# TEST REPORT

## Report No.: HK10080845-1

## Spin Master Toys Far East Limited

Application
For
Certification

(Original Grant)

## (FCC ID: PQN44354TX27145)

Transmitter

Prepared and Checked by:

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Date: September 14, 2010

## GENERAL INFORMATION

## Spin Master Toys Far East Limited
## MODEL: 44354

## FCC ID: PQN44354TX27145

| | |
|---|---|
| Grantee: | Spin Master Toys Far East Limited |
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| Manufacturer: | N/A |
| Manufacturer Address: | N/A |
| Brand Name: | N/A |
| Model: | 44354 |
| Additiional Models: | 1012095, 6010469, 1013491, 6012633, 1013185 |
| Type of EUT: | Transmitter |
| Description of EUT: | F14 Tomcat |
| Serial Number: | N/A |
| FCC ID: | PQN44354TX27145 |
| Date of Sample Submitted: | August 18, 2010 |
| Date of Test: | August 25, 2010 |
| Report No.: | HK10080845-1 |
| Report Date: | September 14, 2010 |
| Environmental Conidtions: | Temperature: +10 to 40°C<br>Humidity: 10 to 90% |

## SUMMARY OF TEST RESULT

**Spin Master Toys Far East Limited**
**MODEL: 44354**

**FCC ID: PQN44354TX27145**

| 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 |
| Anteann 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 | Pass |
| 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 Eissions | 15.109 / ICES-003 | N/A |
| Digital Device Conducted Emissions | 15.107 / ICES-003 | N/A |

Note: 1. The EUT uses a Telescope-type antenna (with unique antenna connector) which, in accordance to section 15.203, is considered sufficient to comply with the pervisions 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 excepted 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 transmitter for RC airplane operating at 27.145 MHz which is controlled by a crystal. The EUT is powered by 9VDC (6 x 1.5V 'AA' size batteries). The EUT has an ON/OFF switch, a left lever, a right lever, a steering trimmer and a charging plug. After switching ON the EUT, the left lever controls the RC airplane to fly straight forward and to control the speed. The right lever controls the RC airplane flying left and right directions. The steering trimmer is used to adjust the flight direction. When the charging plug connects to the corresponding airplane, the internal battery inside the airplane can be charged.

The Model: 1012095, 6010469, 1013491, 6012633, 1013185 are declared the same as the Model: 44354 in hardware aspect. The difference in model number serves as marketing strategy.

Antenna Type : External, Integral

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

### 1.2 Related Submittal(s) Grants

This is a single application for certification of a transmitter.

The receiver for this transmitter is exempted from the Part 15 technical rules per 15.101(b).

### 1.3 Test Methodology

Radiated emission measurements was 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.

## 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 9V (6 x 1.5V AA size) batteries during test.

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 emission at and above 30 MHz, 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 report 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 transmits 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 Spin Master Toys Far East Limited 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.

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 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
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 dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV 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 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission at 27.145 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 2.0 dB

Company: Spin Master Toys Far East Limited Date of Test: August 25, 2010
Model: 44354
Mode: TX mode

Table 1

**Radiated Emissions**

| Polari-zation | Frequency (MHz) | Reading (dBμV) | Pre-Amp (dB) | Antenna Factor (dB) | Average Factor (dB) | Net at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| V | 27.145 | 91.4 | 16 | 15.4 | 12.8 | 78.0 | 80.0 | -2.0 |
| V | 54.290 | 39.9 | 16 | 11.0 | - | 34.9 | 40.0 | -5.1 |
| V | 81.435 | 44.1 | 16 | 7.0 | - | 35.1 | 40.0 | -4.9 |
| H | 108.580 | 37.2 | 16 | 14.0 | - | 35.2 | 43.5 | -8.3 |
| H | 135.725 | 36.9 | 16 | 14.0 | - | 34.9 | 43.5 | -8.6 |
| H | 162.870 | 24.7 | 16 | 16.0 | - | 34.7 | 43.5 | -8.8 |
| H | 190.015 | 35.2 | 16 | 16.0 | - | 35.2 | 43.5 | -8.3 |
| H | 217.160 | 34.4 | 16 | 17.0 | - | 35.4 | 46.0 | -10.6 |
| H | 244.305 | 30.9 | 16 | 20.0 | - | 34.9 | 46.0 | -11.1 |
| H | 271.450 | 28.7 | 16 | 22.0 | - | 34.7 | 46.0 | -11.3 |
| H | 298.595 | 27.9 | 16 | 22.0 | - | 33.9 | 46.0 | -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. Loop antenna is used for the emissions below 30 MHz.

