

Southtel (HK) Ltd.

Application
For
Certification

43/49MHz 25 Channel Cordless Telephone

(FCC ID:N2WBE-25F)

WO# 9810442
CKL/at
January 12, 1999

- The test results reported in this report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
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FCC ID: N2WBE-25F

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MEASUREMENT/TECHNICAL REPORT

**Southtel (HK) Ltd. - MODEL: Bell Equipment BE-25F
TT Systems Corporation TT-25F
FCC ID: N2WBE-25F**

This report concerns (check one): Original Grant Class II Change

Equipment Type: Cordless Telephone (example: computer, modem, transmitter, etc.)

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

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

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-1-96 Edition] provision.

Report prepared by:

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Intertek Testing Services.
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List of attached file

Exhibit type	File Description	filename
Cover Letter	Letter of Agency	letter.pdf
Test Report	Test Report	report.doc
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission for Base	base.jpg
Test Setup Photo	Radiated Emission for Headset	headset.jpg
Test Setup Photo	Conducted Emission	conduct1.jpg, conduct2.jpg
Test Report	Conducted Emission Test Result	conduct.pdf
Test Report	Base Bandwidth Plot	bsbw.pdf
Test Report	Headset Bandwidth Plot	hsbw.pdf
External Photo	External Photo	ophoto1.jpg, ophoto3.jpg
Internal Photo	Internal Photo	iphoto1.jpg to iphoto10.jpg
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Test Report	Auto Channel Selection Mechanism	auto.pdf

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EXHIBIT 1
GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

The BE-25F and TT-25F are 43/49 MHz 25 Channel Cordless Phone. These two models refer to the same product, varying only in cosmetic details. 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 headset unit consists of a keypad with twelve standard keys (0,...9,*,#), four function keys (Mem, Redial, Flash, Intercom), and one channel switch key. A talk 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 the headset unit and a standard keypad for speakerphone function.

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.

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1.2 Related Submittal(s) Grants

This is an Application for Certification of a cordless telephone system. Two transmitters are included in this Application. This specific report details the emission characteristics of each transmitter. The receivers are subject to the verification authorization process, in accordance with 15.101(b). A verification report has been prepared for the receiver sections of each device. The device is also subject to Part 68 Registration.

1.3 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. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 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 2
SYSTEM TEST CONFIGURATION

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2.0 **System Test Configuration**

2.1 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 headset was powered by a fully charged battery.

For the measurements, the EUT is attached to a cardboard box and placed on the wooden turntable. If the base unit attaches to peripherals, they are connected and operational (as typical as possible). The headset 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. All emissions greater than 20 dB μ V/m are recorded.

Radiated emission measurement were performed from 30 MHz to 1000 MHz.

2.2 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.

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2.3 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) Simple telephone

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2.4 Equipment Modification

Any modifications installed previous to testing by Southtel (HK) Ltd. 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:

*Alfred Lo
Technical Supervisor
Intertek Testing Services
Agent for Southtel (HK) Ltd.*



Signature

January 12, 1999 _____ Date

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EXHIBIT 3
EMISSION RESULTS

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3.0 **Emission Results**

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.

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3.1 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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}/\text{m}$

RR = $RA - AG$ in $\text{dB}\mu\text{V}$

LF = $CF + AF$ in dB

Assume a receiver reading of 52.0 $\text{dB}\mu\text{V}$ 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 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

$RA = 52.0 \text{ dB}\mu\text{V}/\text{m}$

$AF = 7.4 \text{ dB}$

$CF = 1.6 \text{ dB}$

$AG = 29.0 \text{ dB}$

$FS = RR + LF$

$FS = 23 + 9 = 32 \text{ dB}\mu\text{V}/\text{m}$

$RR = 23.0 \text{ dB}\mu\text{V}$

$LF = 9.0 \text{ dB}$

Level in $\mu\text{V}/\text{m}$ = Common Antilogarithm $[(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$

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3.2 Radiated Emission Configuration Photograph - Base Unit

Worst Case Radiated Emission

at 46.973 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: base.jpg

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3.3 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 4.0 dB

TEST PERSONNEL:



Tester Signature

Tommy W. L. Leung, Engineer
Typed/Printed Name

January 12, 1999

Date

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Company: Southtel (HK) Ltd.
Model: Bell Equipment BE-25F
Mode : TX-Channel 1

Date of Test: December 20, 1998

Table 1, Base unit

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	43.722	79.6	10	16	73.6	80.0	-6.4
H	87.445	32.8	9	16	25.8	40.0	-14.2
V	131.168	27.8	13	16	24.8	43.5	-18.7
V	174.891	22.9	19	16	25.9	43.5	-17.6

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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Company: Southtel (HK) Ltd.
Model: Bell Equipment BE-25F
Mode : TX-Channel 25

Date of Test: December 20, 1998

Table 2, Base unit

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	46.973	81.0	11	16	76.0	80.0	-4.0
V	93.944	31.4	10	16	25.4	43.5	-18.1
V	140.917	29.4	13	16	26.4	43.5	-17.1
V	187.887	24.6	16	16	24.6	43.5	-18.9

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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Company: Southtel (HK) Ltd.

