Report No. : SZHH01169038-001

RADIO COMMUNICATIONS AND EMC TESTING

ZHANG BO TOYS FACTORY

REMOTE CONTROL AIRCRAFT SERIES

Model: D61

Additional Models: H26,H26WH,CF-906,CF-907,CF-908,CF-909,CF-910,CF-911,CF-912, CF-913,CF-914,CF-915,CF-916,CF-917,CF-918,CF-919,CF-920,CF-921,CF-922,CF-923, CF-924,CF-925,CF-926,CF-927,CF-928,CF-929,CF-930,CF-931,CF-932,CF-933,CF-934, CF-935,CF-936,CF-937,CF-938,CF-939,CF-940,CF-941,CF-942,CF-943,CF-944,CF-945, CF-946,CF-947,CF-948,CF-949,CF-950,CF-951,CF-952,CF-953,CF-954,CF-955,CF-956, CF-957,CF-958,CF-959,D61,D62,D63,D51,D52,D53,D86,D85,D65

Test Report : SZHH01169038-001

Test Engineer :	Abel Zhou Senior Engineer	Sign On File
Report Approved By :	Jimmy Wen Assistant Supervisor	Digitally signed by jimmy.wen Location: Intertek Testing Services
Date :	19 July 2017	

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TRF No.: EN300440_2a

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RADIO PERFORMANCE MEASUREMENTS
RESULT SUMMARY

Requirements	ETSI EN 300 440		Compliance
	Technical requirements	Test Specification	
	Clause Number		
Equivalent Isotropically Radiated Power (EIRP)	4.2.2	4.2.2.3	Complied
Permitted Range of Operating Frequencies	4.2.3	4.2.3.3	Complied
Unwanted emissions in the spurious domain	4.2.4	4.2.4.3	Complied
Spurious radiation	4.3.5	4.3.5.3	Complied
When determining the test conclusion, the Measurement Uncertainty of test has been considered.			

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EMC COMPLIANCE MEASUREMENTS
RESULT SUMMARY

	ETSI EN 301 489-3	ETSI EN 301 489-1	Compliance
	Clause Number		
EMC Emission	7.1	8.2	Complied
Electrostatic Discharge	7.2	9.3	Complied
Radio Frequency Electromagnetic Field (80MHz-6GHz)	7.2	9.2	Complied
When determining the test conclusion, the Measurement Uncertainty of test has been considered.			

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EQUIPMENT UNDER TEST (EUT)

INFORMATION

Applicant :	ZHANG BO TOYS FACTORY XIACUN INDUSTRIAL ZONE,LIANXIA TOWN, CHENGHAI DISTRICT,SHANTOU CITY, GUANGDONG,CHINA
Description of EUT :	REMOTE CONTROL AIRCRAFT SERIES
Brand Name(s)/ Type	N/A/D61
Serial Number(s) :	Not Labelled
Equipment Received :	27 June 2017
Test Date(s) :	27 June 2017 to19 July 2017
Classification of EUT :	Class 3 Type III
Extreme Temp.:	-20 °C to 55 °C
Modulation Type:	GFSK
Antenna Type:	Integral Antenna of Control Unit and Receiver Unit
Test Specification(s) :	ETSI EN 300 440 V2.1.1 (2017-03)
	Draft ETSI EN 301 489-1: V2.2.0 (2017-03)
	Final Draft ETSI EN 301 489-3: V2.1.1 (2017-03)

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EXHIBIT 1

GENERAL DESCRIPTION

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1 INTRODUCTION

Intertek Testing Services Shenzhen Limited Longhua Branch has tested the ZHANG BO TOYS FACTORY D61, REMOTE CONTROL AIRCRAFT SERIES. The sample was tested to the relevant performance specification published by the European Telecommunications Standards Institute. This report contains the results of these tests and is submitted to ZHANG BO TOYS FACTORY as the final test results.

The additional models: H26,H26WH,CF-906,CF-907,CF-908,CF-909,CF-910,CF-911,CF-912, CF-913,CF-914,CF-915,CF-916,CF-917,CF-918,CF-919,CF-920,CF-921,CF-922,CF-923,CF-924, CF-925,CF-926,CF-927,CF-928,CF-929,CF-930,CF-931,CF-932,CF-933,CF-934,CF-935,CF-936, CF-937,CF-938,CF-939,CF-940,CF-941,CF-942,CF-943,CF-944,CF-945,CF-946,CF-947,CF-948, CF-949,CF-950,CF-951,CF-952,CF-953,CF-954,CF-955,CF-956,CF-957,CF-958,CF-959,D61, D62,D63,D51,D52,D53,D86,D85,D65 are same as the model: D61 in hardware aspect. Theirs difference in the appearance and model number. The production units are required to conform to the initial sample as received when the units are placed on the market.

2 TEST SPECIFICATION

2.1 RELEVANT PERFORMANCE SPECIFICATION

The relevant performance specification for ZHANG BO TOYS FACTORY D61, REMOTE CONTROL AIRCRAFT SERIES are ETSI EN 300 440 V2.1.1 (2017-03). The harmonised standards are ETSI EN 300 440 V2.1.1 (2017-03), Final Draft ETSI EN301 489-3 V2.1.1 (2017-03) and Draft ETSI EN301 489-1 V2.2.0 (2017-03).

The tests performed are those required to demonstrate compliance with the essential requirements of Article 3.1(b) and 3.2 of the Radio Equipment Directive (2014/53/EU)-RED Directive for regulatory purposes.

2.2 TEST ENVIRONMENT

The tests were performed in the Radio communications and Electromagnetic Compatibility Test Facility at Intertek Testing Services Shenzhen Ltd. Longhua Branch (Intertek). The sample was subjected to the ambient conditions in the laboratory and indoor test site except during tests at extremes of temperatures and the Radiated Emissions Tests. The temperature and relative humidity recorded during the period of each test are given in the results.

2.3 CONFIGURATION OF TEST SAMPLE

The test samples consisted of one transmitter (Control Unit) and one receiver (Receive Unit).

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2.4 TEST POWER SOURCES

The Control Unit is intended to operate from 6.0VDC (4 x 1.5V AA batteries). The Receive Unit is powered by 3.7VDC (1 x 3.7V Rechargeable battery). The test power source voltages declared by the manufacturer were:

Control Unit:

Nominal test voltage	6.0VDC
Lower extreme test voltage	5.1VDC
Upper extreme test voltage	6.0VDC

2.5 TEST FREQUENCIES

The sample supplied operated nominally at 2.405- 2.470GHz for transceiver. The tests were carried out on channel Low, Medium and High of the alignment range.

2.6 MEASUREMENT UNCERTAINTY

All measurement uncertainties stated in this report are estimated to a 95% confidence level.

