

SCIENTIFIC TOYS LTD.

Application For Certification

FCC ID: BY32161-27TP

R/C Vehicle

Model: BY32161-27TP
Additional models: See Page 1 & 2

Transmitter

Report No.: SZHH00976314-001

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 [10-1-13]

Prepared and Checked by:

Approved by:

Sign on file
Terry Tang
Engineer

Andy Yan
Senior Project Engineer
Date: July 15, 2015

- 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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TRF No.: FCC 15C_TX_b

INTERTEK TESTING SERVICES

GENERAL INFORMATION

SCIENTIFIC TOYS LTD.

MODEL: BY32161-27TP

FCC ID: BY32161-27TP

Grantee:	SCIENTIFIC TOYS LTD.
Grantee Address:	Rm. 1108, 11/F., Block B, New Mandarin Plaza 14 Science Museum Road, TST East Kowloon, Hong Kong
Contact Person:	Muk Shui Leung
Tel:	852-25573202
Manufacturer:	SCIENTIFIC TOYS LTD.
Manufacturer Address:	Rm. 1108, 11/F., Block B, New Mandarin Plaza 14 Science Museum Road, TST East Kowloon, Hong Kong
Model:	BY32161-27TP
Type of EUT:	Transmitter
Description of EUT:	R/C Vehicle
Serial Number:	N/A
FCC ID :	BY32161-27TP
Date of Sample Submitted:	July 2, 2015
Date of Test:	July 7, 2015
Report No.:	SZHH00976314-001
Report Date:	July 15, 2015
Environmental Conidtions:	Temperature: +10 to 40°C Humidity: 10 to 90%

INTERTEK TESTING SERVICES

SUMMARY OF TEST RESULT

SCIENTIFIC TOYS LTD.

MODEL: BY32161-27TP

FCC ID: BY32161-27TP

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	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 Emissions	15.109 / ICES-003	N/A
Digital Device Conducted Emissions	15.107 / ICES-003	N/A

Note: 1. The EUT uses an integral antenna, 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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INTERTEK TESTING SERVICES

1.0 General Description

1.1 Product Description

The equipment under test (EUT) is a transmitter for R/C Vehicle operating at 27.145 MHz which is controlled by a crystal. The EUT is powered by one 9.0V 6F22 size battery.

The Models: 5F6314F, 22958, 21959, 97120, 97130, 97132, 97133, 97121, 97122, 97123, 97124, 97125, 97126, 97127, 97128, 97129, 97131, 97134, 97135, 97136, 97137, 97138, 97139, 97140, 97141-97180, 95555, 95556, 95557, 95558, 95550-95599, 95263, 95267, 95166, 95167, 95160-95169, 95170-95190, 98790, 98791-98799, 99597, 99598, 99843, 99840, 99590-99600, 99660, 21147, 21140, 21141, 21142, 21143, 21144, 21145, 21146, 21148, 21149, 21150, 24625, 24626, 24627, 24628, 24629, 24630-24634, 24635, 24636, 24637, 24638, 24639, 24640, 24641, 24642, 24643, 24644, 24645, 24646, 24658, 24620-24650, 24700, 24701, 24702, 24703, 24704, 24705, 24706, 24707, 24708-24720, 24550, 99420, 24570, 24594, 22920, 22921-22930, 21420, 21421, 21422-21430, 21427, 21428, 21429, 23810, 23814, 23811-23820, 90100, 90101-90110, 98867, 98860-98869, 24920, 24921, 24922, 24923, 24924, 24925, 24926, 24927, 24928, 24929, 24930, 21917, 21857, 25929, 25939, 99925, 99927, 99928, 99924, 99932, 99037, 99877, 20017, 99079, 99096, 99097, 99098, 99099, 97128, 97138, 21867, 22837, 99497, 99099, 99925, 99928, 99924, 99927, 99928, 99932, 99037, 99877, 21917, 21857, 21897, 25929, 25939, 20017, 24930, 99079, 99085, 99096, 99097, 99098, 99099, 99888, 97038, 97118, 97128, 97138, 21867, 22837, 99497, 21975, 97118, 97128, 97138, 97028, 97038, 99937, 99936, 99930-99939, 99870-99879, 99876, 99877, 99878, 99080, 99081, 99082, 99083, 99084, 99085, 99086, 99087, 99088, 99089, 99090, 99091, 99092, 99093, 99094, 99095, 99096, 99097, 99098, 99099, 97138, 97130-91450, 21867, 97210, 97217, 20001-20099, 20005, 20009, 20011, 20016, 20017, 20024, 20036, 20037, 20044, 20046, 20047, 20057, 21860, 21861, 21862, 21863, 21864, 21865, 21866, 21867, 21868, 21869, 21870, 21871, 21872, 21873, 21874, 21875, 21876, 21877, 21878, 21879, 21880, 21881, 21882, 21883, 21884, 21885, 21886, 21887, 21888, 21889, 21890, 21891, 21892, 21893, 21894, 21895, 21896, 21897, 21898, 21899, 21900, 99347, 21900-21932, 21917, 21918, 21933, 21934, 21935, 21936, 21937, 21938, 21939, 21940, 21941-21990, 99000, 99007, 99001-99009, 99010-99019, 99017, 99020-99026, 99027, 99028, 99029, 99030-99039, 99037, 99038, 97977, 95447, 99917, 99910-99929, 99927, 99928, 99940-99949, 99947, 99957, 99950-99999, 99967, 99977, 99987, 99997, 99998, 99999, 21959, 21975, 21977, 21427, 21429, 21449, 95737, , 21624, 21625, 21626, 21627, 21628, 21629, 21630, 21444, 21446, , 93817, 22102, 22103, 21110, 21111, 21116, 21119, 28119, 98790, 99597, 22920, 95737, 21634, 21627, 21620-21640, 36980, 30680, 31200, 31223, 30650, 31210, 31440, 21847, 21840-21849, 21857, 21850-21859, 21887, 21897, 21870-21899, 4817, 2970, 98770, 39170, 69170, 78060, 78080, 78063, 78073, 78083, 78061-78099, 74231, 74232,