Date of Test: December 20, 1998

Model: Bell Equipment BE-25F

Mode : Stand by

Table 3, Base unit

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	34.656	30.6	10	16	24.6	40	-15.4
V	69.312	32.9	7	16	23.9	40	-16.1

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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Company: Southtel (HK) Ltd.
Model: Bell Equipment BE-25F
Mode : Charging

Date of Test: December 20, 1998

Table 4, Base unit

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	34.656	30.6	10	16	24.6	40	-15.4
V	69.312	32.9	7	16	23.9	40	-16.1

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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3.4 Radiated Emission Configuration Photograph - Headset

Worst Case Radiated Emission

at 49.991 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: headset.jpg

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3.5 Radiated Emission Data - Headset

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

Judgement : Passed by 12.8 dB

TEST PERSONNEL:



Tester Signature

Tommy W. L. Leung, Engineer
Typed/Printed Name

January 12, 1999
Date

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Company: Southtel (HK) Ltd.

Date of Test: December 20, 1998

Model: Bell Equipment BE-25F

Mode : TX-Channel 1

Table 5, Headset

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	48.764	71.8	11	16	66.8	80.0	-13.2
H	198.158	25.9	16	16	25.9	43.5	-17.6

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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Company: Southtel (HK) Ltd.

Date of Test: December 20, 1998

Model: Bell Equipment BE-25F

Mode : TX-Channel 24

Table 6, Headset

Radiated Emissions

Polarity	Frequency (M H z)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V /m)	Limit (dB μ V /m)	Margin (dB)
V	49.991	72.2	11	16	67.2	80.0	-12.8
H	181.186	26.4	16	16	26.4	43.5	-17.1

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 signs (-) in the margin column signify levels below the limits.

Test Engineer: Tommy W. L. Leung

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3.6 Line Conducted Configuration Photograph - Base Unit

Worst Case Line-Conducted Configuration

Front View

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3.6 Line Conducted Configuration Photograph (cont.) - Base Unit

Worst Case Line-Conducted Configuration

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conduct1.jpg & conduct2.jpg

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3.7 Line Conducted Emission Configuration Data

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

Judgement : Passed by 20 dB

TEST PERSONNEL:



Tester Signature

Tommy W. L. Leung, Engineer
Typed/Printed Name

January 12, 1999

Date

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Company: Southtel (HK) Ltd.
Model: Bell Equipment BE-25F

Date of Test: December 20, 1998

Conducted Emissions

For electronic filing, the conducted emission test result is saved with filename: conduct.pdf

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EXHIBIT 4
FREQUENCY DEVIATION

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4.0 **Frequency Deviation**

Two stability tests were performed -- Frequency stability versus input voltage and frequency stability versus temperature. For both measurements, a 1 GHz frequency counter with temperature controlled time base is used.

The counter is coupled to the transmitter by coiling a pickup wire over the transmitter antenna or directly attaching it to the antenna, assuming a 50Ω antenna is used.

The frequency stability is measured at room temperature by varying the supply voltage (AC or DC, as required) from 85% through 115% of normal operating voltage. This test is not applicable if the unit uses battery power. For battery powered equipment, the batteries are new and fully charged.

Stability versus temperature testing is carried out with the aid of a Tabai Espec Corp, Model PR-3F(W) environmental chamber. The following procedure is followed during testing:

1. Cool the device to -20°C and allow it to stabilize for 30 minutes. Record the frequency.
2. Heat the oven to $+50^{\circ}\text{C}$ and allow it to stabilize for 30 minutes. Record the frequency of operation.
3. Compare the measurements and a room temperature measurement against the assigned frequency tolerance.

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

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4.1.1 Measurement Data - Base Unit

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
1	43.72000	43.71988	-0.00027
2	43.74000	43.73986	-0.00032
3	43.82000	43.81986	-0.00032
4	43.84000	43.83988	-0.00027
5	43.92000	43.91986	-0.00032
6	43.96000	43.95987	-0.00030
7	44.12000	44.11989	-0.00025
8	44.16000	44.15985	-0.00034
9	44.18000	44.17987	-0.00029
10	44.20000	44.19988	-0.00027
11	44.32000	44.31985	-0.00034
12	44.36000	44.35985	-0.00034
13	44.40000	44.39987	-0.00028

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4.1.1 Measurement Data - Base Unit (Cont'd...)