2.7 SUPPORT EQUIPMENT - RADIO PERFORMANCE MEASUREMENTS

N/A

2.8 SUPPORT EQUIPMENT - EMC COMPLIANCE MEASUREMENTS

N/A

2.9 PERFORMANCE CRITERIA

2.9.1 PERFORMANCE CRITERIA FOR CONTINUOUS PHENOMENA (CT & CR)

During test, there may be loss of function but there should be no unintentional responses.
After test, EUT should operate as intended. Lost functions should be self-recoverable.

2.9.2 PERFORMANCE CRITERIA FOR TRANSIENT PHENOMENA (TT & TR)

At the conclusion of each exposure the EUT shall operated with no user noticeable loss of communication link.
Where the EUT is transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

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EXHIBIT 2

TEST RESULT

OF

RADIO PERFORMANCE MEASUREMENTS

TRF No.: EN300440_2a

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3 EQUIVALENT ISOTROPICALLY RADIATED POWER (E.I.R.P.)

3.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 440 V2.1.1 (2017-03)
Clause :	4.4.2
Test method	Radiated measurement

3.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
SZ061-12	Biconilog Antenna	ETS	3142E	15-Sep-16	15-Sep-17
SZ016-12	Temperature & Humidity Chamber	Terchy	MHK-120NK	23-Jul-16	23-Jul-17
SZ185-01	EMI Receiver	R&S	ESCI	23-Jul-16	23-Jul-17
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	16-Apr-16	16-Apr-18
SZ056-06	Signal Analyzer	R&S	FSV40	02-Aug-16	02-Aug-17
SZ056-03	Spectrum Analyzer	R&S	FSP30	23-Jul-16	23-Jul-17
SZ006-12	DC Power Source	APC	AFC-11005GS	25-Dec-16	25-Jul-17

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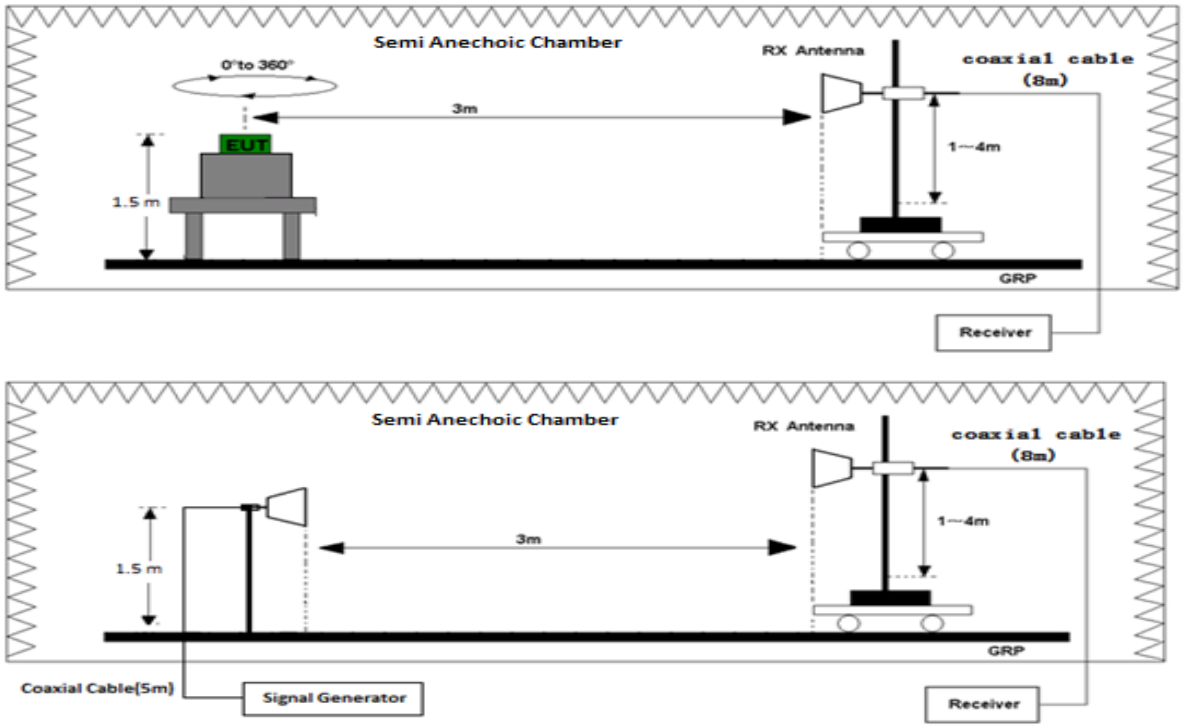
3.3 Test Setup



Test set-up of radiated disturbance (above 1GHz)

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3.4 TEST RESULT

Ambient Test Conditions: Temperature 25°C; Humidity 50%

(Control Unit)

Test Conditions			Power (dBm)	Limit (dBm)	Margin (dB)
Temperature(°C) Humidity(%)	Voltage	CH			
Tmin 25 ℃ Hmin 50%	❒ VDC nom 6.0VDC	L 2405(MHz)	-6.1	10.0	-16.1
Tmin -20 ℃ Hmin 0%	❒ VDC max 6.0VDC		-5.6	10.0	-15.6
	❒ VDC min 5.1VDC		-5.9	10.0	-15.9
Tmax 55 ℃ Hmax 50%	❒ VDC max 6.0VDC		-6.0	10.0	-16.0
	❒ VDC min 5.1VDC		-6.2	10.0	-16.2
Ambient	❒ VDC nom 6.0VDC	M 2450(MHz)	-7.9	10.0	-17.9
Tmin -20 ℃ Hmin 0%	❒ VDC max 6.0VDC		-7.5	10.0	-17.5
	❒ VDC min 5.1VDC		-7.8	10.0	-17.8
Tmax 55 ℃ Hmax 50%	❒ VDC max 6.0VDC		-7.8	10.0	-17.8
	❒ VDC min 5.1VDC		-8.0	10.0	-18.0
Ambient	❒ VDC nom 6.0VDC	H 2470(MHz)	-7.7	10.0	-17.7
Tmin -20 ℃ Hmin 0%	❒ VDC max 6.0VDC		-7.5	10.0	-17.5
	❒ VDC min 5.1VDC		-7.8	10.0	-17.8
Tmax 55 ℃ Hmax 50%	❒ VDC max 6.0VDC		-7.8	10.0	-17.8
	❒ VDC min 5.1VDC		-7.9	10.0	-17.9

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. 10 dBm corresponds to 10 mW.
3. Measurement Uncertainty : ±4.8dB.
4. Cable loss and antenna gain was combined in the calculated result.

