



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AR0026461(8)

Date : 29 May 2013

Application No. : LR014319(7)

Applicant : ET Tech Limited
Room 2912, Tower 2,
Times Sq, 1 Matheson Street,
Causeway Bay, Hong Kong

Sample Description : One(1) item of submitted sample stated to be Twin Turbine 2.0
of Model No. 6000936

Radio Frequency : 27.145MHz Transmitter

Rating : 6 x 1.5V AA size batteries

Sample registration No. : RR017402-002

No. of submitted sample : Two (2) set (s)

Date Received : 14 May 2013.

Test Period : 14 May 2013 to 23 May 2013.

Test Requested : FCC Part 15 Permissive Change.

Test Method : 47 CFR Part 15 (10-1-11 Edition)
ANSI C63.4 – 2009

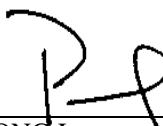
Test Engineer : Mr. LEUNG Shu-kan, Ken

Test Result : See attached sheet(s) from page 2 to 27.

Conclusion : The submitted sample was found to comply with requirement of FCC Part 15
Subpart C.

Remark : There are three channels (A, B and C) and Channel B was tested. The three
channels are used to change coding to prevent interference.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : 

Mr. WONG Lap-pong, Andrew
Assistant Manager
Electrical Division

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1 General Information

1.1 General Description

The equipment under test (EUT) is a transmitter for Twin Turbine. It operates at 27.145MHz and the oscillation of radio control is generated by a crystal. The EUT is powered by 6 x 1.5V AA size batteries. There are two control sticks, two steering trimmer buttons, one channel switch and ON / OFF / Charging switch on the EUT. The channel switch is used to change coding to prevent interference. The EUT can provide battery charge function during the EUT connected with the receiver and set the ON / OFF / Charging switch to charging position. When the EUT switched "ON", Channel selected and control sticks are triggered, it will transmit different radio control signal to receiver.

The antenna is using unique connector and the radio output power is unable to adjust.

The brief circuit description is listed as follows:

- Q1, Q2, Q3, U1 and its associated circuit act as a battery charger.
- U2 and its associated circuit act as an encoder.
- Y1, Q4 and its associated circuit act as an oscillator
- Q5 and its associated circuit act as an amplifier.

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1.2 Location of the test site

FCC Registered Test Site Number: 552221

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
EMI Test Receiver	R&S	ESCI	100152	28 May 2013
Broadband Antenna	Schaffner	CBL6112B	2692	16 Jan 2014
Loop Antenna	EMCO	6502	00056620	15 Sep 2013
Coaxial Cable	Schaffner	RG 213/U	N/A	28 May 2013
Coaxial Cable	Suhner	RG 214/U	N/A	28 May 2013

1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U _{lab})
30MHz ~ 200MHz (Horizontal)	4.83dB
30MHz ~ 200MHz (Vertical)	4.84dB
200MHz ~1000MHz (Horizontal)	4.66dB
200MHz ~1000MHz (Vertical)	4.65dB

Conducted emissions

Frequency	Uncertainty (U _{lab})
150kHz~30MHz	3.02dB



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2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009.

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 1m and 0.8m high above the ground. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.

2.2 Test Result

Peak Detector data was measured unless otherwise stated.

“#” means emissions appearing within the restricted bands shall follow the requirement of section 15.205.

The frequencies from fundamental up to the tenth harmonics were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next page (section 2.3).

It was found that the EUT meet the FCC requirement.



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2.3 Radiated Emission Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

Environmental conditions:

Parameter	Recorded value
Ambient temperature:	27 °C
Relative humidity:	73 %

Detector: Peak (Fundamental frequency), Quasi-peak (outside operation band)

RBW: 120kHz

VBW: 300kHz

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dB μ V)	Antenna Factor and Cable Loss (dB/m)	Average Factor (dB)	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
27.154	V	68.7	9.9	- 19.1	59.5	80.0	- 20.5
54.292	V	21.2	10.2	-	31.4	40.0	- 8.6
81.439	V	19.4	8.6	-	28.0	40.0	- 12.0
# 108.584	V	20.6	12.4	-	33.0	43.5	- 10.5
# 135.734	V	19.3	14.7	-	34.0	43.5	- 9.5
# 162.877	V	21.2	12.0	-	33.2	43.5	- 10.3
190.023	V	21.5	11.2	-	32.7	43.5	- 10.8
217.168	V	20.4	11.9	-	32.3	46.0	- 13.7
244.345	V	22.2	11.9	-	34.1	46.0	- 11.9
271.445	V	19.6	15.0	-	34.6	46.0	- 11.4



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3 Description of the Line-conducted Test

3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

No measurement is required as the EUT is a battery-operated product.