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
14	44.46000	44.45985	-0.00034
15	44.48000	44.47985	-0.00034
16	46.61000	46.60987	-0.00028
17	46.63000	46.62984	-0.00034
18	46.67000	46.66985	-0.00032
19	46.71000	46.70985	-0.00032
20	46.73000	46.72983	-0.00036
21	46.77000	46.76983	-0.00036
22	46.83000	46.82986	-0.00030
23	46.87000	46.86990	-0.00021
24	46.93000	46.92984	-0.00034
25	46.97000	46.96986	-0.00030

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4.1.2 Measurement Data - Base Unit - Channel 1

Frequency Stability

Frequency Stability versus Source Voltage

	Voltage (Vac)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance % (x 10⁻³)
Nominal	120	43,720.00	43,719.88	-0.12	-0.27
85 %	102	43,720.00	43,719.85	-0.15	-0.34
115 %	138	43,720.00	43,719.85	-0.15	-0.34

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance (%) (x 10⁻³)
-20	43,720.00	43,720.49	0.49	1.12
25	43,720.00	43,719.88	-0.12	-0.27
50	43,720.00	43,719.80	-0.20	-0.46

Notes: All readings taken at antenna of base.

Legend (where appropriate)

* No emission was recorded at this environment. Thus, no frequency deviation can be found.

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4.1.2 Measurement Data - Base Unit - Channel 25

Frequency Stability

Frequency Stability versus Source Voltage

	Voltage (Vac)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance % ($\times 10^{-3}$)
Nominal	120	46,970.00	46,969.86	-0.14	-0.30
85 %	102	46,970.00	46,969.82	-0.18	-0.38
115 %	138	46,970.00	46,969.83	-0.17	-0.36

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance (%) ($\times 10^{-3}$)
-20	46,970.00	46,970.52	0.52	1.11
25	46,970.00	46,969.86	-0.14	-0.30
50	46,970.00	46,969.83	-0.17	-0.36

Notes: All readings taken at antenna of base.

Legend (where appropriate)

* No emission was recorded at this environment. Thus, no frequency deviation can be found.

Test Results : From the two sets of tables for Base Unit - channel 1 & channel 25, the largest deviation from nominal frequency was 490 Hz, which was 0.0011% compared to the standard test frequency. The required minimum standard is 0.01% in §15.233(g)

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4.2.1 Measurement Data - Headset

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
1	48.76000	48.76028	0.00057
2	48.84000	48.84028	0.00057
3	48.86000	48.86027	0.00055
4	48.92000	48.92026	0.00053
5	49.02000	49.02028	0.00057
6	49.08000	49.08028	0.00057
7	49.10000	49.10026	0.00053
8	49.16000	49.16028	0.00057
9	49.20000	49.20027	0.00055
10	49.24000	49.24026	0.00053
11	49.28000	49.28028	0.00057
12	49.36000	49.36028	0.00057
13	49.40000	49.40027	0.00055

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4.2.1 Measurement Data - Headset (Cont'd...)

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
14	49.46000	49.46029	0.00059
15	49.50000	49.50028	0.00057
16	49.67000	49.67027	0.00054
17	49.84500	49.84529	0.00058
18	49.86000	49.86028	0.00056
19	49.77000	49.77027	0.00054
20	49.87500	49.87528	0.00056
21	49.83000	49.83028	0.00056
22	49.89000	49.89028	0.00056
23	49.93000	49.93029	0.00058
24	49.99000	49.99029	0.00058
25	49.97000	49.97028	0.00056

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4.2.2 Measurement Data - Headset - Channel 1

Frequency Stability

Frequency Stability versus Source Voltage

	Voltage (Vdc)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance % (x 10⁻³)
Nominal	3.6	48,760.00	48,760.22	0.22	0.45
85 %	3.06	48,760.00	48,760.28	0.28	0.57
115 %	4.14	48,760.00	48,760.34	0.34	0.70

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance (%) (x 10⁻³)
-20	48,760.00	48,761.25	1.25	2.56
25	48,760.00	48,760.28	0.28	0.57
50	48,760.00	48,759.71	-0.29	-0.59

Notes: All readings taken at antenna of headset.

Legend (where appropriate)

* No emission was recorded at this environment. Thus, no frequency deviation can be found.

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4.2.2 Measurement Data - Headset - Channel 25

Frequency Stability

Frequency Stability versus Source Voltage

	Voltage (Vdc)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance % ($\times 10^{-3}$)
Nominal	3.6	49,970.00	49,970.28	0.28	0.56
85 %	3.06	49,970.00	49,970.21	0.21	0.42
115 %	4.14	49,970.00	49,970.33	0.33	0.66

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance (%) ($\times 10^{-3}$)
-20	49,970.00	49,971.28	1.28	2.56
25	49,970.00	49,970.28	0.28	0.56
50	49,970.00	49,969.75	-0.25	-0.50

Notes: All readings taken at antenna of headset.