TRF No.: EN300440_2a

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4 PERMITTED RANGE OF OPERATING FREQUENCIES

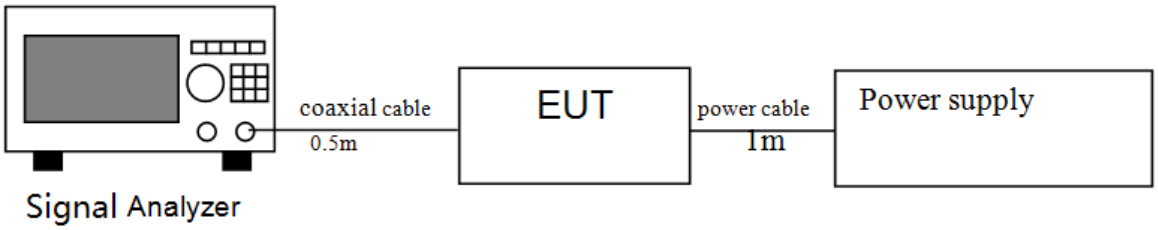
4.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 440 V2.1.1 (2017-03)
Clause :	4.2.3
Test method	Conducted measurements

4.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
SZ056-06	Signal Analyzer	R&S	FSV40	02-Aug-16	02-Aug-17
SZ016-12	Temperature & Humidity Chamber	Terchy	MHK-120NK	23-Jul-16	23-Jul-17
SZ006-12	AC Power Source	APC	AFC-11005GS	25-Dec-16	25-Jul-17

4.3 Test Setup



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4.4 TEST RESULT

PERMITTED RANGE OF OPERATING FREQUENCIES

CONTROL UNIT

Test Conditions			Frequency Range (GHz)	
Temperature (°C) Humidity (%)	Voltage	CH	F_L	F_H
T_{nom} 25°C H_{nom} 50%	VDC $_{nom}$ 6.0VDC	Low, High	2.404323	2.470161
T_{min} -20°C H_{min} 0%	VDC $_{max}$ 6.0VDC		2.404315	2.470165
	VDC $_{min}$ 5.1VDC		2.404320	2.470162
T_{max} 55°C H_{max} 50%	VDC $_{max}$ 6.0VDC		2.404322	2.470162
	VDC $_{min}$ 5.1VDC		2.404325	2.470163
Measurement Uncertainty			± 240Hz	

BAND EDGE WORSE RESULT

Control Unit:

		Frequency (GHz)	Within Assigned Frequency Band
Lowest F_L	F_{LB}	2.404315	Complied
Highest F_H	F_{HB}	2.470165	Complied

where

F_{LB} Lowest frequency at appropriate spurious emission level

F_{HB} Highest frequency at appropriate spurious emission level

EUT was tested during absence of modulation.

The permitted range of modulation bandwidth must be within the limits of the assigned frequency band 2.4-2.4835 GHz.

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5 UNWANTED EMISSION IN THE SPURIOUS DOMAIN FOR TRANSMITTERS

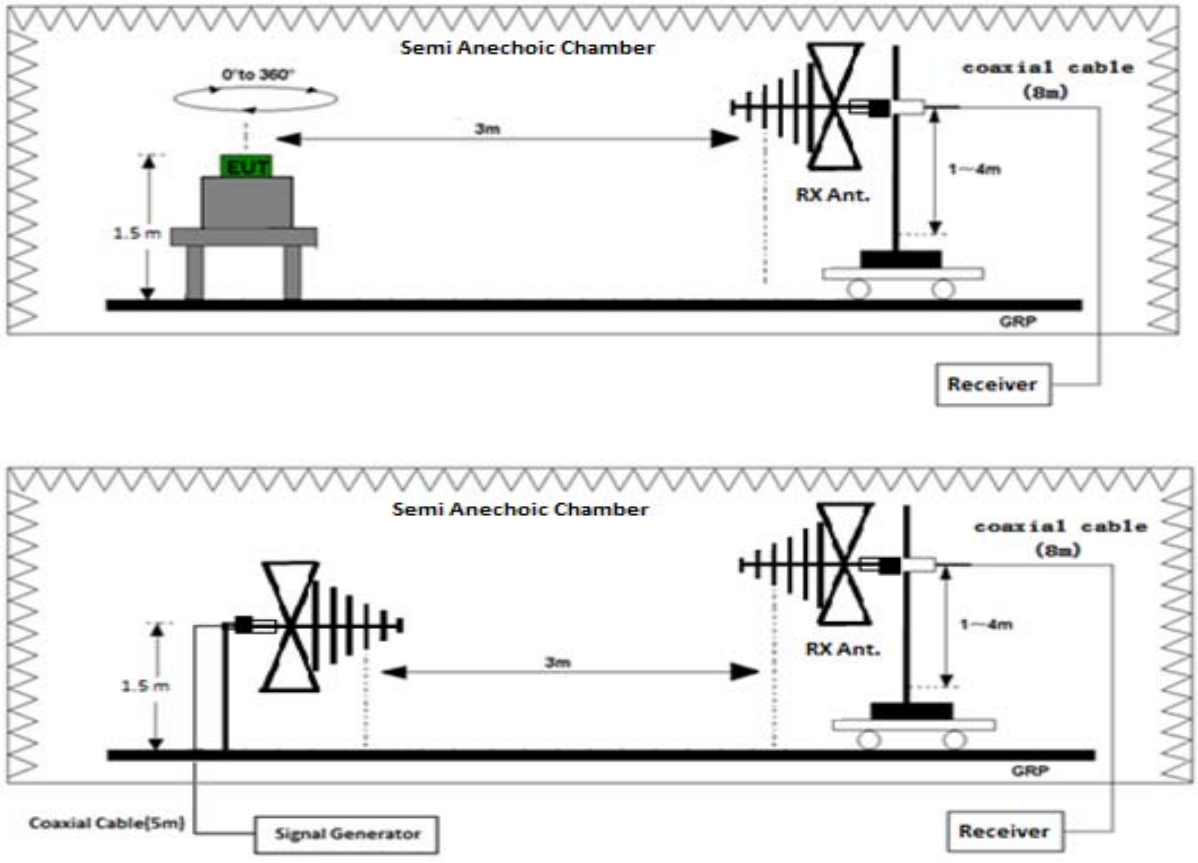
5.1 TEST METHOD AND SUMMARY

Basic Standard :	ETSI EN 300 440 V2.1.1 (2017-03)
Clause :	4.2.4
Test method	Conducted measurements

5.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
SZ056-06	Signal Analyzer	R&S	FSV40	23-Jul-16	23-Jul-17
SZ061-12	BiConiLog Antenna	ETS	3142E	9-Sep-16	9-Sep-17
SZ061-09	Double - Ridged Waveguide Horn Antenna	ETS	3115	27-Oct-16	27-Oct-17
SZ181-04	Preamplifier	Agilent	8449B	9-Feb-17	9-Feb-18
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	16-Jan-17	16-Jan-19

