Giant Electronics Limited

Application
For
Certification

2.4GHz Direct Sequence Spread Spectrum
Cordless Phone with Answering Machine Caller ID

(FCC ID: K7GG2490)

WO# 00085021
WL/at
September 21, 2000

FCC ID: K7GG2490

LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Giant Electronics Limited - MODEL: G2490
FCC ID: K7GG2490

This report concerns (check one☺ Original Grant X Class II Change_____

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 [10-1-96 Edition] provision.

Report prepared by:

Wilson Loke
Intertek Testing Service
2/F., Garment Centre,
576 Castle Peak Road,
Kowloon, Hong Kong.
Phone: 852-2173-8575
Fax: 852-2741-1693

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Cover Letter	Letter of Agency	letter.pdf
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Test Setup Photo	Radiated Emission for Handset	handset1.jpg, handset2.jpg
Test Report	Maximum Output Power Plot	bmaxop.pdf, hmaxop.pdf
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EXHIBIT 1
SUMMARY OF TEST RESULTS

1.0 Summary of Test

Giant Electronics Limited - MODEL: G2490
FCC ID: K7GG2490

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
Out of Band Antenna Conducted Emission	15.247(c)	Pass
Out of Band Radiated Emission	15.247 (c)	Not Applicable
Radiated Emission in Restricted Bands	15.35 (b)(c)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Processing Gain Measurements	15.247	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 G2490 is a 2.4GHz Direct Sequence Spread Spectrum Cordless Phone with Answering Machine & Caller ID. 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,*,#), seven function keys (Caller ID, Flash, Redial, Mute, Memory, Volume up, Volume down). A Phone key is provided to control pick/release telephone line in a toggle base.

The base unit has a page key, which is used to page the handset unit. In addition, there are other keys such as Volume up, Volume down, Play, Forward, Backward, Greetings, Memo and Answering Machine ON / OFF which are for the answering machine feature.

The circuit description is saved with filename: descri.pdf

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 Related Submittal(s) Grants

This is an application for Certification of a DSS-Part 15 Spread Spectrum Transceiver. The device is also subject to Part 68 Registration.

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. All emissions greater than 20 dBμV/m are recorded.

Radiated emission measurement were performed from 30 MHz to tenth harmonics.

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 permantly affixed.

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:

Wilson Loke
Manager
Intertek Testing Services Hong Kong Ltd.
Agent for Giant Electronics Limited

_____Signature

September 22, 2000 Date

EXHIBIT 4
MEASUREMENT RESULTS

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b) :

[ ] The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[×] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximum RES BW and power was read directly in dBm. External attenuation and cable loss were compensated by adding to SA raw reading.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6) dBm.

(Base Unit) Maximum Antenna Gain = 2			
Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2404.8	16.3	42.7
Middle Channel:	2439.0	17.3	53.7
High Channel:	2475.0	17.7	58.9

Cable loss : 2.0 dB External Attenuation : 0 dB

Cable loss, external attenuation: [ ] included in OFFSET function
[x] added to SA raw reading

EUT Transmit Antenna Gain (dBi) + dBm max. Output level = 19.7 dBm (36 dBm or less)

Please refer to the attached plots for details:

Plot B1a: Low Channel Output Power
Plot B1b: Middle Channel Output Power
Plot B1c: High Channel Output Power

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b) - Continued:

(Handset Unit) Maximum Antenna Gain = 2 dB			
Frequency (MHz)		Output in dBm	Output in mWatt
Low Channel:	2404.8	11.4	13.8
Middle Channel:	2439.0	11.7	14.8
High Channel:	2475.0	12.3	17.0

Cable loss : 2.0 dB External Attenuation : 0 dB

Cable loss, external attenuation: [ ] included in OFFSET function
[x] added to SA raw reading

EUT Transmit Antenna Gain (dBi) + dBm max. Output level = 14.3 dBm (36 dBm or less)

Please refer to the attached plots for details:

Plot H1a: Low Channel Output Power
Plot H1b: Middle Channel Output Power
Plot H1c: High Channel output Power

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

It should be noted that the maximum conducted power for this cordless telephone system is 19.7 dBm which is 93.3 mW. This low energy level ensures that the public is not exposed to radio frequency energy levels in excess of the Commission’s guidelines as stipulated in Parts 1.1307(b)(1) and 2.1093.

