

TEST REPORT

Report No.: HK12061244-1

Skyrocket Toys LLC

Application
For
Certification

(Original Grant)

(FCC ID: O5301166RX49)

Superregenerative Receiver

Prepared and Checked by:

Approved by:

Signed On File
Wong Cheuk Ho, Herbert
Engineer

Chan Chi Hung, Terry
Assistant Supervisor
Date: Jul 17, 2012

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GENERAL INFORMATION

Skyrocket Toys LLC
BRAND NAME: Illumivor, MODEL: 01166
FCC ID: O5301166RX49

Grantee:	Skyrocket Toys LLC
Grantee Address:	606 Venice Blvd, Suite D, Venice, CA 90291, U.S.A
Contact Person:	Nelo Lucich
Tel:	(852) 3595 0433
Fax:	(852) 3595 0400
e-mail:	pankym@skyrockettoys.com; jacksonh@skyrockettoys.com
Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	Illumivor
Model:	01166
Type of EUT:	Superregenerative Receiver
Description of EUT:	Illumivor RC Pirahna
Serial Number:	N/A
FCC ID:	O5301166RX49
Date of Sample Submitted:	June 22, 2012
Date of Test:	June 22, 2012 to June 28, 2012
Report No.:	HK12061244-1
Report Date:	Jul 17, 2012
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

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SUMMARY OF TEST RESULT

Skyrocket Toys LLC
BRAND NAME: Illumivor, MODEL: 01166
FCC ID: O5301166RX49

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	N/A
Hopping Channel Carrier Frequencies Separation	15.247(e) / RSS-210 A8.1	N/A
20dB Bandwidth of the Hopping Channel	15.247(a) / RSS-210 A8.1	N/A
Number of Hopping Frequencies	15.247(e) / RSS-210 A8.1	N/A
Average Time of Occupancy of Hopping Frequency	15.247(e) / RSS-210 A8.1	N/A
Antenn Conducted Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	N/A
RF Exposure Compliance	15.247(i) / RSS-Gen 5.5	N/A
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.2	N/A
Transmitter Field Strength	15.227 / RSS-310 3.8	N/A
Transmitter Field Strength	15.229 / RSS-210 A2.7	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(a) / RSS-210 A1.1.1	N/A
Transmitter Field Strength, Bandwidth and Timing Requirement	15.231(e) / RSS-210 A1.1.5	N/A
Transmitter Field Strength and Bandwidth Requirement	15.239 / RSS-210 A2.8	N/A
Transmitter Field Strength and Bandwidth Requirement	15.249 / RSS-210 A2.9	N/A
Transmitter Field Strength and Bandwidth Requirement	15.235 / RSS-310 3.9	N/A
Receiver / Digital Device Radiated Emissions	15.109 / ICES-003	Pass
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

- Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

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1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a super-regenerative receiver of an RC Car operating at 49.680 MHz. The EUT is powered by a 6.0 V DC source (4 x 1.5V AAA batteries). The EUT has an ON/OFF switch.

After switching ON the EUT and the transmitter of the RC Car, the EUT can be controlled to move forward, backward, left and right by the transmitter.

Antenna Type : Internal, Integral

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

1.2 Related Submittal(s) Grants

The Certification procedure of transmitter for this receiver (with FCC ID: O5301165TX49) is being processed at the same time of this application.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). 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. 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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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 (2003).

The EUT was powered by 4 X New 1.5V "AAA" batteries during test.

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 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 plastic stand if necessary and placed on the wooden 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 receives the RF signal continuously.

2.3 Special Accessories

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

2.4 Equipment Modification

Any modifications installed previous to testing by Skyrocket Toys LLC will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

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

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2.6 Support Equipment List and Description

N/A.

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), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

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

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
 AV = Average Factor 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 - AV 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 and average factor of 5 dB are subtracted, giving a field strength of 27 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$\begin{aligned} RA &= 52.0 \text{ dB}\mu\text{V/m} \\ AF &= 7.4 \text{ dB} & RR &= 18.0 \text{ dB}\mu\text{V} \\ CF &= 1.6 \text{ dB} & LF &= 9.0 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ AV &= 5.0 \text{ dB} \\ FS &= RR + LF \\ FS &= 18 + 9 = 27 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(27 \text{ dB}\mu\text{V/m})/20] = 22.4 \mu\text{V/m}$$

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3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission at 48.834 MHz

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

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.