5.3 Test Setup



Test set-up of radiated disturbance (30MHz-1GHz)

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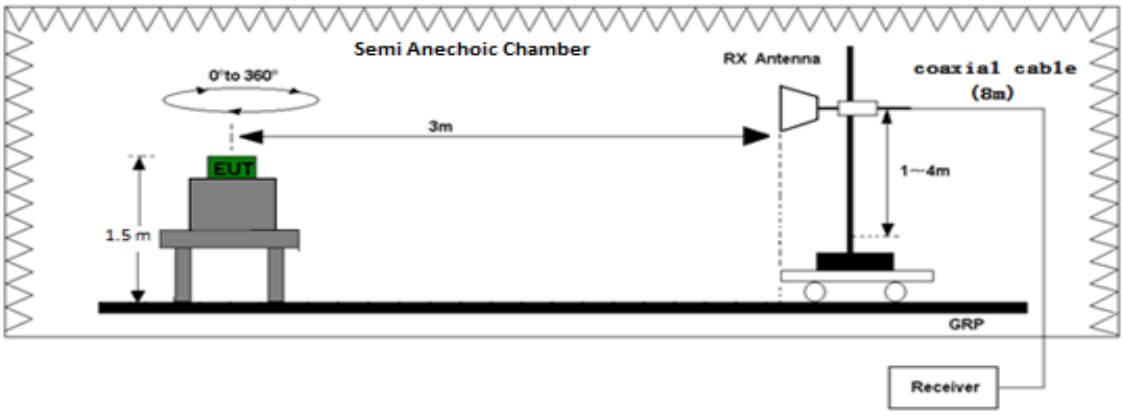

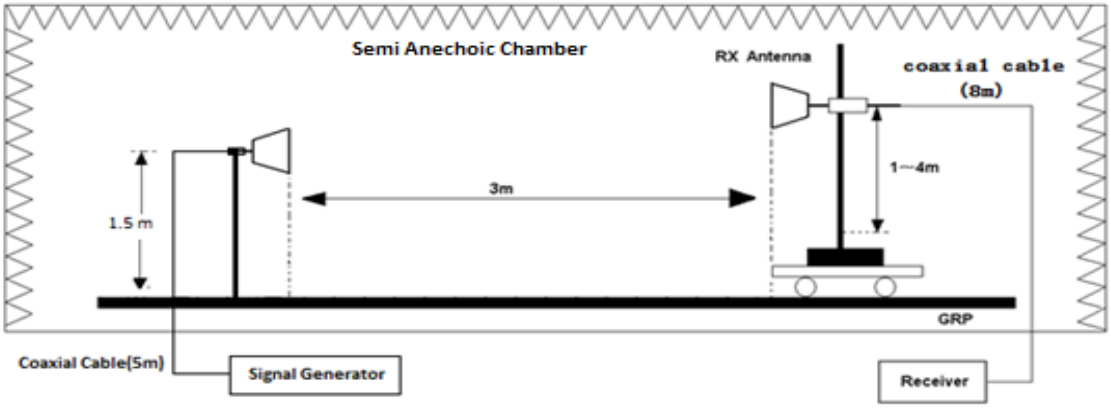

Test set-up of radiated disturbance (above 1GHz)

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5.4 Test Result

Test Conditions: Temperature 25.0°C; Humidity 50.0%

SPURIOUS EMISSIONS – OPERATING

The Channel: Low, Middle, High had been tested, and showed the worse data in the report.

(Control Unit)

Channel: Low			
Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
4810.000	-40.2	-30.0	-10.2
7215.000	-38.2	-30.0	-8.2

Channel: Medium			
Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
4900.000	-40.3	-30.0	-10.3
7350.000	-38.1	-30.0	-8.1

Channel: High			
Frequency (MHz)	Measured Power (dBm)	Limit (dBm)	Margin (dB)
4940.000	-40.2	-30.0	-10.2
7410.000	-38.0	-30.0	-8.0

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit.
3. -30 dBm corresponds to 1 μW.
4. Measurement Uncertainty: ±4.8dB.
5. Correction value was combined in the calculated result.

5.5 SPURIOUS EMISSIONS - STANDBY

There were no emissions found above system measuring level (at least 10 dB below the limit).

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6 SPURIOUS RADIATIONS FOR RECEIVERS

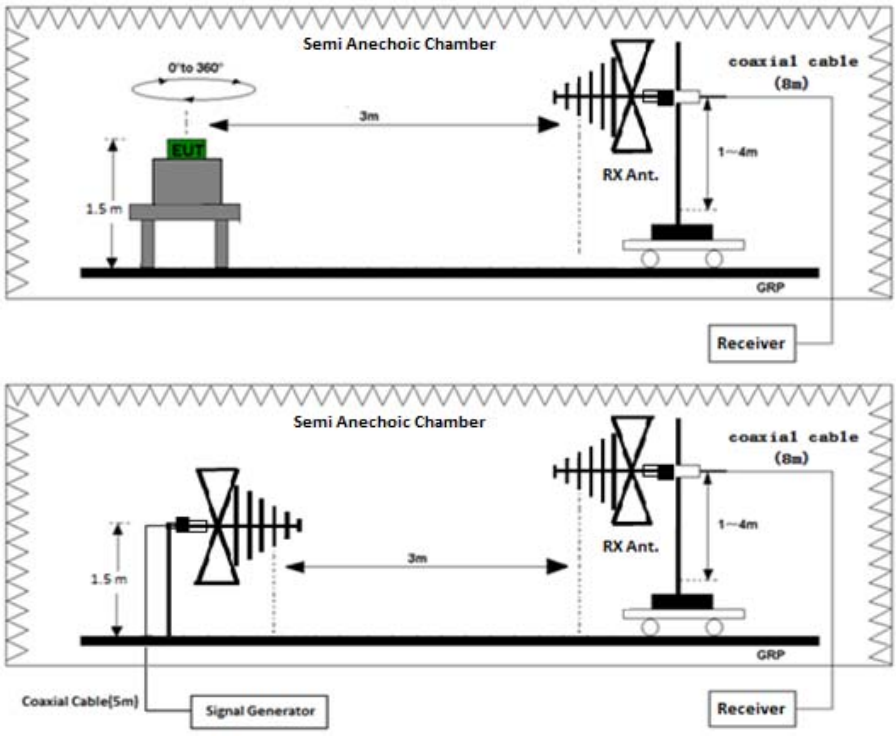
6.1 TEST METHOD AND SUMMARY

	Unwanted emissions in the spurious domain	Spurious radiations
Basic Standard :	ETSI EN 300 440 V2.1.1 (2017-03)	
Clause :	5.4.3	
Application :	All Receivers	

