Road Champs Limited

Application
For
Certification
(FCC ID: OTA53010T)

Transmitter

WO# 0000951
CKL/at
February 12, 2000

FCC ID : OTA53010T

LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

Road Champs Limited - MODEL: 53010
FCC ID: OTA53010T

February 12, 2000

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

Equipment Type: Low Power Transmitter (example: computer, printer, modem, etc.)

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:

Wilbur Ng
Intertek Testing Services
2/F., Garment Center,
576, Castle Peak Road,
HONG KONG
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Fax: 852-2742-9149

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Exhibit type	File Description	filename
Cover Letter	Letter of Agency	letter.pdf
Test Report	Test Report	report.doc
Operation Description	Technical Description	descrip.pdf
Test Setup Photo	Radiated Emission	radiated1.jpg to radiated2.jpg
Test Report	Bandwidth Plot	bw.pdf
External Photo	External Photo	ophoto1.jpg, ophoto2.jpg
Internal Photo	Internal Photo	iphoto1.jpg to iphoto2.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	Average Factor	af.pdf

EXHIBIT 1

GENERAL DESCRIPTION

{PRIVATE }1.0 **General Description**{tc \l 1 "1.0 **General Description**"}

{PRIVATE }1.1 Product Description{tc \l 2 "1.1 Product Description"}

The equipment under test (EUT) is a transmitter for remote control toy car operating at 49.860 MHz which is controlled by a crystal. The EUT is powered by a 9V Battery.

Press the forward button, and the Dumptruck moves forward, as it plays “forward” sound effects and lights flash.
When the button is released, the truck stops. Both sounds and lights stop.

Press the reverse button, and the Dumptruck moves backward, as it plays “backward” sound effects and lights flash.
When the button is released, the truck stops. Both sounds and lights stop.

Pull the dumping lever forward and it dumps, as it plays “dumping” sounds, and lights flash.

Return (push) the dumping lever, and it make “reverse dumping” sounds, lights flash.

The brief circuit description is saved with filename: descri.pdf

{PRIVATE }1.2 Related Submittal(s) Grants{tc \l 2 "1.2 Related Submittal(s) Grants"}

This is a single application for certification of a transmitter. The receiver for this transmitter is authorized by Certification procedure.

{PRIVATE }1.3 Test Methodology{tc \l 2 "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.

{PRIVATE }1.4 Test Facility{tc \l 2 "1.4 Test Facility"}

The open area test site and conducted measurement facility used to collect the emission 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

{PRIVATE }2.0 **System Test Configuration**{tc \l 1 "2.0 **System Test Configuration**"}

{PRIVATE }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 9V Battery.

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.{tc \l 2 "2.1 Justification"}

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a cardboard box, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.
The worst case bit sequence was applied during test.

For simplicity of testing, the unit was wired to transmit continuously.

{PRIVATE }2.2 EUT Exercising Software{tc \l 2 "2.2 EUT Exercising Software"}

There was no special software to exercise the device. Once the button is depressed, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

{PRIVATE }2.3 Special Accessories{tc \l 2 "2.3 Special Accessories"}

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

{PRIVATE }{tc \l 2 ""}

{PRIVATE }2.4 Equipment Modification{tc \l 2 "2.4 Equipment Modification"}

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

No modifications were installed by Intertek Testing Services.

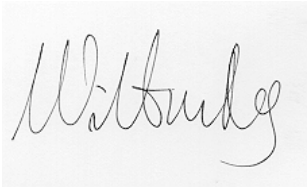
{PRIVATE }2.5 Support Equipment List and Description{tc \l 2 "2.5 Support Equipment List and Description"}

This product was tested in a standalone configuration.

All the items listed under section 2.0 of this report are

Confirmed by:

Wilbur Ng
Assistant Manager
Intertek Testing Services
Agent for Road Champs Limited



_____Signature

February 12, 2000 Date

{PRIVATE }{tc \l 2 ""}

EXHIBIT 3

EMISSION RESULTS

{PRIVATE }3.0 **Emission Results{**tc \l 1 "3.0 **Emission Results"}**

Data is included 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.

