

Remotec Technology Ltd.

Application
For
Certification
(FCC ID: M7N-BW6091TX-00)

Transmitter

WO# 0200025
LC/sa
February 1, 2002

FCC ID: M7N-BW6091TX-00

- 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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LIST OF EXHIBITS

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MEASUREMENT/TECHNICAL REPORT

Remotec Technology Ltd. - MODEL: REMOTEC BW 6091
FCC ID: M7N-BW6091TX-00

This report concerns (check one:) Original Grant 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

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 [5-24-01 Edition] provision.

Report prepared by:

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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	radiated1.jpg, radiated2.jpg
Test Setup Photo	Conduct Emission	conduct1.jpg, conduct2.jpg, conduct3.jpg
Test Report	Conducted Emission Test Result	conduct.pdf
Test Report	Bandwidth Plot	bw.pdf
External Photo	External Photo	ophoto1.jpg, ophoto2.jpg, ophoto3.jpg, ophoto4.jpg and ophoto5.jpg
Internal Photo	Internal Photo	iphoto1.jpg, iphoto2.jpg, iphoto3.jpg, iphoto4.jpg and iphoto5.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	manual1.pdf, manual2.pdf and manual3.pdf
Average Factor Plotting	Average Factor	av1.pdf and av2.pdf
Approval Instruction for Antenna	Antenna Specification	antenna.pdf

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 General Description.0 General Description

1.1 Product Description.1 Product Description

The Equipment Under Test (EUT) is a IR/RF universal remote control with learning ability and operating at 434MHz. The EUT is powered by 4 pieces of rechargeable batteries which can be charged by an adaptor (RR-1090, provided by the applicant). The main function of it is use to control those AV devices which includes in the brand list which provided by applicant. On the other hand, it also can learn and store the IR signal from other IR control. After the storing process, the IR signal can be converted to RF signal model so that it can be transmitted both in IR and RF model simultaneously. It can be seen that the DC socket on the left hand side is use to recharge the batteries. This EUT consists many buttons on the panel which are use to send the commands for controlling the AV devices. Besides that, the LCD display is use to provide the indicating function when each time of button pressing. Moreover, it cease the transmission in less than 1 second after being released the key. Furthermore, the bare wire type antenna was equipped inside the plastic case of the transmitter which show in the follow equipment photographs.

For electronic filing, the brief circuit description and the approval instruction of antenna are saved with filename descri.pdf and antenna.pdf respectively.

1.2 Related Submittal(s) Grants.2 Related Submittal(s) Grants

The receiver for this transmitter was authorized by Certification procedure. The FCC ID of the associated receiver is M7N-BW2112RX-00 and has been granted at 1.18.2002.

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1.3 Test Methodology.3 Test Methodology

Both AC mains line-conducted and 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.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.0

System Test Configuration

2.1 Justification

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSIC63.4 (1992).

The EUT was powered 4 pieces of 1.2V rechargeable batteries during all the test. For the charging model, the adaptor was plugged into the 120VAC/60Hz outlet.

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 EUT was placed on turntable, 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 operated to transmit continuously and the worst case transmission was suggested by the applicant.

2.2 EUT Exercising Software.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.4 Equipment Modification

Any modifications installed previous to testing by Remotec Technology 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

AC/DC AdaptorModel: RR-1090Input: AC 100-240VOutput: DC 9V 1A

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 Remotec Technology Ltd.*

Signature

February 1, 2002 _____ Date

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EXHIBIT 3

EMISSION RESULTS

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3.0 Emission Results.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.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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3.1 Field Strength Calculation (cont'd) 3.1 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.

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

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

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

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

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

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

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

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

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3.2 Radiated Emission Configuration Photograph

.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

at

32.476 MHz

For electronic filing, the front view and back view of the test configuration photographs are saved with filename: radiated1.jpg and radiated2.jpg respectively.

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3.3 Radiated Emission Data.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 0.4 dB margin

TEST PERSONNEL:

Signature

Lawrence H. C. Chow, Compliance Engineer
Typed/Printed Name

February 1, 2002

Date

INTERTEK TESTING SERVICES

Company: Remotec Technology Ltd.

