

October 12, 2002

*Richfield Electronics (China) Ltd.
Unit 14 & 16, 7/F.,
Shing Yip Industrial Bldg.,
19-21 Shing Yip Street, Kwun Tong, Hong Kong.*

Dear Z. T. Yun:

Enclosed you will find your file copy of a Part 15 report (FCC ID: QKQRF-2001).

*For your reference, TCB will normally take another 15-20 days for reviewing the report.
Approval will then be granted when no query is sorted.*

Please contact me if you have any questions regarding the enclosed material.

Sincerely,

A handwritten signature in black ink, appearing to read "Alfred Lo". The signature is written in a cursive style with a large initial "A".

*Alfred Lo
Senior Technical Supervisor*

Enclosure

FCC ID: QKQRF-2001

Richfield Electronics (China) Ltd.

Application
For
Certification
(FCC ID: QKQRF-2001)

Transmitter

WO# 0213749
TC/sa
October 12, 2002

FCC ID: QKQRF-2001

- 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.
- This report shall not be reproduced except in full without prior authorization from Intertek Testing Services Hong Kong Limited
- For Terms And Conditions of the services, it can be provided upon request.
- The evaluation data of the report will be kept for 3 years from the date of issuance.

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LIST OF EXHIBITS

INTRODUCTION

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MEASUREMENT/TECHNICAL REPORT

Richfield Electronics (China) Ltd. - MODEL: AT2001
FCC ID: QKQRF-2001

This report concerns (check one):		Original Grant <u>X</u>	Class	II	Change

Equipment Type: <u>Low Power Transmitter</u> (example: computer, printer, modem, etc.)					

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?		Yes <u> </u>	No <u>X</u>		
		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?		<u>Yes</u>	No <u>X</u>		
If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [12-18-01 Edition] provision.					

Report prepared by:		Alfred Lo			
		Intertek Testing Services			
		Hong Kong Ltd.			
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		576, Castle Peak Road,			
		Kowloon, Hong Kong			
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List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated.pdf
External Photo	External Photo	ophoto.pdf
Internal Photo	Internal Photo	iphoto.pdf
Block Diagram	Block Diagram	block.pdf
Test Report	Bandwidth Plot	bw.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

This Equipment Under Test (EUT) is a low power audio transmitter, which can be operated at 106.7 MHz to 107.9 MHz (Total 7 channels). The main function of the EUT is use to transmit the modulated signal that can be received by common FM broadcast radio. It is powered by three new AA size batteries. The power indicator (red LED) on the top of the EUT body will be lighted while the power switch was press. On the other hand, there have an AUDIO IN jack which provided for audio source and a dip switch for the channel selection. The detail channel selection setting can be found on the user manual.

For electronic filing, the brief circuit description is saved with filename: descri.pdf

The Model: AT-2001P, AT-2000, AT-2002, AT-2003, AT-2004, AT-2005, AT-2006, AT-2007, AT-2008 and AT-2009 is the same as the Model: AT2001 in hardware aspect. The difference in model number serves as marketing strategy.

1.2 Related Submittal(s)

This is a single application for certification of a transmitter.

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1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated Emission measurement was performed in Open Area Test Sites and Conducted Emission was performed in shield room. 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 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).

The EUT was powered by 3 new 'AA' size batteries. The unit was operated standalone and placed in the center of the table.

For simplifying of test, the unit was operated transmit continuously.

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. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

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 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 transmits the typical signal continuously.

2.3 Special Accessories

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

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2.4 Equipment Modification

Any modifications installed previous to testing by Richfield Electronics (China) Ltd. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

2.5 Support Equipment List and Description

1. Walkman
2. 1.8 meter cable
(Provided by ITS)

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

Confirmed by:

Alfred Lo
Senior Technical Supervisor - Home Entertainment Electronics
Intertek Testing Services Hong Kong Ltd.
Agent for Richfield Electronics (China) Ltd.



Signature

October 12, 2002 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 reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

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

where FS = Field Strength in 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

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

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

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

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8.3 Field Strength Calculation (cont) ☐

Example

Assume a receiver reading of 62.0 dB μ 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. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

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

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

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

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

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

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
at
320.122 MHz

For electronic filing, the front view and back view of the test configuration photographs are saved with filename: radiated.pdf respectively.

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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 7.1 dB margin

TEST PERSONNEL:



Signature

Terry C. H. Chan, Compliance Engineer
Typed/Printed Name

October 12, 2002
Date

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Company: Richfield Electronics (China) Ltd.

Date of Test: October 3, 2002

Model: AT2001

Worst Case Operating Mode: Transmitting Mode

Table 1
Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V/m)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
H	106.711	42.4	12.2	16	38.6	48.0	-9.4
H	107.915	41.0	12.5	16	37.5	48.0	-10.5
H	213.419	36.0	11.8	16	31.8	43.5	-11.7
H	215.820	35.7	11.8	16	31.5	43.5	-12.0
H	320.122	40.6	14.3	16	38.9	46.0	-7.1
H	321.727	39.1	14.3	16	37.4	46.0	-8.6
H	426.830	33.8	16.3	16	34.1	46.0	-11.9
H	431.654	33.6	16.3	16	33.9	46.0	-12.1
H	533.538	32.1	18.2	16	34.3	46.0	-11.7
H	539.567	32.0	18.2	16	34.2	46.0	-11.8
H	640.246	32.4	19.2	16	35.6	46.0	-10.4
H	647.480	31.5	19.2	16	34.7	46.0	-11.3

- NOTES:
1. Peak Detector is used below 1000MHz unless otherwise stated.
 2. 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.
 3. Negative sign in the column shows value below limit.
 4. Horn antenna and average detector are used for the emission over 1000MHz.
 5. The radiated emission test was observed up to 2GHz.
- * 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.

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Test Engineer: Terry C. H. Chan

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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.pdf for external photo, and iphoto1.pdf for internal photo.

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EXHIBIT 5

PRODUCT LABELLING

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5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the 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 tested EUT are saved with filename: block.pdf and circuit.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. Moreover, it was said that the declaration which mention in following pages will also be committed at the time.

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EXHIBIT 8

MISCELLANEOUS INFORMATION

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8.0 Miscellaneous Information

The miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

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8.1 Measured Bandwidth

The plot on saved in bw.pdf shows the fundamental emission which are with/without applying modulation. A 15kHz signal is modulated and the maximum input signal is also applied. From the plot, the bandwidth is observed to be confined within a band 200KHz. The 200KHz band is wholly within the frequency range of 88-108MHz.

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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

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8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

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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 Low Power Transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992.

The equipment under test (EUT) is 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 EUT 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) Ø

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 when frequency is 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.