{PRIVATE }3.1 Field Strength Calculation{tc \l 2 "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 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
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

{PRIVATE }3.1 Field Strength Calculation (cont){tc \l 2 "3.1 Field Strength Calculation (cont)"}

Example

Assume a receiver reading of 62.0 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. 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 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB

AV = -10 dB

FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 dBµV/m

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

{PRIVATE }3.2 Radiated Emission Configuration Photograph{tc \l 2 "3.2 Radiated Emission Configuration Photograph"}

Worst Case Radiated Emission

249.309 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated1.jpg to radiated2.jpg

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 6.6 dB

TEST PERSONNEL:

Signature

Ivan Y. M. Wong, Compliance Engineer
Typed/Printed Name

February 12, 2000
Date

Company: Road Champs Limited
Model: 53010

Date of Test: January 31, 2000

Table 1

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dBµV)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	49.877	76.8	11	16	4.3	67.5	80.0	-12.5
H	99.754	37.1	11	16	--	32.1	43.5	-11.4
H	149.631	32.6	13	16	--	29.6	43.5	-13.9
H	199.490	34.8	16	16	--	34.8	43.5	-8.7
H	*249.309	35.4	20	16	--	39.4	46.0	-6.6
H	299.192	18.8	22	16	--	24.8	46.0	-21.2
H	349.069	12.8	24	16	--	20.8	46.0	-25.2

Notes: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meter. 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: Ivan Y. M. Wong

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

{PRIVATE }4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: ophoto1.jpg to ophoto2.jpg and iphoto1.jpg to iphoto2.jpg{tc \l 1 "4.0 **Equipment Photographs**"}

EXHIBIT 5

PRODUCT LABELLING

{PRIVATE }5.0 **Product Labelling**{tc \l 1 "5.0 **Product Labelling**"}

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

EXHIBIT 6

TECHNICAL SPECIFICATIONS

{PRIVATE }6.0 **Technical Specifications**{tc \l 1 "6.0 **Technical Specifications**"}

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

EXHIBIT 7

INSTRUCTION MANUAL

{PRIVATE }7.0 **Instruction Manual**{tc \l 1 "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.

EXHIBIT 8

MISCELLANEOUS INFORMATION

{PRIVATE }8.0 **Miscellaneous Information**{tc \l 1 "8.0 **Miscellaneous Information"}**

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

{PRIVATE }8.1 Measured Bandwidth{tc \l 2 "8.1 Measured Bandwidth"}

The plot on saved in bw.pdf shows the fundamental emission is confined in the specified band. The field strength of any emission appearing between the band edges and up to 10 kHz above and below the band edges (49.81 and 49.91 MHz) is at least 30 dB below the carrier level. It meets the requirement of Section 15.235(b).

{PRIVATE }Figure 8.1 Bandwidth{tc \f O \l 9 "Figure 8.1 Bandwidth"}

{PRIVATE }8.2 Discussion of Pulse Desensitization{tc \l 2 "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*.

Pulse desensitivity was not applicable for this device. The effective period (T_{eff}) was approximately 0.6 ms for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

{PRIVATE }8.3 Calculation of Average Factor{tc \l 2 "8.3 Calculation of Average Factor"}

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner are saved with filename: af.pdf

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 20.550 ms
Effective period of the cycle = 1.65 ms x 4 + 0.6 ms x 10
= 6.6 ms + 6 ms
= 12.6ms

DC = 12.6 ms / 20.55 ms = 0.61 or 61%

Therefore, the averaging factor is found by 20 $\log_{10}$ 0.61 = -4.3 dB

{PRIVATE }8.4 Emissions Test Procedures{tc \l 2 "8.4 Emissions Test Procedures"}

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under 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 transmitting 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 ground plane. 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 axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

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.

{PRIVATE }8.4 Emissions Test Procedures (cont'd){tc \l 2 "8.4 Emissions Test Procedures (cont'd)"}

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 are 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.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.