

SCIENTIFIC TOYS LTD

# TEST REPORT

**SCOPE OF WORK**

FCC TESTING–BY35148-24RR, SEE PAGE 7 & 8

**REPORT NUMBER**

SZHH01206660-001

**ISSUE DATE**

November 28, 2017

**PAGES**

41

**DOCUMENT CONTROL NUMBER**

FCC ID 249\_C

© 2017 INTERTEK



**SCIENTIFIC TOYS LTD**

Application  
For  
Certification

**FCC ID: BY35148-24RR****R/C Car**

**Model: BY35148-24RR**  
**Additional Models: See Page 7 & 8**

2.4GHz Transceiver

Report No.: SZHH01206660-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-16]

Prepared and Checked by:

Approved by:

Sign on file

*Terry Tang*  
*Senior Engineer*

---

*Kidd Yang*  
*Senior Project Engineer*  
*Date: November 28, 2017*

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

**Intertek Testing Service Shenzhen Ltd. Longhua Branch**

1F/2F, Building B, QiaoAn Scientific Technology Park, Shangkeng Community, Guanhu Subdistrict, Longhua District, Shenzhen, P.R. China.  
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751

## LIST OF EXHIBITS

### *INTRODUCTION*

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labelling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information
<i>EXHIBIT 9:</i>	Confidentiality Request
<i>EXHIBIT 10:</i>	Test Equipment List

## MEASUREMENT/TECHNICAL REPORT

SCIENTIFIC TOYS LTD

Model: BY35148-24RR

Additional Model: See Page 7 & 8

FCC ID: BY35148-24RR

This report concerns (check one)      Original Grant X      Class II Change \_\_\_\_\_

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

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 [10-1-16 Edition] provision.

Report prepared by:

Terry Tang  
Intertek Testing Services Shenzhen Ltd. Longhua Branch  
1F/2F, Building B, QiaoAn Scientific Technology Park,  
Shangkeng Community, Guanhu Subdistrict, Longhua  
District, Shenzhen, P.R. China  
Tel / Fax: 86-755-8601 6288/86-755-8601 6751

## Table of Contents

<b>1.0 General Description .....</b>	<b>7</b>
1.1 Product Description .....	7
1.2 Related Submittal(s) Grants .....	9
1.3 Test Methodology .....	9
1.4 Test Facility .....	9
<b>2.0 System Test Configuration .....</b>	<b>11</b>
2.1 Justification .....	11
2.2 EUT Exercising Software .....	11
2.3 Special Accessories .....	11
2.4 Equipment Modification .....	11
2.5 Measurement Uncertainty .....	12
2.6 Support Equipment List and Description .....	12
<b>3.0 Emission Results .....</b>	<b>14</b>
3.1 Radiated Test Results .....	15
3.1.1 Field Strength Calculation .....	15
3.1.2 Radiated Emission Configuration Photograph .....	16
3.1.3 Radiated Emissions .....	16
3.1.4 Transmitter Spurious Emissions .....	18
<b>4.0 Equipment Photographs .....</b>	<b>23</b>
<b>5.0 Product Labelling .....</b>	<b>25</b>
<b>6.0 Technical Specifications .....</b>	<b>27</b>
<b>7.0 Instruction Manual .....</b>	<b>29</b>
<b>8.0 Miscellaneous Information .....</b>	<b>31</b>
8.1 Bandedge Plot .....	32
8.2 Discussion of Pulse Desensitization .....	34
8.3 Transmitter Duty Cycle Calculation .....	35
8.4 Emissions Test Procedures .....	36
<b>9.0 Confidentiality Request .....</b>	<b>39</b>
<b>10.0 Test Equipment List .....</b>	<b>41</b>

## List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Report	Bandedge Plot	bandedge.pdf
Test Report	20dB BW Plot	bw.pdf
Test Report	Timing Plot	af.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf

**EXHIBIT 1**

**GENERAL DESCRIPTION**

## 1.0 General Description

### 1.1 Product Description

The equipment under test (EUT) is a R/C Car operating at 2.4G Band. The EUT can be powered by DC4.5V (3 x 1.5V AAA batteries). For more detail information pls. refer to the user manual.

