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TEST REPORT

Report No.: 15040610HKG-001

Grandex International Development Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: VC961236127)


Transmitter

Prepared and Checked by:

Approved by:



Tse Ying, Cathy
Senior Lead Engineer



Ng Mei Nar, Chris
Lead Engineer
Date: May 05, 2015

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GENERAL INFORMATION

Grantee:	Grandex International Development Ltd.
Grantee Address:	Unit 2401, Million Fortune Industrial Centre, 34-36 Chai Wan Kok Street, Tsuen Wan, N.T., Hong Kong
Contact Person:	Peter Ng
Tel:	(852) 2405-2266
Fax:	(852) 2405 3950
e-mail:	peter@grandex.com.hk
Manufacturer:	Grandex International Development Ltd.
Manufacturer Address:	Unit 2401, Million Fortune Industrial Centre, 34-36 Chai Wan Kok Street, Tsuen Wan, N.T., Hong Kong
Brand Name:	N/A
Model:	61236
Type of EUT:	Transmitter
Description of EUT:	Radio Control Vehicles
Serial Number:	N/A
FCC ID:	VC961236127
Date of Sample Submitted:	April 10, 2015
Date of Test:	April 10, 2015 to April 30, 2015
Report No.:	15040610HKG-001
Report Date:	May 05, 2015
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

Report No.: 15040610HKG-001
FCC ID: VC961236127

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Intertek Testing Services Hong Kong Ltd.

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SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Transmitter Field Strength	15.227	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2013 Edition

- 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 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 portable transmitter of a RC Car operating at 27.145 MHz as dictated by a crystal. The EUT is powered by a 3.0 V DC source (2 x 1.5V battery). The EUT has a left / right control lever and a forward / backward control lever.

After switching ON the EUT and the receiver of the RC Car, activating the control levers on the EUT can control the receiver moving forward, backward left and right directions.

Antenna Type: External, Integral

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).

1.3 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.4 (2009). 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 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 (2009).

The device was powered by new 2 x 1.5V AA size 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 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 Measurement Uncertainty

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

2.5 Support Equipment List and Description

N/A.

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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 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

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



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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found 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 5.4 dB

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Applicant: Grandex International Development Ltd.
Model: 61236
Worst-Case Operating Mode: Transmitting

Date of Test: April 30, 2015

Table 1

**Radiated Emissions
Pursuant to FCC Part 15 Section 15.227 Requirement**

Polari- zation	Frequency (MHz)	Reading (dB μ V)	Pre- Amp (dB)	Antenna Factor (dB)	Average Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	27.145	64.1	16	15.4	0.0	63.5	80.0	-16.5
V	54.290	39.6	16	11.0	-	34.6	40.0	-5.4
H	81.435	43.3	16	7.0	-	34.3	40.0	-5.7
H	108.580	36.5	16	14.0	-	34.5	43.5	-9.0
H	135.725	35.9	16	14.0	-	33.9	43.5	-9.6
H	162.870	34.4	16	16.0	-	34.4	43.5	-9.1
H	190.015	34.6	16	16.0	-	34.6	43.5	-8.9
H	217.160	33.9	16	17.0	-	34.9	46.0	-11.1
H	244.305	30.5	16	20.0	-	34.5	46.0	-11.5
H	271.450	27.6	16	22.0	-	33.6	46.0	-12.4

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 30MHz.
5. Measurement Uncertainty is ± 5.3 dB at a level of confidence of 95%.



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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.



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8.0 Miscellaneous Information

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

8.1 Measured Bandwidth

The plot shows the fundamental emission is confined in the specified band. And it also shows that the emission is at least 33.66 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 designed (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.



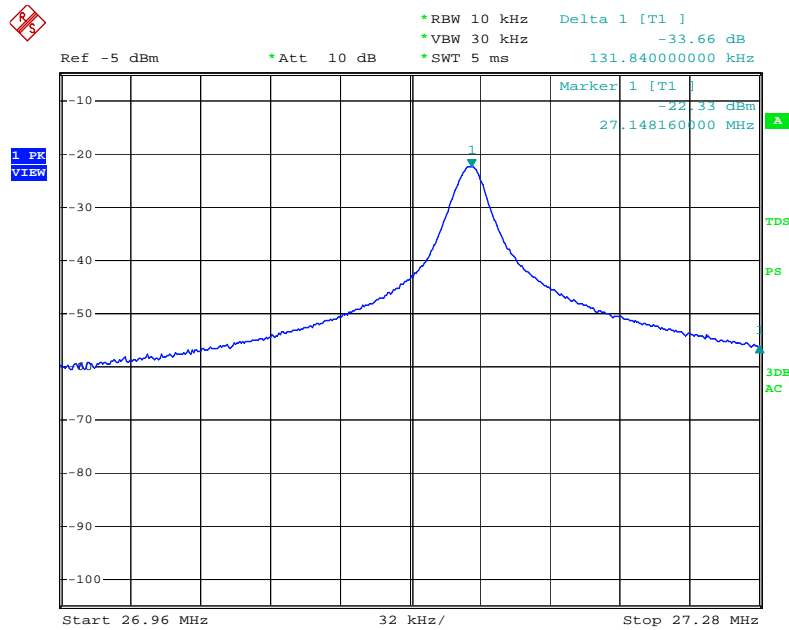
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Peak Measurement