3.3 Graph and Table of Conducted Emission Measurement Data

Not Applicable



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4 Photograph

4.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename TSup1.jpg to TSup2.jpg.

4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename ExPho1.jpg to ExPho2.jpg and InPho1.jpg to InPho4.jpg.

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5 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

Document	Filename
ID Label/Location	LabelSmp.jpg
Block Diagram	BlkDia.pdf
Schematic Diagram	Schem.pdf
Users Manual	UserMan.pdf
Operational Description	OpDes.pdf

5.1 Bandwidth

The plot on saved in TestRpt2.pdf shows the fundamental emission is confined in the specified band. It also shows that the band edge met the 15.209 requirement at 26.9599 and 27.2801 MHz.

Emission at 26.96MHz = 14.76 dBuV/m

Emission at 27.28MHz = 14.23 dBuV/m

5.2 Duty cycle

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

The duration of one cycle = 83.913ms

Duration of pulse 1 = 579.7us

Duration of pulse 2 = 289.9us

Duration of pulse 3 = 884.1us

Number of pulse 1 = 8

Number of pulse 2 = 13

Number of pulse 3 = 1

Effective period of the cycle = $(8 \times 579.7\mu s) + (13 \times 289.9\mu s) + (1 \times 884.1\mu s)$
= 9.2904ms

Duty Cycle = $9.2904 / 83.913$
= 0.111

Therefore, the average factor is found by $20 \log_{10} 0.111 = -19.1\text{dB}$

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5.3 Transmission time

Not Applicable



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A3.	Photos of Internal Configurations	2	pages
A4.	ID Label/Location	2	pages
A5.	Bandwidth Plot	1	page
A6.	Average Factor	3	pages
A7.	Block Diagram	1	page
A8.	Schematics Diagram	1	page
A9.	User Manual	2	pages
A10.	Operation Description	1	page

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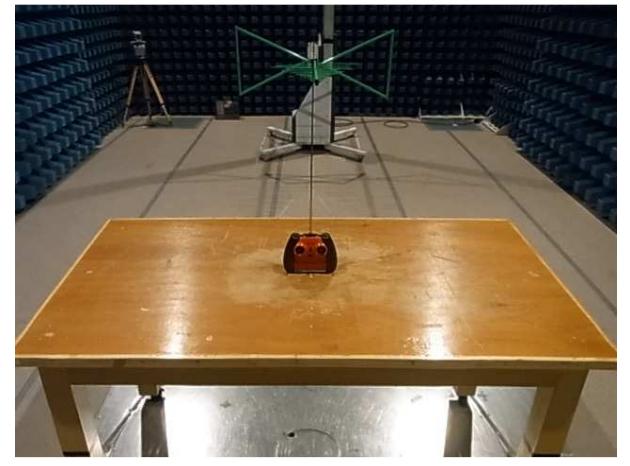
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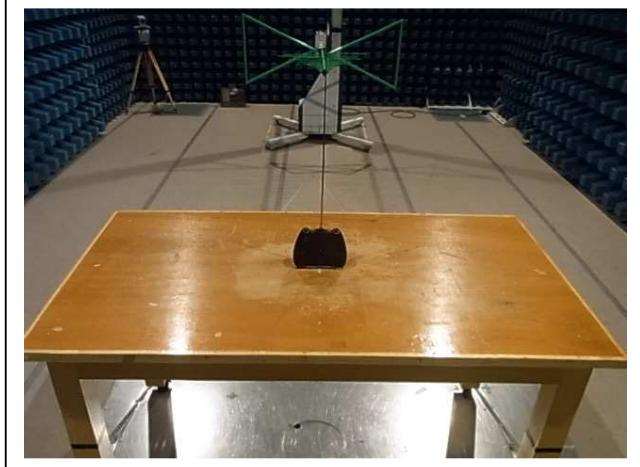
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A1. Photos of the set-up of Radiated Emissions



(Front view)



(Back view)

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A2. Photos of External Configurations



