively.