

TEST REPORT

Applicant Name : Guangdong Yinrun Industry Co, Ltd.
& Address : Yinrun Ind. Garden, Laimei Zone, Chenghai, Shantou city,
Guangdong, China

Manufacturing Site : Same as applicant

Sample Description

Product	: TOY-R/C Bumper Car 1026
Model No.	: 1026(27.145MHz)
Electrical Rating	: 2*AAA 1.5V battery
FCC ID	: XHT1026-27M
Date Received	: 06 July 2010

Date Test Conducted : 06 July 2010 to 19 July 2010

Test standards : FCC Part 15.227

Test Result : Pass

Conclusion : The submitted samples complied with the above rules/standards.

Remark : None.

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1 General Description

1.1 Product Description

The equipment under test (EUT) is a transmitter for TOY-R/C Bumper Car operating at 27.145 MHz which is controlled by a crystal. The EUT is powered by 2*AAA 1.5V battery. The EUT has 2 press-buttons. The 2 press-buttons are used to control The RC Car to move forward and backward, turn right and left.

Antenna Type: External, Integral

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

1.2 Test Methodology

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

1.3 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, Block D, Huahan Building, Langshan Road, Nanshan District Shenzhen, P.R.China. This test facility and site measurement data have been fully placed on file with File Number 242492.

2 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 2 new AAA 1.5V batteries.

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 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 placed on 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

No modification.

2.5 Measurement Uncertainty

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

2.6 *Support Equipment List and Description*

N/A

3 Emission Results

Data is included 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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}/\text{m}$

RR = RA - AG - AV in $\text{dB}\mu\text{V}$

LF = CF + AF in dB

Assume a receiver reading of 52.0 $\text{dB}\mu\text{V}$ 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 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

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

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

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

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

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

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

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

$$FS = RR + LF$$

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

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

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 and Spurious 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 10.7 dB

Applicant: Guangdong Yinrun Industry Co, Ltd.
Model: 1026-27M

Date of test: 15 July 2010

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Vertical	27.146	40.1	0.0	21.4	5.3	56.2	80.0	-23.8
Vertical	54.290	40.1	20.0	9.2	-	29.3	40.0	-10.7
Vertical	81.435	36.2	20.0	8.8	-	25.0	40.0	-15.0
Vertical	108.580	36.9	20.0	9.3	-	26.2	43.5	-17.3
Vertical	135.725	38.5	20.0	8.6	-	27.1	43.5	-16.4
Vertical	162.870	37.8	20.0	9.6	-	27.4	43.5	-16.1
Vertical	190.870	30.5	20.0	11.9	-	22.4	43.5	-21.1

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. Loop antenna is used for the emissions below 30MHz
5. Horn antenna is used for the emission over 1000MHz.

4 Equipment photo

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

5 Product Labelling

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

6 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 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 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 *Bandwidth Plot*

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 35dB below the carrier level at the band edge (26.96 and 27.28 MHz). It meets the requirement of Section 15.227(b).

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 (Teff) was approximately 560 μ s for a digital "1" bit, as shown in the plots of 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 is shown below.

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

The duration of one cycle =77.76ms

Effective period of the cycle = $4*1.6\text{ms}+64*0.56\text{ms}=42.24\text{ms}$

$DC = 42.24/77.76=0.54321$ or 54.321%

Therefore, the averaging factor is found by $20\lg 0.54321=-5.3\text{dB}$

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 C63.4 - 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.

8.5 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 transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. 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 Equipment list

1) Radiated Emission test

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	25-Nov-09	25-May-11
SZ185-01	EMI Receiver	R&S	ESCI	100547	08-Mar-10	08-Mar-11
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	18-Mar-10	18-Mar-11
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	31-Oct-09	31-Oct-10
SZ062-04	RF Cable	RADIALL	RG 213U	--	05-Nov-09	05-Nov-10
SZ062-06	RF Cable	RADIALL	0.04-26.5GHz	--	17-Aug-09	17-Aug-10
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	27-Nov-09	27-May-11