Date of Test: December 1, 2002

Model: REMOTEC BW 6091

Worst Case Operating Mode: Transmitting Mode

Table 1

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Average Factor (-dB)	Net 3m at (dB μ V/ m)	Limit at 3m (dB μ V/ m)	Margin (dB)
H	434.033	74.3	16.3	16	18.8	55.8	80.8	-25.0
H	868.066	36.1	22.4	16	18.8	23.7	60.8	-37.1
H	*1302.047	54.1	25.5	34	18.8	26.8	54.0	-27.2
H	1736.070	47.3	26.5	34	18.8	21.0	60.8	-39.8
H	2170.108	44.3	29.1	34	18.8	20.6	60.8	-40.2

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 tenth harmonic of highest fundamental frequency.

* 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: Lawrence H. C. Chow

INTERTEK TESTING SERVICES

Company: Remotec Technology Ltd.

Date of Test: December 1, 2002

Model: REMOTEC BW 6091

Worst Case Operating Mode: Charging Mode

Table 2

Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net 3m at (dB μ V/ m)	Limit at 3m (dB μ V/ m)	Margin (dB)
H	32.476	44.0	11.6	16	39.6	40.0	-0.4
H	64.706	36.7	9.9	16	30.6	40.0	-9.4
H	139.481	35.3	11.9	16	31.2	43.5	-12.3
H	186.896	32.7	16.7	16	33.4	43.5	-10.1
H	226.741	34.8	11.4	16	30.2	43.5	-13.3

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 tenth harmonic of highest fundamental frequency.

Test Engineer: Lawrence H. C. Chow

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3.4 Conducted Emission Configuration Photograph

**Worst Case Conducted Emission
at
0.46 MHz**

For electronic filing, the front view, rear view and side view of the test configuration photographs are saved with filename: conduct1.jpg, conduct2.jpg and conduct3.jpg.

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Company: Remotec Technology Ltd.
Model: REMOTEC BW 6091

Date of Test: December 1, 2002

Conducted Emissions Section 15.107 Requirements

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

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3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission are saved with filename: conduct.pdf. The data table lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 8.5 dB margin

* Peak Detector Data Unless otherwise stated.

TEST PERSONNEL:

Signature

Lawrence H. C. Chow, Compliance Engineer
Typed/Printed Name

February 1, 2002

Date

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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 ophoto5.jpg for external photo, and iphoto1.jpg to iphoto5.jpg for internal photo.

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EXHIBIT 5

PRODUCT LABELLING

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5.0 Product Labelling 5.0 Product Labelling

For electronics filing, the FCC ID label artwork (scale in 1:1) 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.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.

EXHIBIT 7

INSTRUCTION MANUAL

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7.0 Instruction Manual.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual1.pdf, manual2.pdf and manual3.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 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.

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8.1 Measured Bandwidth.1 Stabilization Waveform

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bw.pdf. From the plot, the bandwidth is observed to be 450kHz, at 20dBc where the bandwidth limit is 1084kHz.

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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*.

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 10 μ s for a digital “1” bit which is illustrated on technical specification, with a resolution bandwidth (3dB) of 100kHz, so the pulse desensitivity factor is 0dB.

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8.3 Calculation of Average Factor .2 Discussion of Pulse Desensitization

$$\text{Averaging factor in dB} = 20 \log (\text{duty cycle})$$

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.

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

$$\text{The duration of one cycle} = 66.251\text{ms}$$

$$\text{Effective period of the cycle} = \text{Total on time} \times \text{carrier ratio:}$$

$$\begin{aligned} & [8.711\text{ms} + (33 \times 637\text{ }\mu\text{s})] \times 10/26 \\ & = 11.43\text{ms} \end{aligned}$$

$$\text{DC} = 11.43 \text{ ms} / 100\text{ms} = 0.114$$

Therefore, the averaging factor is found by $20 \log_{10} 0.114 = -18.8\text{dB}$

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8.4 Emissions Test Procedures.3 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'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 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.