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

(Base Unit)	
Frequency (MHz)	6 dB Bandwidth (kHz)
2404.8	1509

Refer to the following plots for 6 dB bandwidth sharp:

Plot B2a: Low Channel 6 dB RF Bandwidth
Plot B2b: Middle Channel 6 dB RF Bandwidth
Plot B2c: High Channel 6 dB RF Bandwidth

For electronic filing, the above plots are saved with filename: b6dB.pdf

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2) - Continued:

(Handset Unit)	
Frequency (MHz)	6 dB Bandwidth (kHz)
2475.0	1490

Refer to the following plots for 6 dB bandwidth sharp:

Plot H2a: Low Channel 6 dB RF Bandwidth
Plot H2b: Middle Channel 6 dB RF Bandwidth
Plot H2c: High Channel 6 dB RF Bandwidth

For electronic filing, the above plots are saved with filename: h6dB.pdf

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.3 Maximum Power Density Reading, FCC Rule 15.247(d) :

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. Id there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz - Fstart, kHz)/3kHz

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated by adding to the SA raw reading.

(Base Unit)	
Frequency (MHz)	Power Density (dBm)
2475.0	3.75

Frequency Span = 1500kHz

Sweep Time = Frequency Span/3kHz
= 500 seconds

Cable Loss: 2.0 dB

Refer to the following plots for power density data :

Plot B3a: Low Channel 6 dB power density
Plot B3b: Middle Channel 6 dB power density
Plot B3c: High Channel 6 dB power density

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

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Maximum Power Density Reading, FCC Rule 15.247(d) - Continued:

(Handset Unit)	
Frequency (MHz)	Power Density (dBm)
2475.0	-2.89

Frequency Span = 2000kHz

Sweep Time = Frequency Span/3kHz
= 666.667 seconds
= 700 seconds

Cable Loss: 2.0 dB

Refer to the following plots for power density data :

Plot H3a: Low Channel 6 dB power density
Plot H3b: Middle Channel 6 dB power density
Plot H3c: High Channel 6 dB power density

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

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(c):

In any 100 kHz 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 100 kHz 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:

Plot B4a.1 - B4a.2: Low Channel Emissions
Plot B4b.1 - B4b.2: Middle Channel Emissions
Plot B4c.1 - B4c.2: High Channel Emissions
Plot B4d.1 - B4d.2: Modulation Products Emissions
Plot H4a.1 - H4a.2: Low Channel Emissions
Plot H4b.1 - H4b.2: Middle Channel Emissions
Plot H4c.1 - H4c.2: High Channel Emissions
Plot H4d.1 - H4d.2: Modulation Products Emissions

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

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.5 Out of Band Radiated Emissions (for emissions in 4. 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
[ ] See attached data sheet

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

Radiated emission measurements were performed from 30 MHz to 10000 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

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.

4.7 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

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

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

FS = RR + LF

where FS = Field Strength in dBμV/m
RR = RA - AG in dBμV
LF = CF + AF in dB

Assume a receiver reading of 52.0 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, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
FS = RR + LF
FS = 23 + 9 = 32 dBμV/m

RR = 23.0 dBμV
LF = 9.0 dB

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

4.8 Radiated Emission Configuration Photograph - Base Unit

Worst Case Radiated Emission

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: base1.jpg and base2.jpg

4.9 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 5.5 dB

****

TEST PERSONNEL:

Tester Signature

H. Y. Vu, Engineer
Typed/Printed Name

September 21, 2000
Date

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490
Mode : TX-Channel 1

Table 1, Base Unit

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	*4806.747	46.7	34.0	34	46.7	54.0	-7.3
H	7214.613	35.9	37.0	34	38.9	54.0	-15.1
H	9619.484	41.9	39.2	34	47.1	54.0	-6.9

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H.Y.Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490
Mode : TX-Channel 20

Table 2, Base unit

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	*4879.082	46.1	34.0	34	46.1	54.0	-7.9
H	*7318.623	35.4	37.0	34	38.4	54.0	-15.6
H	9758.164	42.4	39.2	34	47.6	54.0	-6.4