Company: Spin Master Toys Far East Limited Date of Test: August 25, 2010
Model: 44354
Mode: Charging Mode

Table 2

**Radiated Emissions**

| Polarization | Frequency (MHz) | Reading (dBµV) | Pre-amp (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 36.019 | 39.9 | 16 | 10.0 | 33.9 | 40.0 | -6.1 |
| V | 42.027 | 40.7 | 16 | 10.0 | 34.7 | 40.0 | -5.3 |
| V | 48.029 | 39.9 | 16 | 11.0 | 34.9 | 40.0 | -5.1 |
| V | 60.037 | 40.1 | 16 | 10.0 | 34.1 | 40.0 | -5.9 |
| V | 66.067 | 40.7 | 16 | 9.0 | 33.7 | 40.0 | -6.3 |
| V | 72.011 | 41.8 | 16 | 7.0 | 32.8 | 40.0 | -7.2 |

Notes: Negative signs (-) in the margin column signify levels below the limit.

## 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 measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

## 8.1 Measured Bandwidth

The plot saved in bw.pdf which shows the fundamental emission is confined in the specified band. And it also shows that the emission is at least 34 dB below the carrier level at the band edge (26.96 and 27.28 MHz). It meets the requirement of Section 15.227(b).

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.

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.*

The effective period ($T_{eff}$) was approximately 500 µs 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.

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 = 100 ms
Effective period of the cycle = (5 x 0.5 + 2 + 1.0 x 1.4 + 7 x 0.6) ms
= 22.7 ms

DC = 22.7 ms / 100 ms = 0.227

Therefore, the averaging factor is found by 20 $\log_{10}$ 0.227 = -12.8 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 C63.4 - 2003.

The transmitting equipment under test (EUT) is 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 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. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

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 - 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. 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 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.

## 9.0 **Equipment List**

Radiated Emissions Test

| Equipment | EMI Test Receiver | Biconical Antenna | Log Periodic Antenna | Active H-field Loop Antenna |
|---|---|---|---|---|
| Registration No. | EW-0016 | EW-0954 | EW-0446 | EW-0191 |
| Manufacturer | ROHDESCHWARZ | EMCO | EMCO | EMCO |
| Model No. | ESVS30 | 3104C | 3146 | 6502 |
| Calibration Date | Apr 21, 2010 | Apr 14, 2010 | Apr 26, 2010 | Jun 26, 2008 |
| Calibration Due Date | Apr 21, 2011 | Oct 14, 2011 | Oct 26, 2011 | Dec 26, 2010 |

| Equipment | 14m Double Shield RF Cable (20MHz - 6GHz) | 14m Double Shield RF Cable (9kHz - 6GHz) | Spectrum Analyzer |
|---|---|---|---|
| Registration No. | EW-2528 | EW-2375 | EW-2188 |
| Manufacturer | RADIALL | RADIALL | AGILENTTECH |
| Model No. | nm / br5d / sma 14m | n m/br56/bnc m 14m | E4407B |
| Calibration Date | Feb 18, 2010 | Sep 11, 2009 | Dec 25, 2009 |
| Calibration Due Date | Feb 23, 2011 | Sep 12, 2010 | Dec 31, 2010 |