Intertek ETL SEMKO

Hui Zhou ADL Electronics Co., Ltd.

Application
For
Certification

46MHz/49MHz 10 Channel Analog Modulation Cordless Phone with Caller ID

(FCC ID: S2I-26760)

05025151
TL/ Ann Choy
February 25, 2005

Intertek Testing Services Hong Kong Ltd.
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LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Hui Zhou ADL Electronics Co., Ltd. - MODEL: FS26760XXX-A, FH26760XXX-A, EX26760XXX-A, TW26760XXX-A, IN26760XXX-A, SB26760XXX-A

FCC ID: S2I-26760

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

Equipment Type: ETS - Cordless Telephone System

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 [12-08-03 Edition] provision.

Report prepared by: Tommy Leung
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List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.doc
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission for Base	config photos.doc
Test Setup Photo	Radiated Emission for Handset	config photos.doc
Test Report	Conducted Emission Test Result	conduct.pdf
Test Setup Photo	Conducted Emission	config photos.doc
Test Report	Base Bandwidth Plot	bsbw.pdf
Test Report	Handset Bandwidth Plot	hsbw.pdf
External Photo	External Photo	external photos.doc
Internal Photo	Internal Photo	internal photos.doc
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
User Manual	FCC Information	fcc information.pdf

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EXHIBIT 1
GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The FS26760 is a 46MHz/49MHz 10 Channel Analog Modulation Cordless Phone with 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,*,#), eight function keys (Channel/Exit, Store/Menu, </>, Intercom, Flash/Del, Redial/Pause, Volume, Mute), and one channel switch key. 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.

The antenna used in base unit is integral. The extendable antenna used in handset is integral. The test sample is a prototype.

The model FS26760 is one of the models FS26760XXX-A, and the models FH26760XXX-A, EX26760XXX-A, TW26760XXX-A, IN26760XXX-A, and SB26760XXX-A are the same as the models FS26760XXX-A in hardware aspect. The letters “XXX” on the model numbers are in term of any letters or numbers with different color. The difference in model numbers serve as marketing strategy. The suffix “A” serve as internal control only.

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.

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 (2001). 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

2.0 System Test Configuration

2.1 Justification

For emissions testing, the equipment under test (EUT) was setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The handset was powered by a fully charged battery. The antenna of handset was fully extended during radiated emission testing.

For the measurements, the EUT is attached to a plastic support 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. All emissions greater than 20 dBμV/m are recorded.

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.

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) Base Unit: An AC adaptor (220-240VAC to 9VDC 200mA, Model: G090020D22) (Supplied by Client)
(2) Handset Unit: A “Ni-cd” type rechargeable battery (3.6V, 300mAh) (Supplied by Client)

CABLES:

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

OTHERS:

(1) RadioShack step-up voltage converter (120VAC to 240VAC, Model: 273-1411) (Supplied by Intertek)

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.5 Equipment Modification

Any modifications installed previous to testing by Hui Zhou ADL Electronics Co., 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:

Tommy Leung
Assistant Manager
Intertek Testing Services
Agent for Hui Zhou ADL Electronics Co., Ltd.

tlll. _____ Signature

MAR 4, 2005 _____ Date

EXHIBIT 3
EMISSION RESULTS

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.

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

3.2 Radiated Emission Configuration Photograph - Base Unit

Worst Case Radiated Emission

at 46.730 MHz

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

3.3 Radiated Emission Data

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

Judgement : Passed by 1.5 dB

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TEST PERSONNEL:

Tester Signature

Kenneth C. C. Lam, Senior Lead Engineer
Typed/Printed Name

Feb 25, 2005
Date

Company: Hui Zhou ADL Electronics Co., Ltd. Date of Test: February 9-21, 2005
Model: FS26760
Mode : TX - Channel 5

Table 1, Base unit

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	46.730	82.6	16	11.9	78.5	80.0	-1.5
V	93.460	41.2	16	9.4	34.6	43.5	-8.9
V	140.190	38.0	16	11.7	33.7	43.5	-9.8
V	186.920	31.9	16	16.7	32.6	43.5	-10.9
V	233.650	45.5	16	11.4	40.9	46.0	-5.1
V	280.380	36.9	16	13.3	34.2	46.0	-11.8
V	327.110	34.6	16	14.6	33.2	46.0	-12.8
V	373.840	34.1	16	14.9	33.0	46.0	-13.0
V	420.570	33.3	16	15.9	33.2	46.0	-12.8
V	467.300	38.8	16	16.8	39.6	46.0	-6.4

NOTES: 1. Peak detector is used for the emission measurement.

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. Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9kHz to 500MHz.

Test Engineer: Kenneth C. C. Lam

3.4 Radiated Emission Configuration Photograph - Handset

Worst Case Radiated Emission

at 49.875 MHz

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

3.5 Radiated Emission Data

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

Judgement : Passed by 4.4 dB

****

TEST PERSONNEL:

Tester Signature

Kenneth C. C. Lam, Senior Lead Engineer
Typed/Printed Name

Feb 25, 2005
Date

Company: Hui Zhou ADL Electronics Co., Ltd. Date of Test: February 9-21, 2005
Model: FS26760
Mode : TX - Channel 5

Table 2, Handset

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
V	49.875	79.7	16	11.9	75.6	80.0	-4.4
V	99.750	39.0	16	10.6	33.6	43.5	-9.9
V	149.625	38.5	16	11.6	34.1	43.5	-9.4
H	199.500	32.3	16	17.2	33.5	43.5	-10.0
H	249.375	37.5	16	11.4	32.9	46.0	-13.1
H	299.250	33.5	16	13.3	30.8	46.0	-15.2
H	349.125	31.2	16	14.6	29.8	46.0	-16.2

NOTES: 1. Peak detector is used for the emission measurement.