Antenna Type: Integral antenna

Modulation Type: GFSK

Antenna Gain: 0dBi Max

The Additional Models: AD11444, 27810, 27800,27801,27802,27803, 27804, 27805, 27806, 27807,27808, 27809, 27810, 27811-27819, 28720, 27821-27829, 27830, 27831-27839, 27840, 27841-24849, 27850, 27851-27869, 27860, 27861-27869, 27870, 27871-27879, 27880, 27881-27889, 27890, 27891-27899,27900, 27500, 27501, 27502, 27503, 27504, 27505-27799, 28001, 28002, 28003, 28004, 28005, 28006, 28007, 28008, 28009, 28010, 28011, 28012, 28013, 28014, 28015, 28016, 28017, 28018, 28019, 28020, 28021, 28022, 28023, 28024, 28025, 28026, 28027, 28028, 28029, 28030, 28031-28050, 28051-28099, 24620-24625, 24626, 24627, 24628, 24929, 24630, 24631, 24632, 24633, 24634, 24635, 24636, 24637, 24638, 24639, 24640, 24641, 24642, 24643, 24644, 24645, 24646, 24658, 24600-24660, 24550, 95263, 95267, 95268, 95551, 95555, 95559, 99660, 98790, 95167, 99910 99917, 21147, 21627, 21634, 99843, 99840, 99870, 21110, 21111, 21116, 21119, 21147, 21060, 21070, 21080, 24920, 95551, 95552, 95553, 95554, 95555, 95556, 95557, 95558, 95559, 95550-95560, 98850-98899, 98867, 98877, 99450-99499, 99457, 99467, 99347, 23345, 99917, 22930, 21421, 21427, 21429, 97079, 24528, 24529, 24530, 24058, 24047, 24048, 24040-24099, 22920, 22921-22950, 21627, 21634, 21620-21650, 21440, 98790, 99597, 99840, 99870, 99849, 95166, 95167, 95550, 95551, 95552, 95553, 95554, 95555, 95556, 95557, 95558, 95559, 95560, 95561-95570, 95571-95570, 24930, 99420, 24700, 24701, 24702, 24703, 24704, 24705-24730, 92230, 92240, 92250, 92323, 92324, 92325, 92244, 99668, 99660-99669, 99658, 99650-99659, 23810, 23814, 23800-23820, 23817, 90000-90110, 90100, 24017, 24019, 24020, 24021, 24043, 24044, 24045, 24046, 24047, 24048, 24049, 24000-24050, 98120, 98122, 98121-98129, 98130-98139, 98132, 99670, 99671-99679, 91460-91479, 91480-91489, 91586, 20028, 20001,20006, 99647, 99640-99649, 95527, 95520-95529, 94500, 94501, 94507, 29100, 30760, 31680-31689, 21902, 21907, 21959, 21975, 21977, 93817, 21446, 21416, 21437, 21438, 32100-32109, 32107, 32108, 30756, 30753, 21005, 21007, 21000-21010, 33340, 33341-33350, 33360, 27717, 29982, 27723, 27415, 27410-27420, 22102, 22103, 22100-22120, 21110, 21111, 21112, 21113, 21114, 21115, 21116, 21117, 21118, 21119, 21120, 22920, 22921-22940, 99668, 99658, 99659, 28018, 28000-28030, 95730, 95734, 95737, 95731-95740, 98867, 98877, 98857-98897, 21700, 21702, 21701, 21702, 21703, 21704, 21705, 21706, 21707, 21708, 21709, 21710-21730, 21917, 21930, 21931, 21932, 21933, 21934, 21935, 21936, 21937, 21938, 21940, 21900-21970, 99037, 95030, 95031-95039, 20017, 20010, 20001, 20002, 20003, 20005, 20006, 20007, 20008, 20009, 20010, 20011-20015. 20016, 20024, 20018-20050, 23810, 23814, 23817, 23900-23830, 21870, 21876, 21877, 21878, 21879,21850-21899, 99900, 99902, 99901-99909, 99910-99919, 99917, 99927, 99928, 99920-99929, 99937,