6.2 EQUIPMENT LIST

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
SZ056-06	Signal Analyzer	R&S	FSV40	23-Jul-16	23-Jul-17
SZ061-12	BiConiLog Antenna	ETS	3142E	9-Sep-16	9-Sep-17
SZ061-09	Double - Ridged Waveguide Horn Antenna	ETS	3115	27-Oct-16	27-Oct-17
SZ181-04	Preamplifier	Agilent	8449B	9-Feb-17	9-Feb-18
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	16-Jan-17	16-Jan-19

6.3 Test Setup



TRF No.: EN300440_2a

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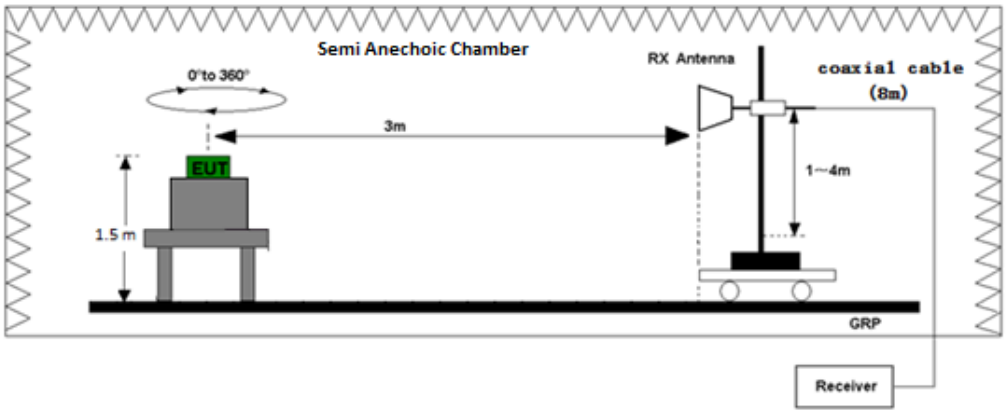
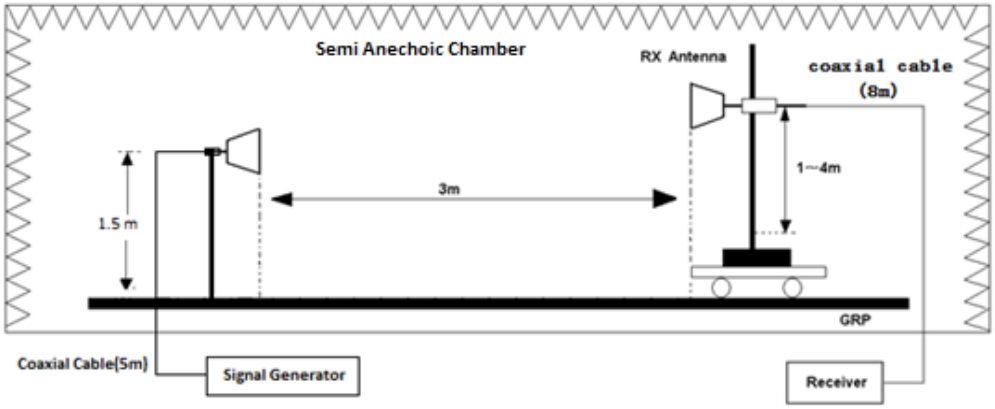
Test set-up of radiated disturbance (30MHz-1GHz)





Test set-up of radiated disturbance (above 1GHz)

6.4 Test Result

Test Conditions: Temperature 27.1°C; Humidity 68%

SPURIOUS EMISSIONS - OPERATING

There were no emissions found above system measuring level (at least 10 dB below the limit).

SPURIOUS EMISSIONS - STANDBY

There were no emissions found above system measuring level (at least 10 dB below the limit).

Notes:

1. Negative sign (-) in the margin column signify levels below the limit.
2. Other emissions found were at least 10 dB below the limit.
3. -57 dBm corresponds to 2nW, -47 dBm corresponds to 20nW.
4. Measurement Uncertainty : ±5.0dB.

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EXHIBIT 3

TEST RESULT

OF

EMC COMPLIANCE MEASUREMENTS

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7 EMC EMISSION TEST

7.1 RADIATED EMISSION TEST

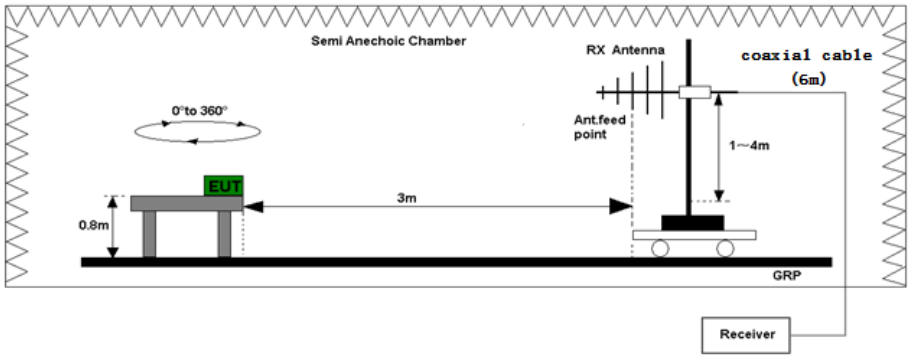
7.2 TEST METHOD AND SUMMARY

Basic Standard :	EN55032: 2015
Test :	Radiated Emission
Classification :	Class B
Port :	Enclosure Port of Ancillary Equipment

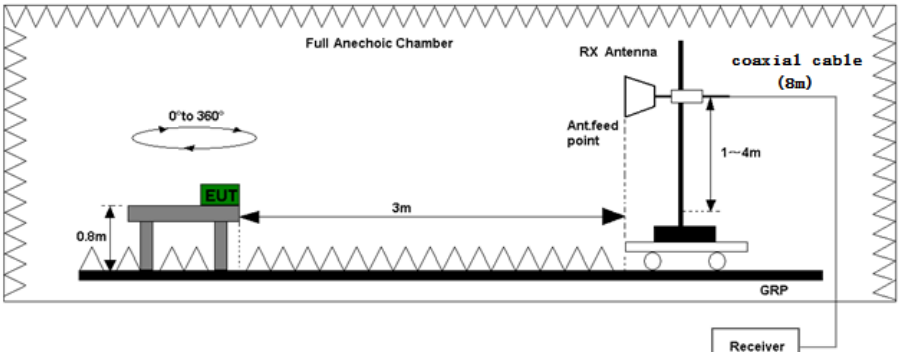
7.3 TEST EQUIPMENT

Equip No.	Description	Manufacturer	Model No.	Cal. Date	Due Date
SZ185-01	EMI Receiver	R & S	ESCI	23-Jul-16	23-Jul-17
SZ061-12	Biconilog Antenna	ETS	3142E	15-Sep-16	15-Sep-17
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	16-Apr-16	16-Apr-18