External Configuration 1



External Configuration 2

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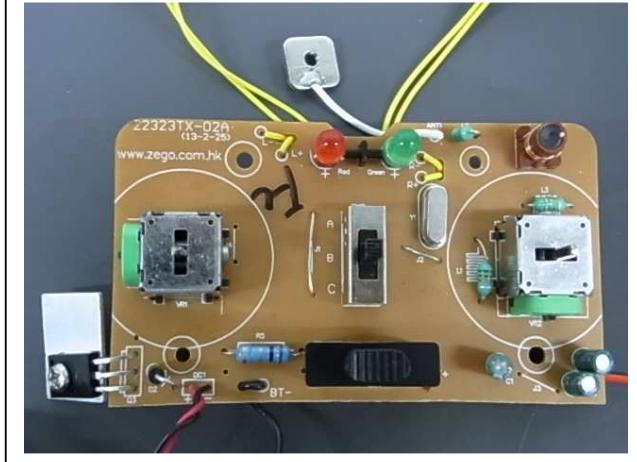
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A3. Photos of Internal Configurations



Internal Configurations 1



Internal Configurations 2

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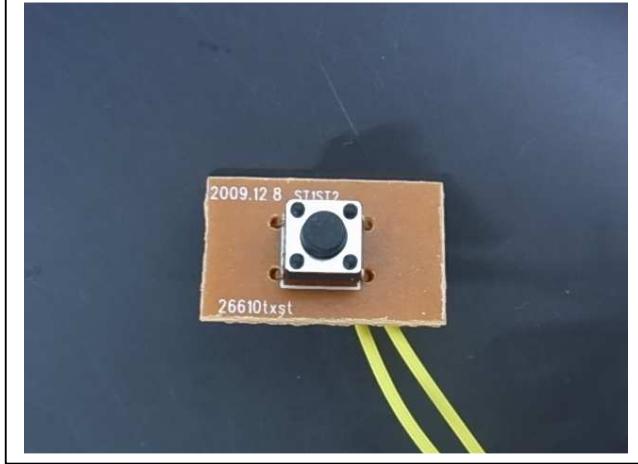
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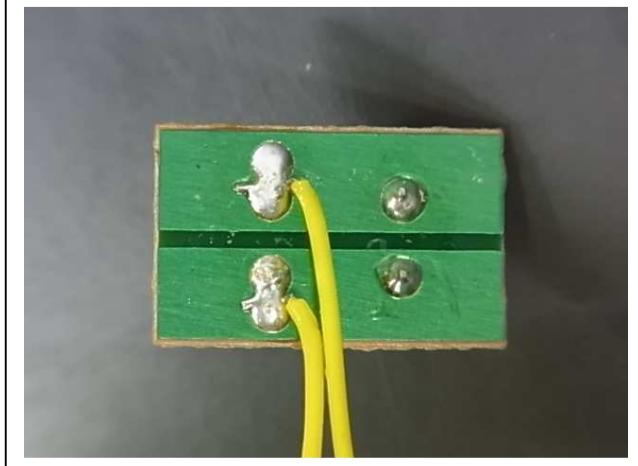
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A3. Photos of Internal Configurations



Internal Configurations 3



Internal Configurations 4

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A4. ID Label/Location



ID Label 1

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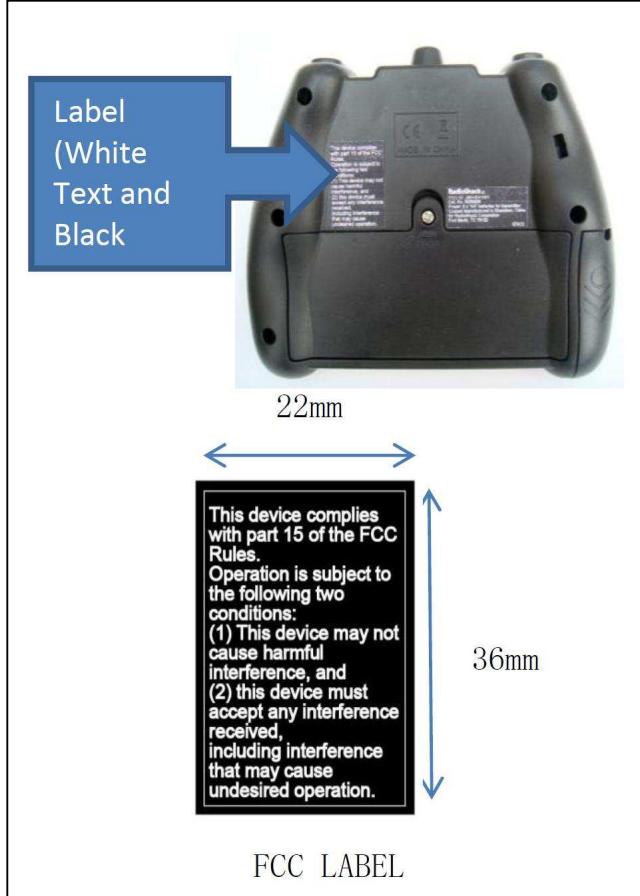
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A4. ID Label/Location