99930-99937, 99947, 99940-99949, 99957, 99950-99959, 99967, 99960-99969, 99977, 99970-99979, 99987, 99980-99989, 99997, 99990-99999, 99090, 99096, 99097, 99098, 99099, 99080-99095, 93817, 21959, 21975, 21978, 21442, 21444, 21445, 21446, 21448, 21430-21450, 21121, 21124, 21129, 21120-21130, 21420, 21421, 21422, 21423, 21424, 21425, 21426, 21427, 21428, 21429, 21430, 21431-21450, 1815, 21465, 27000, 27001, 27002, 27003, 27004, 27005, 27006, 27007, 27008, 27009, 27010, 27011, 27012, 27013, 27014, 27015, 27016, 27017, 27018, 27019, 27020, 27021, 27022, 27023, 27024, 27025, 27026, 27027, 27028, 27028, 27030, 27031-27100, 99750, 99751-99780, 97000, 97001-97009, 97010, 97011-97030, 41000-41009, 41010, 41011, 41012, 41013, 41014, 41015, 41016, 41017, 41018, 41019, 41020, 41021-41050, 80890, 80990, 80891-80999, 30690, 30700, 30693, 29100, 30760, 30650, 31210, 31440, 31223, 36744, 71884, 78060, 78080, 78083, 70360, 70362, 70370, 70350-70400, 74231, 74232, 71856, 71050, 70467, 60360, 40360, 40380, 40370, 40760), 24036, 24044, 24046, 92477, 96837-97517, 21132, 94840-97847, 21870, 21871, 21872-21879, 21877, 24017, 24019, 24020, 24043, 24010-24050, 21045, 21046, 21050, 21446, 21958, 21975, 30690, 30700, 30693, 29100, 30760, 30310, 30330, 32560, 36730, 30650, 30850, 31440, 31210, 36734, 36744, 30337, 70467, 95730, 95734, 95731-95740, 24058, 24057, 24047, 24067, 24040-24080, 21040, 21041, 21042, 21043, 21044, 21045, 21046, 21047, 21048, 21049, 21050, 21051, 21052, 21053, 21054, 21055, 21056, 21057, 21058, 21059, 21060, 21061-21099, 29100, 30760, 98122, 98132, 98133, 91482, 99670, 20028, 20001-20050, 20001, 20006, 99647, 99648, 97038, 97028, 21959, 21975, 21977, 21978, 21440-21450, 21442, 21444, 21446, 21448, 93817, 33340, 27717, 29982, 27415, 22102, 22103, 22004, 22100-22120, 22116, 21110, 21111, 21116, 21119, 21112-21120, 24017, 24043, 24019, 24600-24650, 24625, 24626, 24627, 24628, 24629, 24630, 24631, 24632, 24633, 24634, 24635, 24636, 24637, 24638, 24639, 24640, 24641, 24642, 24643, 24644, 24645, 24646, 24550, 24570, 24594, 99420, 24700, 24702, 24703, 24704-24720, 22920, 98790, 99597, 99840, 99668, 99658, 28018, 95166, 95167, 95730, 95734, 95737, 95731-95740, 98867, 98877, 21700, 21937, 21936, 99037, 95030, 21933, 21917, 20009, 20017, 99080-99099, 99096, 99097, 99098, 99099, 23810, 23814, 21870, 21871, 21872, 21873, 21874, 21875, 21876, 21877, 21878, 21879, 21880, 99900, 99917, 99927, 99932, 99934, 99099, 21129, 21425, 21815, 21420-21485, 21465, 41010, 27000, 27007, 27014, 97000, 97010, 30690, 30700, 30693, 30650, 31210, 31223, 36744, 71884, 78060, 78080, 70360, 70362, 74231, 74233, 71856, 70050, 70467, 60360, 40380, 40370, 40760, 40567, 40570, 40572, 40560-40580, 24645, 21700, 21702, 28023, 28025, 28000, 28001-28030, 98867, 98877, 98770, 39140, 39141-39149, 39150, 92150, 92151-92159, 92160, 92161-92170, 37270, 36909, 37181, 37185, 37170, 37190, 97138, 97100-97150, 21867, 21850-21899, 97210, 97217, 97200-97250, 99110, 99120, 99447 are the same as the Model: BY35148-24RR in hardware aspect (circuitry and electrical, mechanical and physical construction), the only differences are the appearance and model no. for trading purpose.