Judgment: Passed by 5.5 dB

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Applicant: Skyrocket Toys LLC
Model: 01166
Mode: Receiving

Date of Test: June 28, 2012

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	45.086	39.6	16	10.0	33.6	40.0	-6.4
V	47.621	39.1	16	11.0	34.1	40.0	-5.9
V	48.834	39.5	16	11.0	34.5	40.0	-5.5
V	50.829	38.2	16	11.0	33.2	40.0	-6.8
V	53.576	37.8	16	11.0	32.8	40.0	-7.2
V	101.274	35.4	16	13.0	32.4	43.5	-11.1
V	104.832	36.2	16	13.0	33.2	43.5	-10.3
V	106.496	35.2	16	13.0	32.2	43.5	-11.3
V	186.526	31.6	16	16.0	31.6	43.5	-11.9
V	189.471	32.4	16	16.0	32.4	43.5	-11.1
V	192.598	31.4	16	16.0	31.4	43.5	-12.1

NOTES: 1. Peak Detector Data 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 is used for the emissions over 1000MHz.

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Applicant: Skyrocket Toys LLC
Model: 01166
Mode: Light On

Date of Test: June 28, 2012

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	38.098	39.6	16	10.0	33.6	40.0	-6.4
V	45.621	39.4	16	10.0	33.4	40.0	-6.6
V	54.592	39.1	16	11.0	34.1	40.0	-5.9
H	148.621	36.6	16	14.0	34.6	43.5	-8.9
H	152.625	35.2	16	15.0	34.2	43.5	-9.3
H	194.308	33.2	16	16.0	33.2	43.5	-10.3

NOTES: 1. Peak Detector Data 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 is used for the emissions over 1000MHz.

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4.0 **Equipment Photographs**

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 **Product Labelling**

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

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.

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.

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 the factors such as pulse desensitization and averaging factor.

8.1 Stabilization Waveform

Previous to the testing, the superregenerative receiver was stabilized as outlined in the test procedure. The plot saved on the filename : superreg.pdf shows the fundamental emission when a signal generator was used to stabilize the receiver. Please note that the antenna was placed as close as possible to the EUT for clear demonstration of the waveform and that accurate readings are not possible from this plot.

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8.2 Emissions Test Procedures

This device is a Superregenerative receiver. No desensitization of the measurement equipment is required as the received signals are continuously.

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of superregenerative 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 - 2003. Superregenerative 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 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 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.

The frequency range scanned is from 30 MHz to 1000 MHz.

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8.2 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 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. 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.

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9.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna (20MHz to 200MHz)	Log Periodic Antenna (200 - 1000)MHz
Registration No.	EW-2500	EW-0954	EW-0572
Manufacturer	ROHDESCHWARZ	EMCO	EMCO
Model No.	ESCI	3104C	3146
Calibration Date	Feb 24, 2011	Oct 18, 2011	Nov 15, 2011
Calibration Due Date	Feb 24, 2013	Apr 18, 2013	May 15, 2013

Equipment	14m Double Shield RF Cable (9kHz - 6GHz)	14m Double Shield RF Cable (9kHz - 6GHz)	Spectrum Analyzer
Registration No.	EW-2373	EW-2376	EW-2188
Manufacturer	RADIALL	RADIALL	AGILENTTECH
Model No.	n m/br56/bnc m 14m	n m/br56/bnc m 14m	E4407B
Calibration Date	Sep 16, 2011	Sep 09, 2011	Sep 26, 2011
Calibration Due Date	Sep 12, 2012	Sep 12, 2012	Sep 26, 2012

2) Bandwidth Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2188
Manufacturer	AGILENTTECH
Model No.	E4407B
Calibration Date	Sep 26, 2011
Calibration Due Date	Sep 26, 2012