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. Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9kHz to 500MHz.

Test Engineer: Kenneth C. C. Lam

3.6 Line Conducted Configuration Photograph - Base

Worst Case Line-Conducted Configuration

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

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 more than 20 dB

TEST PERSONNEL:

Tester Signature

Kenneth C. C. Lam, Senior Lead Engineer
Typed/Printed Name

Feb 25, 2005
Date

Company: Hui Zhou ADL Electronics Co., Ltd. Date of Test: February 9-21, 2005
Model: FS26760

Conducted Emissions

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

EXHIBIT 4
FREQUENCY DEVIATION

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^{o}C and allow it to stabilize for 30 minutes. Record the frequency.

2. Heat the oven to +50^{o}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 ±0.01% of the operating frequency.

4.1.1 Measurement Data - Base Unit

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
1	46.61000	46.609880	-0.00026
2	46.63000	46.629880	-0.00026
3	46.67000	46.669880	-0.00026
4	46.71000	46.709880	-0.00026
5	46.73000	46.729880	-0.00026
6	46.77000	46.769880	-0.00026
7	46.83000	46.829750	-0.00053
8	46.87000	46.870000	0.00000
9	46.93000	46.929880	-0.00026
10	46.97000	46.969880	-0.00026

4.1.2 Measurement Data - Base Unit - Channel 5

Frequency Stability

Frequency Stability versus Source Voltage

	Voltage (Vac)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance% (x 10^{-3})
Norminal	120.0	46730.00	46729.88	-0.12	-0.26
85%	102.0	46730.00	46729.88	-0.12	-0.26
115%	138.0	46730.00	46730.00	0.00	0.00

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance% (x 10^{-3})
-20	46730.00	46729.63	-0.37	-0.79
25	46730.00	46729.88	-0.12	-0.26
50	46730.00	46730.13	0.13	0.28

Test Results: From the above sets of table for base unit, the largest deviation for nominal frequency was -370Hz, which was -0.00079% compared to the standard test frequency. The required minimum standard is ±0.01% in §15.233(g).

4.2.1 Measurement Data - Handset Unit

Channel Frequency

Channel	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance %
1	49.67000	49.970020	0.00004
2	49.84500	49.845020	0.00004
3	49.86000	49.860020	0.00004
4	49.77000	49.770020	0.00004
5	49.87500	49.875020	0.00004
6	49.83000	49.830020	0.00004
7	49.89000	49.890020	0.00004
8	49.93000	49.930140	0.00028
9	49.99000	49.990020	0.00004
10	49.97000	49.970020	0.00004

4.2.2 Measurement Data - Handset - Channel 5

Frequency Stability

Frequency Stability versus Temperature

Temperature (°C)	Assigned Frequency (kHz)	Measured Frequency (kHz)	Frequency deviation (kHz)	Tolerance% (x 10^{-3})
-20	49875.00	49.875.50	0.50	1.00
25	49875.00	49.875.02	0.02	0.04
50	49875.00	49874.50	-0.50	-1.00

Test Results: From the above table for handset unit, the largest deviation for nominal frequency was ±500Hz, which was ±0.001% compared to the standard test frequency. The required minimum standard is ±0.01% in §15.233(g).

EXHIBIT 5
OPERATING BANDWIDTH

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 handset.

(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 at 100% bandwidth deflection and determine the bandwidth as follows (d) or (c).

   (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.

5.1 Base Unit - Channel 5

Operating Bandwidth

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-8.500	26.0	-10
8.650	26.0	10
-20.000	67.2	N/A
20.000	69.5	N/A

Test Result: From the above table for Base Unit - Channel 5, the modulated signal from base unit closest to band edge was 1.350kHz below the upper band edge 46.740MHz according to §15.233(d).

Bandwidth Plot - Base Unit

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

5.2 Handset - Channel 5

Operating Bandwidth

kHz from Carrier	Amplitude Down from Carrier (dB)	Limit (kHz)
-8.630	26.0	-10
8.630	26.0	10
-20.000	67.3	N/A
20.000	67.9	N/A

Test Result: From the above table for Handset - Channel 5, the modulated signal from handset closest to band edge was 1.370kHz below the upper band edge 49.885MHz and above the lower bandedge 49.865MHz according to §15.233(d).

Bandwidth Plot - Handset

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

EXHIBIT 6
EQUIPMENT PHOTOGRAPHS

6.0 Equipment Photographs

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

EXHIBIT 7
PRODUCT LABELLING

7.0 **Product Labelling**

For electronic filing, the FCC ID label 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 respectively.

EXHIBIT 9
INSTRUCTION MANUAL

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 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 10
SECURITY CODE INFORMATION

10.0 **Security code information**

The telephone has an internal security code with 65536 possible combinations. Each time the HANDSET is registered with the BASE UNIT, the code is randomly set to a new combination via RF link.