FCC LABEL

ID Label 2

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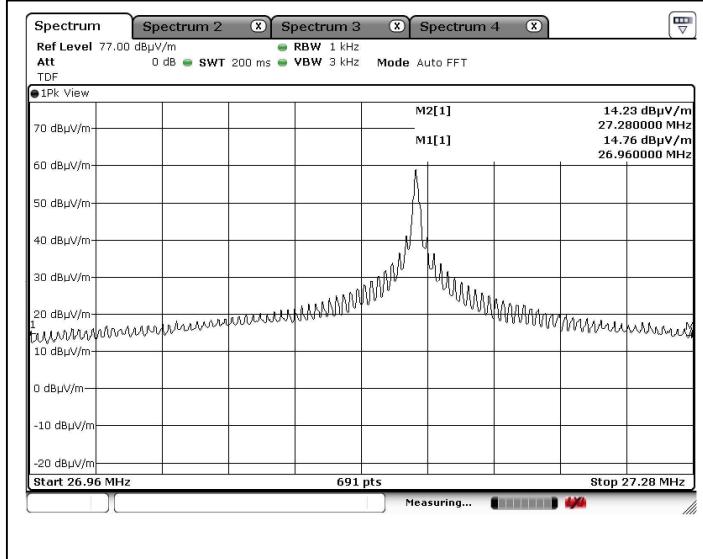
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A5. Bandwidth Plot



Bandwidth 1

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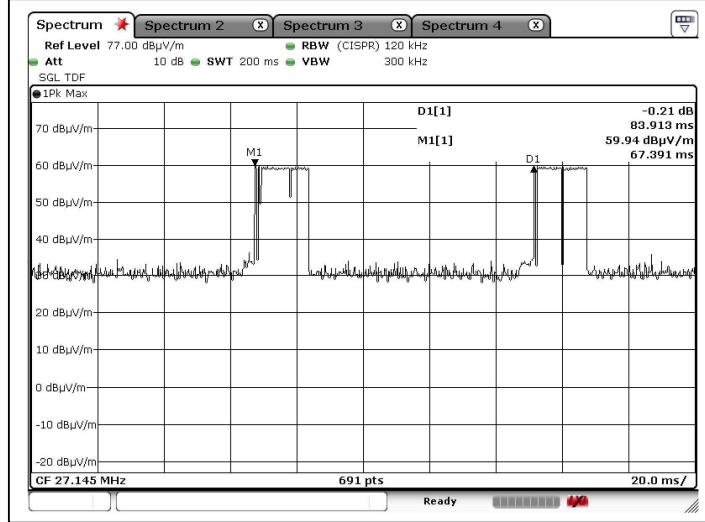
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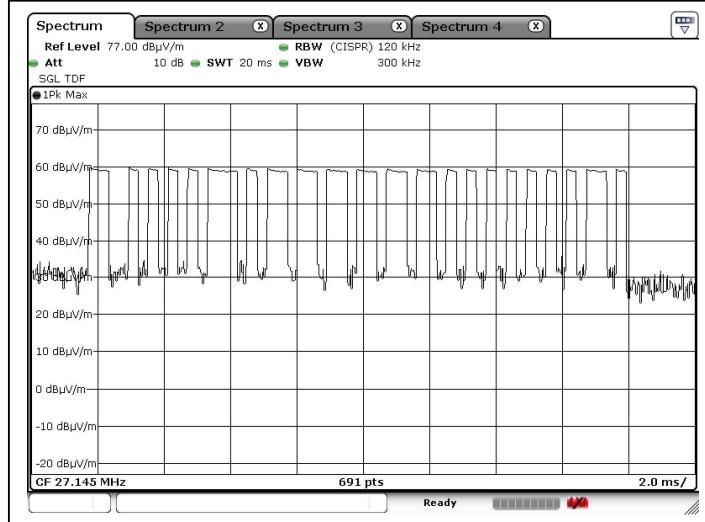
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A6. Duty Cycle