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

## 1.2 Related Submittal(s) Grants

This is an application for certification of a car unit for the R/C Car, and the corresponding controller unit which associated with this EUT is subjected to FCC ID certification with FCC ID: BY35013-24TT.

## 1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

## 1.4 Test Facility

The Semi-anechoic chamber used to collect the radiated data is **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 1F/2F, Building B, QiaoAn Scientific Technology Park, Shangkeng Community, Guanhu Subdistrict, Longhua District, Shenzhen, P.R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: CN1188).

**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

## 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 C63.10 (2013).

The EUT is powered by three new DC 1.5V AAA Batteries during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. 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.

The EUT was operated standalone and placed in the central 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 placed on a turn table, 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.

### 2.3 Special Accessories

No special accessories used.

### 2.4 Equipment Modification

Any modifications installed previous to testing by SCIENTIFIC TOYS LTD will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd Longhua Branch.

2.5 Measurement Uncertainty

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

2.6 Support Equipment List and Description

Description	Manufacturer	Model No.
N/A	N/A	N/A

**EXHIBIT 3**  
**EMISSION RESULTS**

### 3.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

## 3.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

### 3.1.1 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 $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ 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:

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

Assume a receiver reading of 62.0 dB $\mu$ 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 $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$\begin{aligned} RA &= 62.0 \text{ dB}\mu\text{V} \\ AF &= 7.4 \text{ dB} \\ CF &= 1.6 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ PD &= 0 \text{ dB} \\ AV &= -10 \text{ dB} \\ FS &= 62 + 7.4 + 1.6 - 29 + 0 = 42 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(42 \text{ dB}\mu\text{V/m})/20] = 125.9 \mu\text{V/m}$$



### 3.1.2 Radiated Emission Configuration Photograph

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

### 3.1.3 Radiated Emissions

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.

Worst Case Radiated Emission  
at  
60.45 MHz

Judgement: Passed by 17.5 dB

#### ***TEST PERSONNEL:***

*Sign on file*

Terry Tang, Senior Engineer  
*Typed/Printed Name*

November 22, 2017  
*Date*

Applicant: SCIENTIFIC TOYS LTD  
 Date of Test: November 22, 2017  
 Worst Case Operating Mode:

Model: BY35148-24RR  
 Transmitting(2402MHz)

Table 1

**Radiated Emissions**

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
Horizontal	60.450	29.2	20.0	13.3	22.5	40.0	-17.5
Horizontal	765.510	29.0	20.0	15.7	24.7	46.0	-21.3
Horizontal	877.570	27.4	20.0	19.3	26.7	46.0	-19.3
Vertical	60.770	28.0	20.0	13.5	21.5	40.0	-18.5
Vertical	655.800	30.9	20.0	15.8	26.7	46.0	-19.3
Vertical	800.700	27.6	20.0	20.3	27.9	46.0	-18.1

- NOTES: 1. Quasi-Peak detector is used except for others 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 value in the margin column shows emission below limit.
4. All emissions are below the QP limit.

### 3.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission  
at  
4804.00 MHz

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

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 18.0 dB

***TEST PERSONNEL:***

*Sign on file*

Terry Tang, Senior Engineer  
*Typed/Printed Name*

November 22, 2017  
*Date*

Applicant: SCIENTIFIC TOYS LTD  
 Date of Test: November 22, 2017  
 Worst Case Operating Mode:

Model: BY35148-24RR  
 Transmitting

Table 2

**Radiated Emissions**

(2402MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2402.000	81.7	36.7	28.1	73.1	114.0	-40.9
Vertical	4804.000	52.7	36.7	35.5	51.5	74.0	-22.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2402.000	81.7	36.7	28.1	15.5	57.6	94.0	-36.4
Vertical	4804.000	52.7	36.7	35.5	15.5	36.0	54.0	-18.0

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 is used for the emission over 1000MHz.

Test Engineer: Terry Tang

Applicant: SCIENTIFIC TOYS LTD  
 Date of Test: November 22, 2017  
 Worst Case Operating Mode:

Model: BY35148-24RR  
 Transmitting

Table 3

**Radiated Emissions**

(2440MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2440.000	81.2	36.7	28.1	72.6	114.0	-41.4
Vertical	4880.000	52.4	36.7	35.5	51.2	74.0	-22.8

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2440.000	81.2	36.7	28.1	15.5	57.1	94.0	-36.9
Vertical	4880.000	52.4	36.7	35.5	15.5	35.7	54.0	-18.3

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 is used for the emission over 1000MHz.