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74233, 71856, 70050, 70467, 74046, 30690, 30700, 30693, 30650, 31210, 31440, 31223, 30310, 36980, 21900-21916, 21917, 21918, 21919, 21920-21929, 21930, 21931, 21932, 21933, 21934, 21935, 21936, 21937, 21938, 21939, 21940, 21941-21950, 21951-21958, 21959, 21960-21974, 21975, 21976, 21977, 21978, 21979, 21980, 21981-21999, 21444, 21446, 21448, 21440-21450, 93817, 24930, 24931, 24932, 24933, 24934, 24935, 24936, 24937, 24938, 24939, 24940, 24941-24999, 21600-21650, 21625, 21626, 21627, 21628, 21629, 21630, 21631, 21632, 21633, 21634, 21635, 21601, 21602, 21603, 21604, 21605, 21606, 21607, 21608, 21609, 21610-21630, 22102, 22103, 22004, 22100-22110, 21110, 21111, 21116, 21119, 21100-21130, 99668, 99660-99669, 99658, 99650-99659, 28018, 28019, 28020, 28021, 28022, 28023, 28024, 28025, 28026, 28027, 28028, 28029, 28030, 28031, 28050, 28051-28099, 98870, 98871-98879, 21700, 21701, 21702, 21703, 21704, 21705, 21706, 21707, 21708, 21709, 21710, 21711-21750, 21870, 21871, 21872, 21873, 21874, 21875, 21876, 21877, 21878, 21879, 21880, 21881-21899, 24046, 24049, 21045, 21046, 21047, 21857, 21897, 21837, 21830-21839, 21847, 21840-21849, 21850-21859, 21890-21899, 99487, 99967, 97977, 95447, 99007, 99017, 99027, 99037, 99038, 99047, 99057, 99067, 99077, 99086, 99087, 99088, 99089, 99000-99089, 99090-99095, 99096, 99097, 99098, 99099, 99900-99916, 99917, 99918-99926, 99927, 99928, 99929-99936, 99932, 99934, 99937, 99938-99967, 97038, 95737, 95734, 95730-95740, 24058, 24050-24099, 33340, 33341-33349, 30690, 30700, 30703, 30650, 31210, 31223, 31440, 30310, 30311-30319, 36980, 29100, 30760, 94440, 95030, 98120, 98867, 98877, 98873, 99670, 99870, 99937, 99877, 99879, 98777, 99347, 99630, 23345, 39160, 39170, 69170, 130314, 97028 are the same as the Model: BY32161-27TP in hardware and electrical aspect. The difference in appearance and model number serves as marketing strategy

Antenna Type: integral antenna

Type of modulation: N/A

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

1.2 Related Submittal(s) Grants

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

INTERTEK TESTING SERVICES

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). Radiated Emission measurement was performed in a Semi-anechoic chamber. Preliminary scans were performed in the Semi-anechoic chamber 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

The Semi-anechoic chamber facility used to collect the radiated data is Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch and located at 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

INTERTEK TESTING SERVICES

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 (2009).

The EUT was powered by one new 9.0V 6F22 size battery 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 centre 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 can transmit 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 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 Kejiyuan Branch.

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.

INTERTEK TESTING SERVICES

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.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

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

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

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

$$AV = 5.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 18 + 9 = 27 \text{ dB}\mu\text{V/m}$$

$$RR = 18.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

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

INTERTEK TESTING SERVICES

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission at 54.290 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 15.4 dB

INTERTEK TESTING SERVICES

Applicant: SCIENTIFIC TOYS LTD.

Date of test: July 7, 2015

Model: BY32161-27TP

Test Mode: Transmit

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
Vertical	27.145	26.7	0.0	18.4	0.0	45.1	80.0	-34.9
Vertical	54.290	37.7	20.0	6.9	--	24.6	40.0	-15.4
Vertical	81.435	33.6	20.0	6.3	--	19.9	40.0	-20.1
Vertical	108.580	30.5	20.0	8.1	--	18.6	43.5	-24.9
Vertical	135.725	31.8	20.0	6.9	--	18.7	43.5	-24.8
Vertical	162.870	31.6	20.0	7.8	--	19.4	43.5	-24.1
Vertical	190.015	26.1	20.0	13.9	--	20.0	43.5	-23.5

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.

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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 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 39.93 dB below the carrier level at the band edge (26.96MHz 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.

INTERTEK TESTING SERVICES

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*. And Pulse Desensitization is not used for this EUT.

8.3 Calculation of Average Factor

The EUT is transmitting continuously and the duty cycle is 100%.

INTERTEK TESTING SERVICES

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 - 2009.

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.

INTERTEK TESTING SERVICES

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 - 2009.

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.

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

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	8-Jun-15	8-Jun-16
SZ185-01	EMI Receiver	R&S	ESCI	100547	7-Feb-15	7-Feb-16
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	19-Apr-14	19-Apr-16
SZ062-04	RF Cable	RADIAL	RG 213U	--	8-Jun-15	8-Nov-15
SZ062-06	RF Cable	RADIAL	0.04-26.5GHz	--	8-Jun-15	8-Nov-15
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	7-Feb-15	7-Feb-16