Duty Cycle 1



Duty Cycle 2

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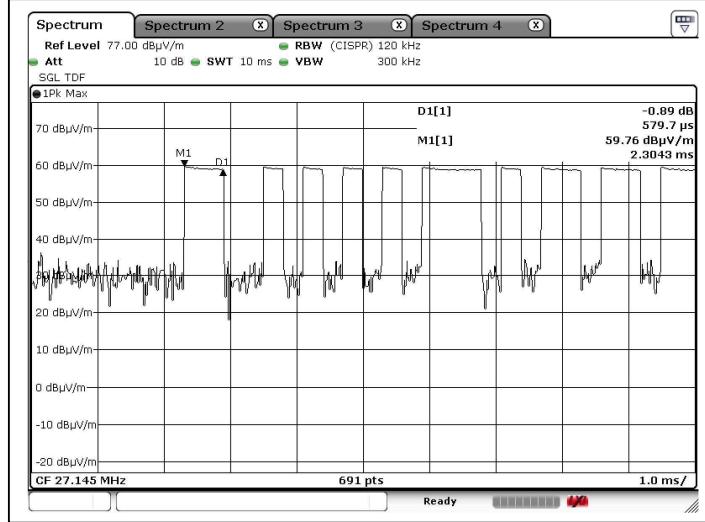
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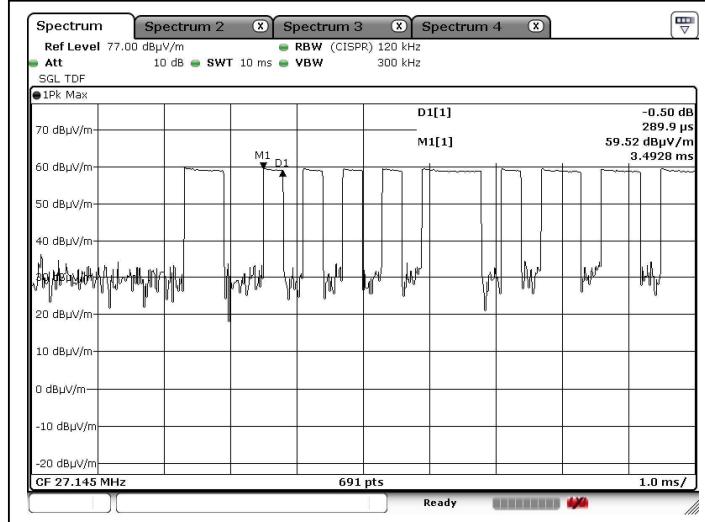
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A6. Duty Cycle



Duty Cycle 3



Duty Cycle 4

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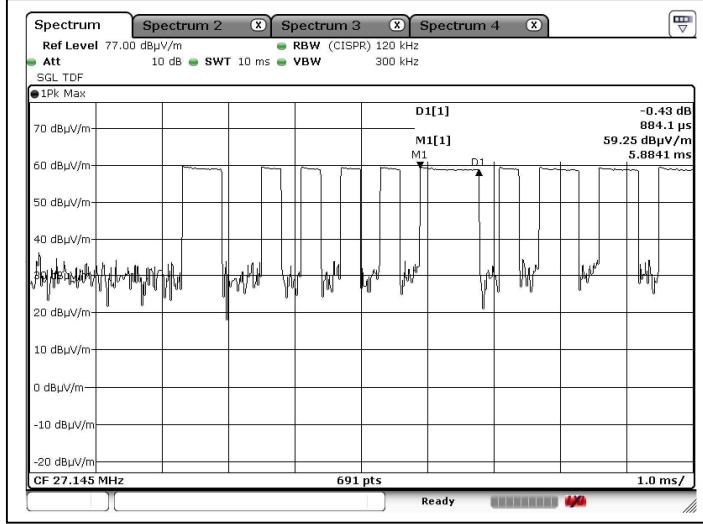
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A6. Duty Cycle