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490
Mode : TX-Channel 40

Table 3, Base unit

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	*4950.000	45.3	34.0	34	45.3	54.0	-8.7
H	*7425.000	35.9	37.0	34	38.9	54.0	-15.1
H	9900.000	43.3	39.2	34	48.5	54.0	-5.5

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

4.10 Radiated Emission Configuration Photograph - Handset

Worst Case Radiated Emission

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: handset1.jpg and handset2.jpg

4.11 Radiated Emission Data - Handset

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

Judgement : Passed by 9.5 dB

****

TEST PERSONNEL:

Tester Signature

H. Y. Vu, Engineer
Typed/Printed Name

September 21, 2000
Date

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490
Mode : TX-Channel 1

Table 4, Handset

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
V	*4809.857	44.5	34.0	34	44.5	54.0	-9.5
H	7214.752	39.5	37.0	34	42.5	54.0	-11.5
H	9619.714	35.8	39.2	34	41.0	54.0	-13.0

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H.Y.Vu

Company: Giant Electronics Limited
Model: G2490
Mode : TX-Channel 20

Date of Test: August 26, 2000

Table 5, Handset

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	*4878.247	43.6	34.0	34	43.6	54.0	-10.4
H	*7317.351	38.8	37.0	34	41.8	54.0	-12.2
H	9756.459	35.4	39.2	34	40.6	54.0	-13.4

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited
Model: G2490
Mode : TX-Channel 40

Date of Test: August 26, 2000

Table 6, Handset

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	*4950.251	43.5	34.0	34	43.5	54.0	-10.5
H	*7425.364	39.1	37.0	34	42.1	54.0	-11.9
H	9900.502	35.2	39.2	34	40.4	54.0	-13.6

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.12 AC Line Conducted Emission, FCC Rule 15.207:

[ ] Not required; battery operation only

[×] Test data attached

4.13 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: conduct1.jpg to conduct3.jpg

4.14 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

TEST PERSONNEL:

Tester Signature

H. Y. Vu, Engineer
Typed/Printed Name

September 21, 2000
Date

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.15 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: August 26, 2000
Model: G2490

Table 7, Base

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	144.016	29.2	11.7	16	24.9	43.5	-18.6
H	172.810	29.2	14.7	16	27.9	43.5	-15.6
H	201.603	35.1	11.8	16	30.9	43.5	-12.6
H	211.220	42.2	11.8	16	38.0	43.5	-5.5
H	220.816	42.1	11.8	16	37.9	46.0	-8.1
H	230.402	47.6	11.4	16	43.0	46.0	-3.0
H	240.008	42.7	11.4	16	38.1	46.0	-7.9
H	249.604	42.4	11.4	16	37.8	46.0	-8.2
H	268.811	38.2	12.4	16	34.6	46.0	-11.4
H	278.407	36.1	13.3	16	33.4	46.0	-12.6
H	297.598	37.5	13.3	16	34.8	46.0	-11.2
H	345.615	33.5	14.6	16	32.1	46.0	-13.9

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Table 8, Handset

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	86.407	39.5	8.0	16	31.5	40.0	-8.5
H	115.210	35.8	12.8	16	32.6	43.5	-10.9
H	129.612	36.9	12.6	16	33.5	43.5	-10.0
H	139.213	38.7	11.9	16	34.6	43.5	-8.9
H	148.814	39.5	11.6	16	35.1	43.5	-8.4
H	158.415	40.6	12.4	16	37.0	43.5	-6.5
H	177.611	36.3	15.5	16	35.8	43.5	-7.7
H	196.813	32.4	17.1	16	33.5	43.5	-10.0
H	201.613	38.0	11.8	16	33.8	43.5	-9.7
H	225.616	37.4	11.4	16	32.8	46.0	-13.2
H	244.818	41.5	11.4	16	36.9	46.0	-9.1

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Table 8, Handset (Cont'd…)

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	249.618	42.2	11.4	16	37.6	46.0	-8.4
H	254.400	46.2	12.4	16	42.6	46.0	-3.4
H	264.000	45.6	12.4	16	42.0	46.0	-4.0
H	268.820	43.2	12.4	16	39.6	46.0	-6.4
H	273.631	44.1	12.4	16	40.5	46.0	-5.5
H	283.222	42.3	13.3	16	39.6	46.0	-6.4
H	288.022	38.6	13.3	16	35.9	46.0	-10.1
H	292.823	41.6	13.3	16	38.9	46.0	-7.1
H	302.486	39.2	14.3	16	37.5	46.0	-8.5
H	312.025	39.8	14.3	16	38.1	46.0	-7.9