7.4 TEST SETUP



Test set-up of radiated disturbance (30MHz-1GHz)



Test set-up of radiated disturbance (above 1GHz)

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7.5 TEST RESULT

Worst-case Operating Mode: Forward Running (Motoring)

30MHz - 1GHz radiated disturbance Data Table

Polarization	Frequency (MHz)	Net at 3m (dBμV/m)	Calculated Net at 10m (dBμV/m)	Limit at 10m (dBμV/m)	Margin (dB)
H	347.180	27.9	17.9	37.0	-19.1
H	449.060	35.0	25.0	37.0	-12.0
H	461.180	35.0	25.0	37.0	-12.0
V	39.700	25.5	15.5	30.0	-14.5
V	609.090	31.2	21.2	37.0	-15.8
V	662.925	32.3	22.3	37.0	-14.7

Notes: 1. Quasi-Peak Detector Data
2. Negative sign (-) in the margin column signify levels below the limit
3. Frequency range scanned: 30 MHz to 1000 MHz
4. Only emissions significantly above equipment noise floor are reported.

1GHz - 6GHz radiated disturbance Data Table

Polarization	Frequency (MHz)	Net at 3m Average (dBμV/m)	Net at 3m Peak (dBμV/m)	Limit at 3m Average (dBμV/m)	Limit at 3m Peak (dBμV/m)	Margin Average (dBμV/m)	Margin Peak (dBμV/m)
\	\	\	\	\	\	\	\

Notes: 1. Frequency range scanned: 1000 MHz to 6000 MHz.
2. Only emissions significantly above equipment noise floor are reported.
3. Negative value in the margin column shows emission below limit.

7.6 MEASUREMENT UNCERTAINTY

Measurement Uncertainties: ± 4.8dB. The measured result is above the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

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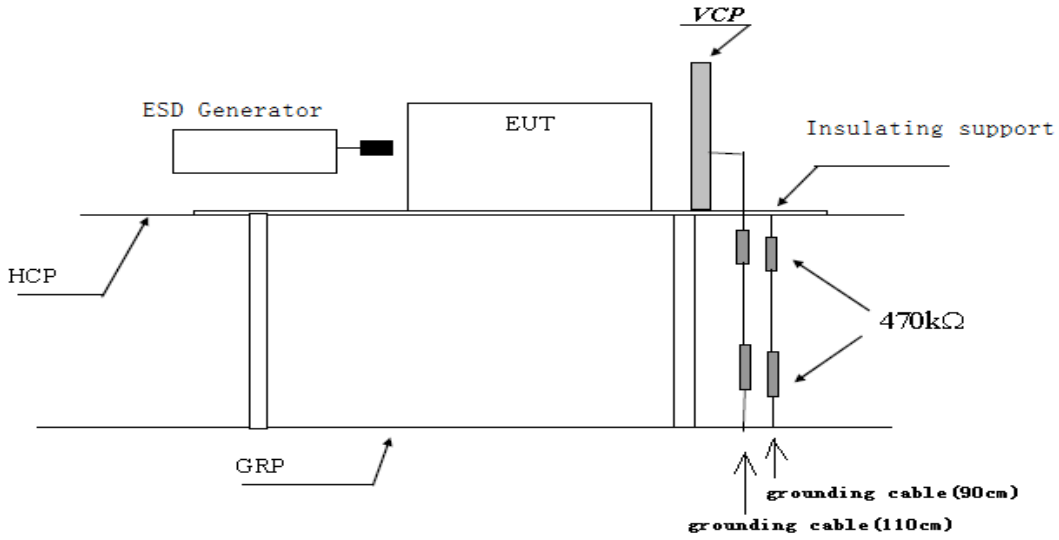
8 ELECTROSTATIC DISCHARGE

8.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-2: 2009
Port :	Enclosure
Required Performance Criterion :	TT & TR
Level :	± 2.0, ± 4.0, ±8.0 kV (Air Discharge) ± 2.0, ±4.0 kV (Contact Discharge) ± 2.0, ±4.0 kV (Indirect Contact Discharge)
No. of Discharge(s) :	Minimum of 10 Discharges per Each Polarity
Time Between Each Discharge :	1 second
Test Mode :	TX : Stand-by and Transmission, Power-Off RX : Stand-by and Operating (Motor), Power-Off
Test Setup :	Table-top
Temperature :	25.1^{0}C
Relative Humidity :	48.6%
Test of Post-installation :	N/A

8.2 TEST SETUP



Test set-up of electrostatic discharge

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8.3 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ189-03	ESD Simulator	Teseq	NSG 435	14-Nov-16	14-Nov-17

8.4 TEST RESULT

Discharge Type	Applied Voltage	Result (Pursuant to ETSI EN 301 489-3 Criterion TT & TR)
Contact Discharge	± 2.0, ± 4kV	Complied
Air Discharge	± 2, ± 4, ± 8kV	Complied
Indirect HCP Discharge	± 2.0, ± 4kV	Complied
Indirect VCP Discharge	± 2.0, ± 4kV	Complied

8.5 ADDITIONAL RESULT INFORMATION

The EUT worked normally as intended during and after the test. No any observable change occurred.

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9 RADIO FREQUENCY ELECTROMAGNETIC FIELD

9.1 TEST METHOD AND SUMMARY

Basic Standard :	EN 61000-4-3: 2006 + A1: 2008 + A2: 2010
Port :	Enclosure
Required Performance Criterion :	CT & CR
Level :	3.0 V/m (rms)
Test Modulation :	1kHz, 80% AM
Frequency :	80 MHz to 6000 MHz
Dwell Time :	1s
Frequency Step :	10%
Temperature :	27.1^{0}C
Relative Humidity :	59.7%
Test Facility :	Full Anechoic Chamber
Antenna Polarization :	Horizontal and Vertical
Type of Antenna :	Broadband Antenna
Test Distance :	3m
Test Mode :	TX : Stand-by and Transmission, Power-Off RX : Stand-by and Operating (Motor), Power-Off
Test Setup :	Table-top

* The Equipment would be verified together with the test system before testing.