Duty Cycle 5

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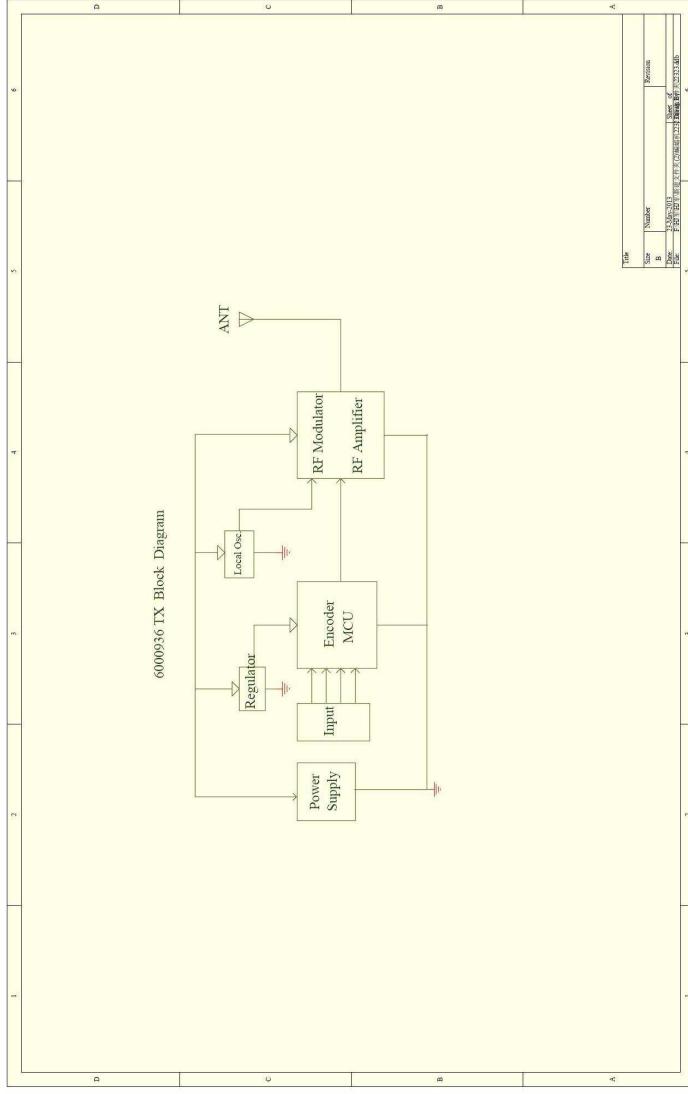
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A7. Block Diagram



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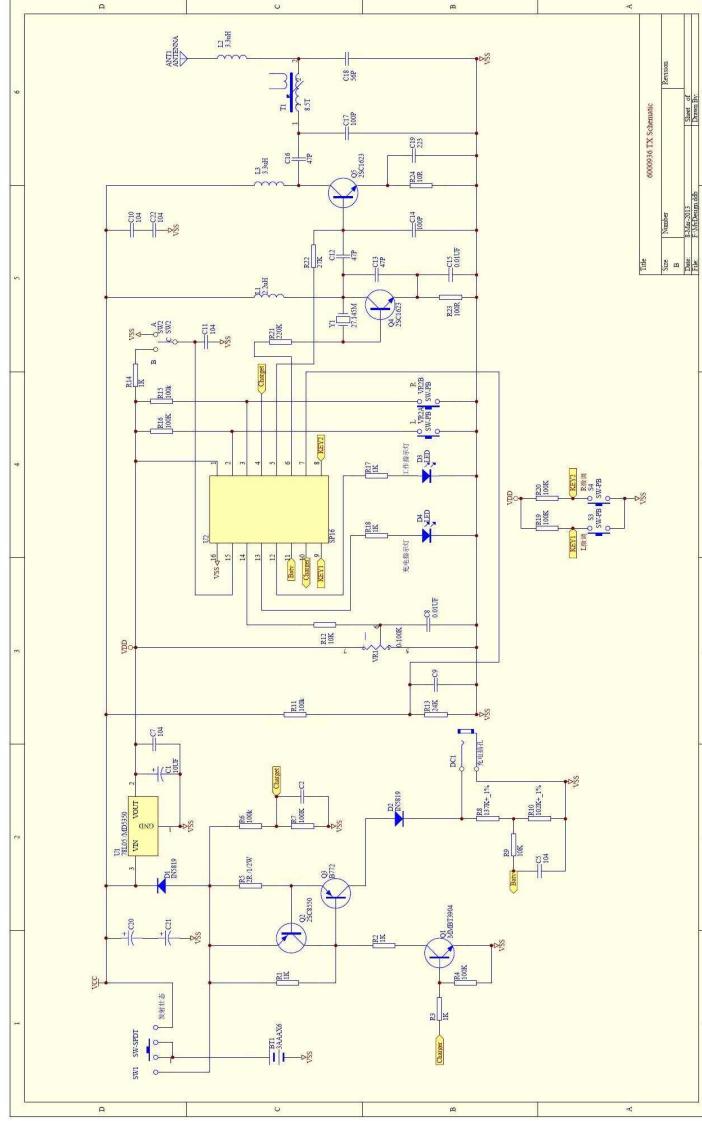
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A8. Schematics Diagram