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Table 8, Handset (Cont'd…)

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	321.626	41.1	14.3	16	39.4	46.0	-6.6
H	331.227	42.0	14.6	16	40.6	46.0	-5.4
H	350.429	40.2	14.9	16	39.1	46.0	-6.9
H	374.431	36.4	14.9	16	35.3	46.0	-10.7
H	388.833	33.0	15.4	16	32.4	46.0	-13.6
H	441.638	35.1	16.3	16	35.4	46.0	-10.6
H	480.021	34.9	17.3	16	36.2	46.0	-9.8
H	489.622	36.2	17.3	16	37.5	46.0	-8.5
H	508.824	33.4	18.0	16	35.4	46.0	-10.6
H	537.627	36.2	18.2	16	38.4	46.0	-7.6

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

Table 8, Handset (Cont'd…)

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dBµV/m)	Limit (dBµV/m)	Margin (dB)
H	556.829	38.5	18.3	16	40.8	46.0	-5.2
H	566.430	40.2	18.3	16	42.5	46.0	-3.5
H	576.031	39.4	18.6	16	42.0	46.0	-4.0
H	585.632	40.4	18.6	16	43.0	46.0	-3.0
H	595.233	36.4	18.6	16	39.0	46.0	-7.0
H	604.834	39.9	18.9	16	42.8	46.0	-3.2
H	624.036	39.6	18.9	16	42.5	46.0	-3.5
H	643.238	38.5	19.2	16	41.7	46.0	-4.3
H	662.431	36.5	19.6	16	40.1	46.0	-5.9
H	681.633	32.9	20.7	16	37.6	46.0	-8.4

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 detector data for frequencies below 1000 MHz and average detector data for frequencies over 1000 MHz.

Test Engineer: H. Y. Vu

Company: Giant Electronics Limited Date of Test: August 26, 2000
Model: G2490

4.16 Processing Gain Measurements, FCC Ref: 15247(e)

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

	Refer to attached test procedure and data sheets.
X	Refer to circuit analysis and processing gain data provided by manufacturer

4.17 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 in 100 msec/100

Duty cycle correction, dB = 20* log (DC)

	See attached spectrum analyzer chart (s) for transmitter timing
	See transmitter timing diagram provided by manufacturer
×	Not applicable, duty cycle was not used.

Processing Gain Measurement
Result
(Supplied by Manufacturer)

Test Setup Description:

The processing gain was measured using the CW jamming margin method described by FCC recommended test procedure, as described FCC-97-114. The specific test diagram is illustrated below.

All test equipment and the EUT were allowed to warm up for one hour prior to start of test to minimize drift over time. All test equipment had valid calibration. Calibration of carrier and interferer levels was performed several times during testing with no observed changes.

The measurements were performed at the mid center channel at 2440.8 MHz, over a range of 2441.8-2439.8 MHz. The measurements made across the center (+/-) 1 MHz should be used for calculation of Gp since that bandwidth represents the receiver passband. The computer set signal was (+/-) 1 MHz to handset and receive the signal from base.

A signal level 20 dB above threshold was chosen so that thermal noise would not effect the processing gain measurements. The measured threshold of the radio was -92 dBm at BER = 1 x 10^{6}, therefore the signal was -72 dBm. The measured signal level at the output of the 6 dB splitter was -42 dBm (PSA), used for calculating Gp.

For the jammer signal, -44 dBm at the generator corresponds to -70 dBm (Pj) at the input of base phone.