9.2 TEST EQUIPMENT

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	27-Jun-16	27-Dec-17
SZ180-01	Signal Generator	R&S	SML03	27-Jun-16	27-Dec-17
SZ181-01	Amplifier	PRANA	AP32 MT215	22-Jul-16	22-Jul-17
SZ181-07	Power Amplifier	MILMEGA	AS0827-110	30-Dec-16	30-Jul-17
SZ182-01	RF Power Meter	BOONTON	4232A	22-Jul-16	22-Jul-17
SZ188-02	Anechoic Chamber	ETS	RFD-F/A-100	30-Dec-16	30-Jul-17
SZ190-07	RF Amplifier	Milmega	AS0860-75/45	20-Jul-16	20-Jul-17
SZ180-15	Signal Generator	R&S	SMB100A	30-Jul-16	30-Jul-17
EM061-06	Stacked double log.-Per. Antenna	SCHWARZBECK	STLP 9149	30-Dec-16	30-Jul-17

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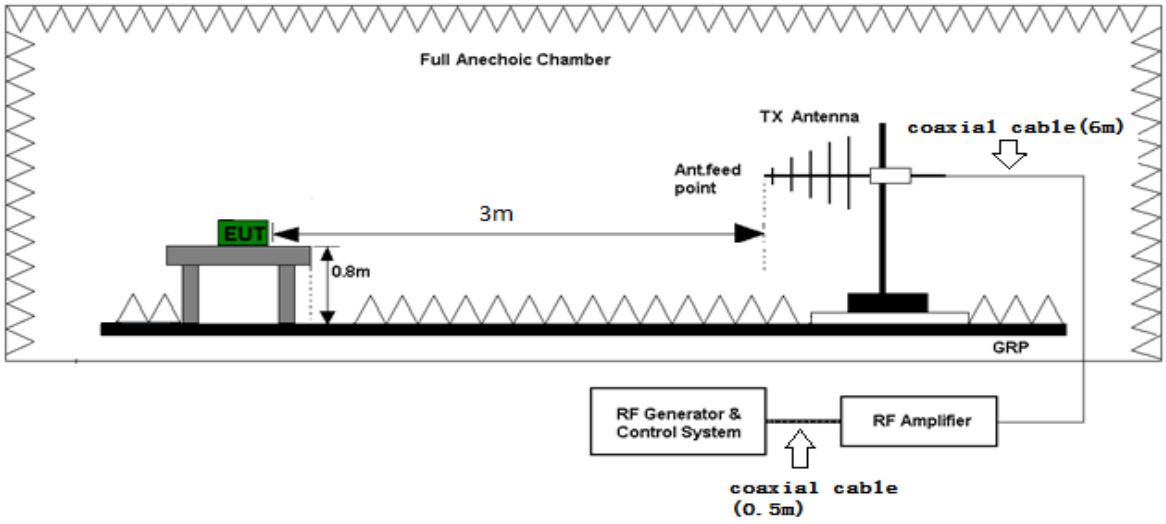
9.3 TEST SETUP



Test set-up of Immunity to Radiated Electric Fields

9.4 TEST RESULT

Frequency (MHz)	Exposed Side	Result (Pursuant to ETSI EN 301 489-3 Criterion CT & CR)
80 to 6000	Front	Complied
80 to 6000	Left	Complied
80 to 6000	Rear	Complied
80 to 6000	Right	Complied

9.5 ADDITIONAL RESULT INFORMATION

The EUT worked normally as intended during and after the test. No any observable change occurred.

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EXHIBIT 4

PHOTOS OF EUT

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10 EUT PHOTOS

10.1 EXTERNAL PHOTOS

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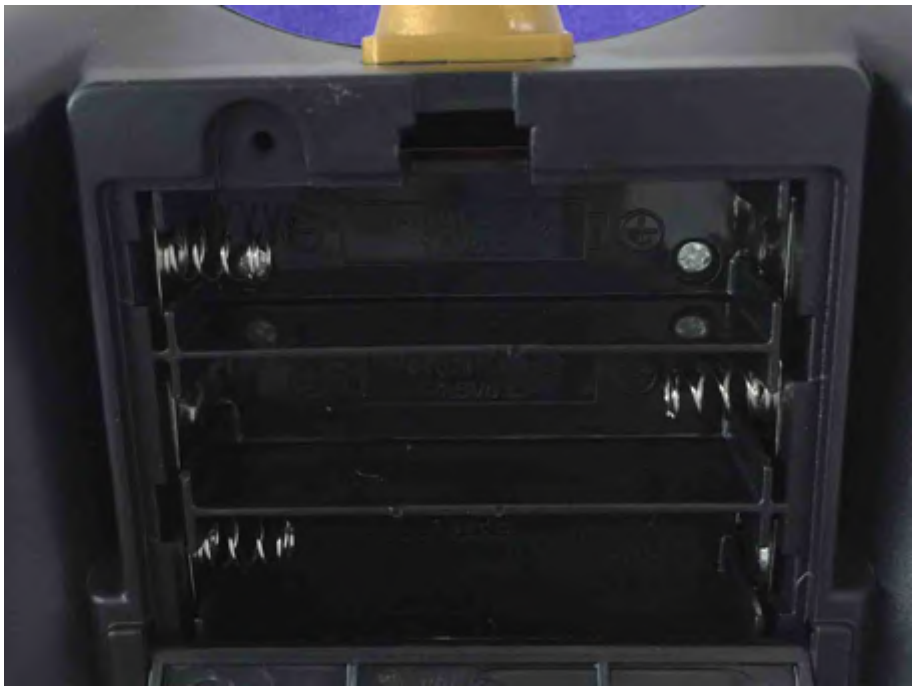
10.2 INTERNAL PHOTOS (Control Unit)



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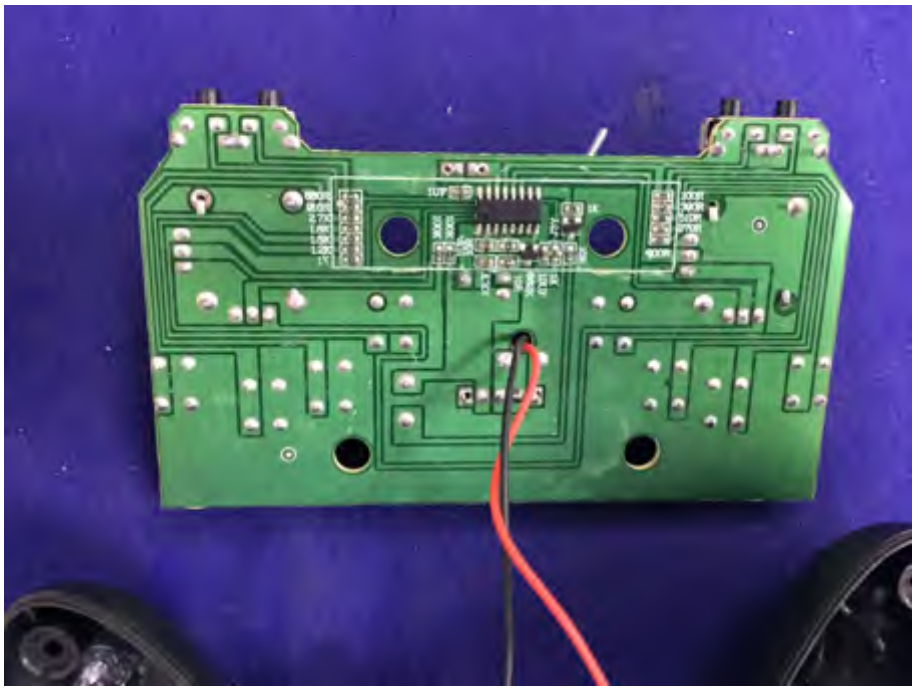