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Reviewed by:

Re.

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A9. User Manual



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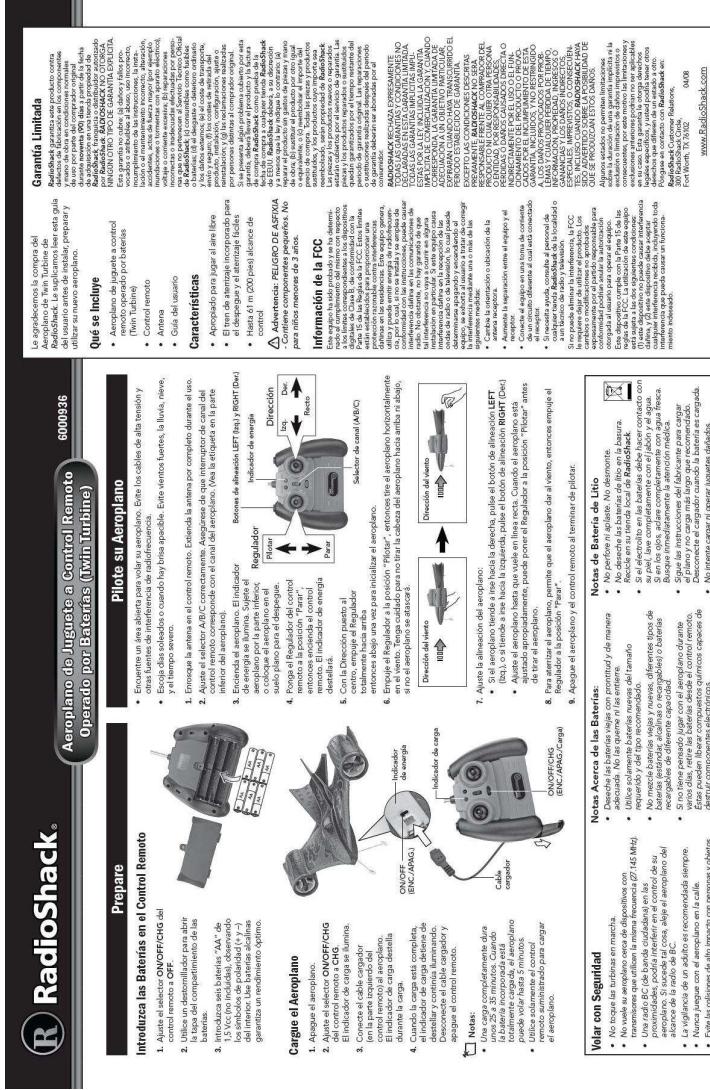
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A9. User Manual



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A10. Operation Description

Transmitter Operational Description

Remote controller used 1.5V *6 'AA' batteries, it is designed to operate a single fixed frequency in the 27.145MHz band, Please see attached block diagram and schematic.

Device has two joysticks. One controls receiver forward and the other one control receiver turns left and right. One Encoder MCU is used on transmitter. The MCN receives controlling signal, a encode serial bit-stream is sent out via RF Modulator, RF amplifier and antenna.

Receiver Operational Description

Receiver is used 3.7V LiPolymer battery to supply power, Antenna receive the modulated signal, the signal is demodulated through Super Regge Motor Demodulator, the demodulating signal is amplified and decoded byMCU, MCU send out driving signal to drive the Motor.

***** End of Report *****

Tested by:

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