

Cirkisys Electronics Limited

Application
For
Certification
(FCC ID: OBMALPHA-1)

Superheterodyne Receiver

WO# 9810693
CKL/at
January 12, 1999

- The test results reported in this test 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: OBMALPHA-1

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MEASUREMENT/TECHNICAL REPORT

Cirkisys Electronics Limited - MODEL: 6015N
FCC ID: OBMALPHA-1

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

Equipment Type: Superheterodyne Receiver (example: computer, printer, modem, 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 B for unintentional radiator - the new 47 CFR [10-1-96 Edition] provision.

Report prepared by:

Wilbur Ng
Intertek Testing Services
Hong Kong Ltd.
2/F., Garment Centre,
576, Castle Peak Road,
Kowloon, Hong Kong
Phone: 852-746-8680
Fax: 852-785-5487

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List of attached file

Exhibit type	filename
Test Report	report.doc
Test Setup Photo	radiated.jpg
External Photo	ophoto1.jpg to ophoto2.jpg
Internal Photo	iphoto1.jpg to iphoto5.jpg
Block Diagram	block.pdf
Schematics	circuit.pdf
ID Label/Location	label.pdf
User Manual	manual.pdf
Cover Letter	letter.pdf
Circuit Description	descri.pdf

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 **General Description**

1.1 Product Description

The Alpha One Pager is a POCSAG alpha-numeric pager. It can operate at frequency 928MHz or 932 MHz by choosing corresponding value of X1. Detailed information can refer to circuit diagram. It has two key and 16 character (14-segment type) LCD display. It is controlled by Samsung KS57C21116 4-bit MCU. The POSCAG data is received by the decoder SM8212B and will store to the memory (RAM) of the MCU. The user can use the key to read the received message. The message will display the LCD glass and will scroll if more than 16 character. When the new user message is arrived, the pager can set the alert signal to user such as buzzing sound or vibration from vibrator.

1.2 Related Submittal(s) Grants

This is a single application for Certification of a receiver.

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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 radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site 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 placed on file with the FCC.

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EXHIBIT 2

SYSTEM TEST CONFIGURATION

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2.0 **System Test Configuration**

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (1992).

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The device was powered from a new AAA battery.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on the turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it received continuously.

2.3 Support Equipment List and Description

This product was tested in standalone configuration.

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2.4 Equipment Modification

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

No modifications were installed by Intertek Testing Services.

2.5 Special Accessories

There are no special accessories necessary for compliance of this product.

Confirmed by:

Wilbur Ng
Assistant Manager - EMC
Intertek Testing Services
Hong Kong Ltd.
Agent for Cirkisys Electronics Limited



Wilbur Ng
Signature

January 19, 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 dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ 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 dB μ V/m

RR = RA - AG in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

$$AF = 7.4 \text{ dB}$$

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

$$CF = 1.6 \text{ dB}$$

$$LF = 9.0 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

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

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

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

Front View

at 910.620 MHz

For electronic filing, the front view and back view of test configuration saved filename: radiated.jpg.

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3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 9.2 dB

*All readings are peak unless stated otherwise

TEST PERSONNEL:



Signature

Billy C. M. Chow, Compliance Engineer

Typed/Printed Name

January 19, 1999

Date

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Company: Cirkisys Electronics Limited
Model: 6015N (928MHz, 2400 bps)

Date of Test: January 4, 1999

Table 1

FCC Class B Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
H	906.614	27.2	32.0	16	43.2	54	-10.8
H	1813.228	51.5	26.5	34	44.0	54	-10.0

NOTES: 1. Negative sign in the column shows value below limit.

2. Peak Detector Data.
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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.

Test Engineer: Billy C. M. Chow

INTERTEK TESTING SERVICES

Company: Cirkisys Electronics Limited
Model: 6015N (932MHz, 2400 bps)

Date of Test: January 4, 1999

Table 2

FCC Class B Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
H	910.620	27.8	33.0	16	44.8	54	-9.2
H	1821.124	51.4	26.5	34	43.9	54	-10.1

NOTES: 1. Negative sign in the column shows value below limit.

2. Peak Detector Data.
3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances 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.

Test Engineer: Billy C. M. Chow

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EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

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4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: ophoto1.jpg to ophoto2.jpg for external photo, iphoto1.jpg to iphoto5.jpg for internal photo.

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EXHIBIT 5

PRODUCT LABELLING

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5.0 **Product Labelling**

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

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EXHIBIT 6

TECHNICAL SPECIFICATIONS

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6.0 Technical Specifications

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

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EXHIBIT 7

INSTRUCTION MANUAL

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7.0 **Instruction Manual**

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

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

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EXHIBIT 8

MISCELLANEOUS INFORMATION

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8.0 **Miscellaneous Information**

This miscellaneous information includes details of the stabilizing process (including a plot of the stabilized waveform), the test procedure and calculation of factors such as pulse desensitization and averaging factor.

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8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

This device is a Superheterodyne receiver and pulse desensitivity was not applicable for this device.

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8.3 Calculation of Average Factor

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

This device is a Superheterodyne receiver.

It is not necessary to apply average factor to the measurement results.

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8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of Superheterodyne receivers operating under the Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992. Superheterodyne receivers are stabilized prior to measurement by generating a signal well above the receiver threshold whose frequency is tuned until the emissions stabilize into a line spectrum. The signal is usually generated as CW with a Marconi 2022D signal generator and a short whip antenna and is at a level of several hundred to several thousand mV/m. Plots of the stabilized signal will be shown. If a modulated signal is used, it will be noted.

The equipment under test (EUT) is attached to a cardboard box and placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 kHz to 30 MHz.

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8.4 Emissions Test Procedures (cont)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 1992.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.