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8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately $493\mu s$ for a digital “1” bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 100kHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

It is not necessary to apply average factor as the measured (peak) data has been complied with average limit of the radiated emission.

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

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 axis to obtain maximum emission levels. 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. 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.



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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 were made as described in ANSI C63.4 (2009).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 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 8.1). 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 forbidden 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, unless otherwise reported. Measurements taken at a closer distance are so marked.

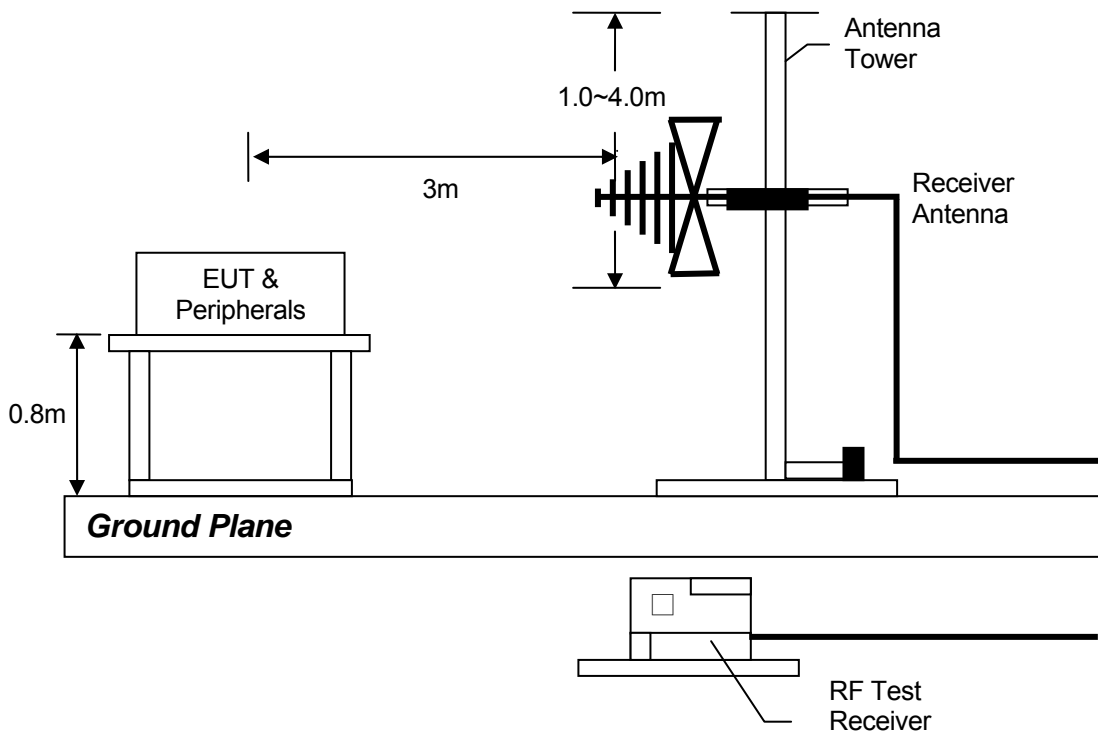
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8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.





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9.0 **Equipment List**

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer
Registration No.	EW-2500	EW-2253
Manufacturer	R&S	R&S
Model No.	ESCI	FSP40
Calibration Date	Nov. 06, 2014	May 08, 2014
Calibration Due Date	Nov. 06, 2015	May 08, 2015

Equipment	Log Periodic Antenna	Biconical Antenna	Active Loop H-field (9kHz to 30MHz)
Registration No.	EW-0446	EW-2512	EW-2313
Manufacturer	EMCO	EMCO	Electrometric
Model No.	3146	3104C	EM-6876
Calibration Date	Nov. 10, 2014	Jan. 22, 2015	Dec 16, 2014
Calibration Due Date	May 10, 2016	Jul. 22, 2016	Jun 16, 2016

2) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Nov. 19, 2014
Calibration Due Date	Nov. 19, 2015

END OF TEST REPORT