Test Engineer: Terry Tang

Applicant: SCIENTIFIC TOYS LTD  
 Date of Test: November 22, 2017  
 Worst Case Operating Mode:

Model: BY35148-24RR  
 Transmitting

Table 4

**Radiated Emissions**

(2480MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2480.000	80.7	36.7	28.1	72.1	114.0	-41.9
Vertical	4960.000	52.3	36.7	35.5	51.1	74.0	-22.9

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2480.000	80.7	36.7	28.1	15.5	56.6	94.0	-37.4
Vertical	4960.000	52.3	36.7	35.5	15.5	35.6	54.0	-18.4

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 is used for the emission over 1000MHz.

Test Engineer: Terry Tang

**EXHIBIT 4**  
**EQUIPMENT PHOTOGRAPHS**

## 4.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.



**EXHIBIT 5**  
**PRODUCT LABELLING**

## 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**

## 6.0 Technical Specifications

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

**EXHIBIT 7**

**INSTRUCTION MANUAL**

## 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**

## 8.0 Miscellaneous Information

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



## 8.1 Bandedge Plot

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: bandedge.pdf. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

### Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e (Bandedge Plot).

#### **(i) Lower channel 2402MHz:**

Peak Resultant field strength = Fundamental emissions (peak value) – delta  
from the bandedge plot

$$\begin{aligned} &= 73.1 \text{ dB}\mu\text{v/m} - 33.8 \text{ dB} \\ &= 39.3 \text{ dB}\mu\text{v/m} \end{aligned}$$

#### **(ii) Upper channel 2480MHz:**

Peak Resultant field strength = Fundamental emissions (peak value) – delta  
from the bandedge plot

$$\begin{aligned} &= 72.1 \text{ dB}\mu\text{v/m} - 37.4 \text{ dB} \\ &= 34.7 \text{ dB}\mu\text{v/m} \end{aligned}$$

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dB $\mu$ v/m (Peak Limit) and 54dB $\mu$ v/m (Average Limit).

## 8.1 Bandedge Plot (cont'd)

Pursuant to FCC part 15 Section 15.215(c), the 20dB 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 excepted variations in temperature and supply voltage were considered.

Figure 8.1 Bandwidth

## 8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period ( $T_{eff}$ ) is approximately 2.5507ms for a digital "1" bit, as shown in the plots of Exhibit 9.4. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB

## 8.3 Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b, c)

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 = 15.1884ms  
Effective period of the cycle = 2.5507ms  
DC =  $2.5507\text{ms} / 15.1884\text{ms} = 0.1679$  or 16.79%

Therefore, the averaging factor is found by  $20 \log_{10} (0.1679) = -15.5\text{dB}$

## 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 C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz 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 EUT 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.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

#### 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 C63.10 - 2013.

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. 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, RBW 3MHz used for fundamental emission.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted 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.

**EXHIBIT9**  
**CONFIDENTIALITY REQUEST**

## 9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.



**EXHIBIT10  
TEST EQUIPMENT LIST**

## 10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-12	BiConiLog Antenna	ETS	3142E	00166158	20-Sep-2017	20-Sep-2018
SZ185-01	EMI Receiver	R&S	ESCI	100547	9-Feb-2017	9-Feb-2018
SZ061-09	Horn Antenna	ETS	3115	00092346	20-Sep-2017	20-Sep-2018
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	26-May-2017	26-May-2018
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	16-Mar-2017	16-Mar-2018
SZ056-06	Spectrum Analyzer	R&S	FSV40	101101	7-Jul-2017	7-Jul-2018
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	9-Feb-2017	9-Feb-2018
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	16-Apr-2016	16-Apr-2018
SZ062-02	RF Cable	RADIALL	RG 213U	--	8-Jul-2017	8-Jan-2018
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	11-Sep-2017	11-Mar-2018
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	11-Sep-2017	11-Mar-2018
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02	--	14-Jun-2017	14-Jun-2018