Legend (where appropriate)

* No emission was recorded at this environment. Thus, no frequency deviation can be found.

Test Results : From the two sets of tables for Headset - channel 1 & channel 25, the largest deviation from nominal frequency was 1280 Hz, which was 0.0026% compared to the standard test frequency. The required minimum standard is 0.01% in §15.233(g)

EXHIBIT 5
OPERATING BANDWIDTH

INTERTEK TESTING SERVICES

5.0 Operating Bandwidth

For measurements of bandwidth, the following procedure was followed by the test engineer:

- (1) Set up the equipment such that the antenna is located close enough to give a full scale deflection of the unmodulated carrier.
- (2) Plot the unmodulated carrier. Any residual guard tones should be left in place, as these will be present at all times in actual operation.
- (3) Plot the bandwidth with all alerting tones active. These include ringing and "call" signals from the base, and any intercom functions available in the headset.
- (4) Determine the worst case bandwidth using the following procedure:
 - (a) Disable all internal modulations, if possible.
 - (b) Apply a 2500 Hz signal to the audio input.
 - (c) Vary the input signal level and observe on the spectrum analyzer the waveform. Vary unit until a maximum deflection is observed. Record the input signal level. Record and plot the bandwidth deflection (100% modulation) measured at -26 dBc.
 - (d) **FOR A DEVICE WITH MODULATION LIMITING:**
Apply a 2500 Hz signal with the input level 16 dB greater than the level which produces 50% modulation. Plot and record the bandwidth.
 - (e) **FOR A DEVICE WITHOUT MODULATION LIMITING:**
Apply a 2500 Hz signal with the input level set for 85% modulation. If not possible, maximize the modulation percentage. Plot and record bandwidth.
- (5) Complete the tables on the following pages.

INTERTEK TESTING SERVICES

5.1 Base Unit - Channel 1

Operating Bandwidth

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-6.25/6.13	26	±10
- 20	66.31	N/A
+ 20	62.46	N/A

Base Unit - Channel 25

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-6.13/6.25	26	±10
- 20	64.47	N/A
+ 20	63.80	N/A

Test Result: From the above two tables for Base Unit-channel 1 & channel 25, the modulated signal from base unit closest to band edge was 3.75 kHz above the lower band edge 43.710 MHz and 3.75 below the upper limit of 46.980 MHz according to §15.233(d)

Bandwidth Plot - Base Unit

For electronic filing, the bandwidth plot is saved with filename: bsbw.pdf

INTERTEK TESTING SERVICES

5.2 Headset - Channel 1

Operating Bandwidth

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-6.50/6.25	26	±10
- 20	69.93	N/A
+ 20	67.54	N/A

Headset - Channel 25

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-6.38/6.12	26	±10
- 20	69.74	N/A
+ 20	68.95	N/A

Test Result: From the above two tables for Headset-channel 1 & channel 25, the modulated signal from headset closest to band edge was 3.5 kHz above the lower band edge 48.750 MHz according to §15.233(d)

INTERTEK TESTING SERVICES

Bandwidth Plot - Headset

For electronic filing, the bandwidth plot is saved with filename: hsbw.pdf

INTERTEK TESTING SERVICES

EXHIBIT 6
EQUIPMENT PHOTOGRAPHS

INTERTEK TESTING SERVICES

6.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: ophoto1.jpg to ophoto3.jpg & iphoto1.jpg to iphoto10.jpg

EXHIBIT 7
PRODUCT LABELLING

INTERTEK TESTING SERVICES

7.0 **Product Labelling**

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

EXHIBIT 8
TECHNICAL SPECIFICATIONS

8.0 **Technical Specifications**

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

EXHIBIT 9
INSTRUCTION MANUAL

INTERTEK TESTING SERVICES

9.0 Instruction Manual

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

Please note that the required FCC Information to the User can be found on Page 9 and 10 of this manual.

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

EXHIBIT 10
SECURITY CODE INFORMATION

INTERTEK TESTING SERVICES

10.0 Security code information

The telephone has an internal security code over 65,000 possible combinations. Each time you pick up the HEADSET, the code is randomly set to a new combination.

Communication between HEADSET and BASE UNIT may not be possible in any of the following situation:

1. After a power failure.
2. After relocation the BASE UNIT by disconnecting the AC adaptor.
3. After replacing the HEADSET battery.

To reset, place the HEADSET on the BASE UNIT for 2 seconds.

EXHIBIT 11
AUTOMATIC CHANNEL SELECTION

INTERTEK TESTING SERVICES

11.0 Automatic Channel Selection

The mechanism of automatic channel selection is saved with filename: auto.pdf