Test Equipment:

HP Signal Generator, Model No. 8672A
HP Spectrum Analyzer, Model No.: 8566B

Explanation of Results:

The following notations are used on the spreadsheet data:

Pg: Power at Generator in dBm (as indicated by generator display)

Pj: Power of interfereer

Ps: Power of carrier at power meter test report (initial calibration)

J/S: Jammer to Signal ratio, Pj-Ps (dB) (calculated in spreadsheet)

Gp: Processing Gain = (S/N)o + Lsys + J/S:\
Where Lsys = 1 dB (system loss);
(S/N)o = 14.0 dB for GMSK at BT = 0.5;
Gp = 11.0 + 1 + J/S = 12 + J/S

All measurements inside the (+/-) 1 MHz passband of the receiver give Gp results that exceed the minimum required value of 10 dB. Elimination of the worst 20% measurements was therefore not needed in order to meet the requirements (see spreadsheet and plotted results).

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Table 9

Processing Gain Measurement

Frequency (MHz)	Pg dBm	Pj dBm	Psa (handset) dBm	Ps (handset)	J/S dB	Gp dB
2441.80	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2441.75	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2441.70	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2441.65	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2441.60	-36.5	-62.5	-40.2	-70.2	7.7	19.7
2441.55	-42.0	-68.0	-40.2	-70.2	2.2	14.2
2441.50	-41.5	-67.5	-40.2	-70.2	2.7	14.7
2441.45	-41.0	-67.0	-40.2	-70.5	3.2	15.2
2441.40	-41.5	-67.5	-40.2	-70.2	2.7	14.7
2441.35	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2441.30	-44.5	-70.5	-40.2	-70.2	-0.3	11.7
2441.25	-45.5	-71.5	-40.2	-40.2	-1.3	10.7
2441.20	-45.0	-71.0	-40.2	-70.2	-0.8	11.2
2441.15	-43.5	-69.5	-40.2	-70.2	0.7	12.7
2441.10	-43.0	-69.0	-40.2	-70.2	1.2	13.2
2441.05	-42.8	-68.8	-40.2	-70.2	1.4	13.4
2441.00	-38.0	-64.0	-40.2	-70.2	6.2	18.2

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Table 10

Processing Gain Measurement

Frequency (MHz)	Pg dBm	Pj dBm	Psa (handset) dBm	Ps (handset)	J/S dB	Gp dB
2440.95	-43.0	-69.0	-40.2	-70.2	1.2	13.2
2440.90	-41.0	-67.0	-40.2	-70.2	3.2	15.2
2440.85	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2440.80	-39.0	-65.0	-40.2	-70.2	5.2	17.2
2440.75	-38.0	-64.0	-40.2	-70.2	6.2	18.2
2440.70	-42.5	-68.5	-40.2	-70.2	1.7	13.7
2440.65	-42.0	-68.0	-40.2	-70.2	2.2	14.2
2440.60	-38.5	-64.5	-40.2	-70.5	5.7	17.7
2440.55	-43.0	-69.0	-40.2	-70.2	1.2	13.2
2440.50	-42.0	-68.0	-40.2	-70.2	2.2	14.2
2440.45	-43.0	-69.0	-40.2	-70.2	1.2	13.2
2440.40	-42.0	-68.0	-40.2	-40.2	2.2	14.2
2440.35	-43.5	-69.5	-40.2	-70.2	0.7	12.7
2440.30	-43.5	-69.5	-40.2	-70.2	0.7	12.7
2440.25	-40.5	-66.5	-40.2	-70.2	3.7	15.7
2440.20	-39.5	-65.5	-40.2	-70.2	4.7	16.7
2440.15	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2440.10	-42.0	-68.0	-40.2	-70.2	2.2	14.2
2440.05	-41.0	-67.0	-40.2	-70.2	3.2	15.1
2440.00	-38.0	-64.0	-40.2	-70.2	6.2	18.9
2439.95	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2439.90	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2439.85	-37.0	-63.0	-40.2	-70.2	7.2	19.2
2439.80	-37.0	-63.0	-40.2	-70.2	7.2	19.2

EXHIBIT 5
EQUIPMENT PHOTOGRAPHS

5.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: ophoto1.jpg to ophoto2.jpg & iphoto1.jpg to iphoto10.jpg

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.

EXHIBIT 8
INSTRUCTION MANUAL

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual1.pdf and manual2.pdf

Please note that the required FCC Information to the User is saved with filename: FCC information.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

EXHIBIT 9
SECURITY CODE INFORMATION

9.0 Security code information

The telephone has an internal security code of over 65,000 possible combinations. Each time the HANDSET is placed on the base cradle, the code is randomly set to a new combination.