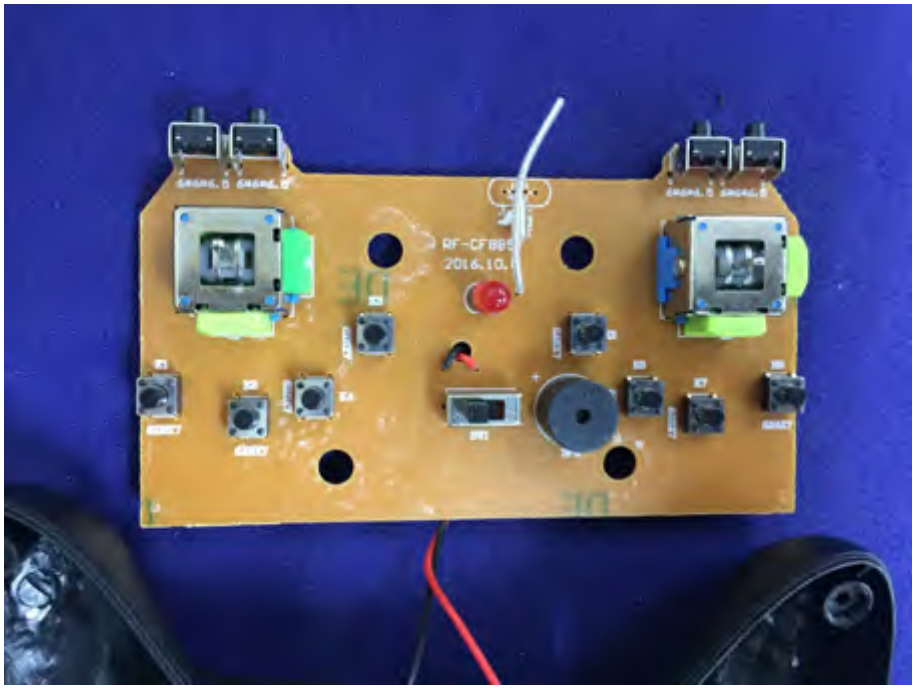

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10.3 INTERNAL PHOTOS (RECEIVE UNIT)

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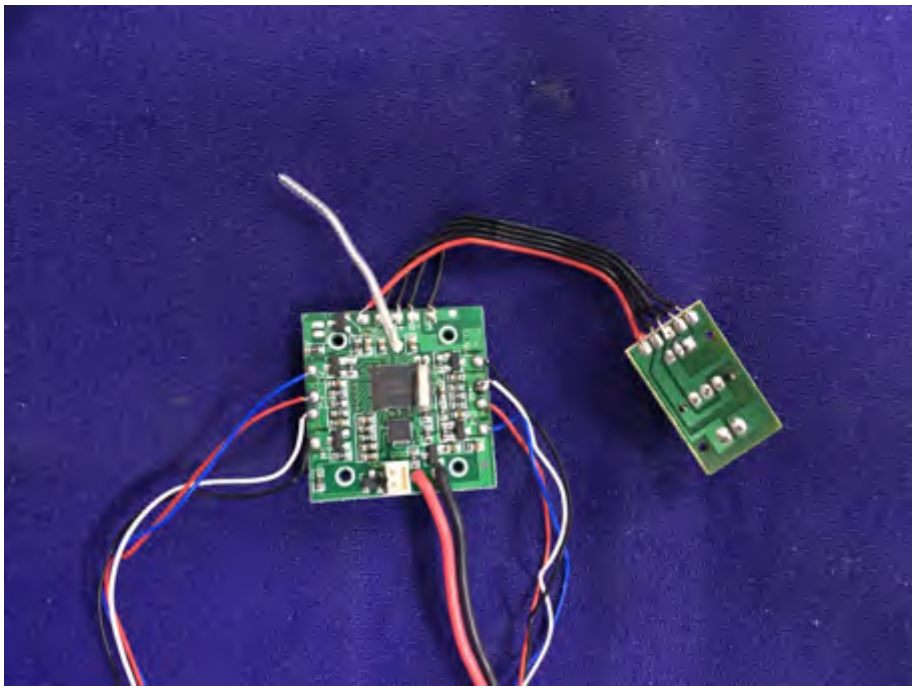

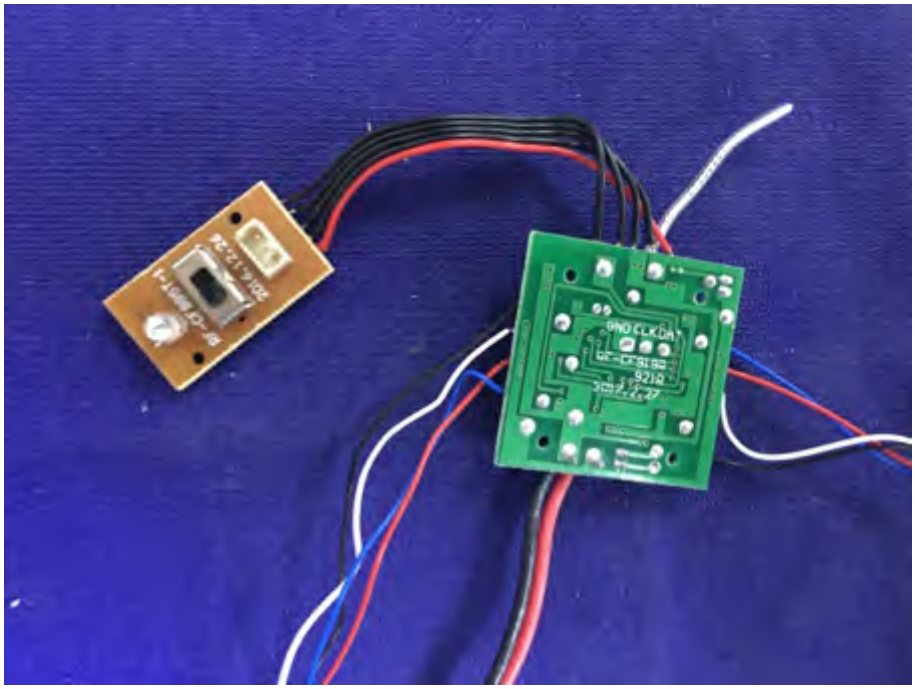

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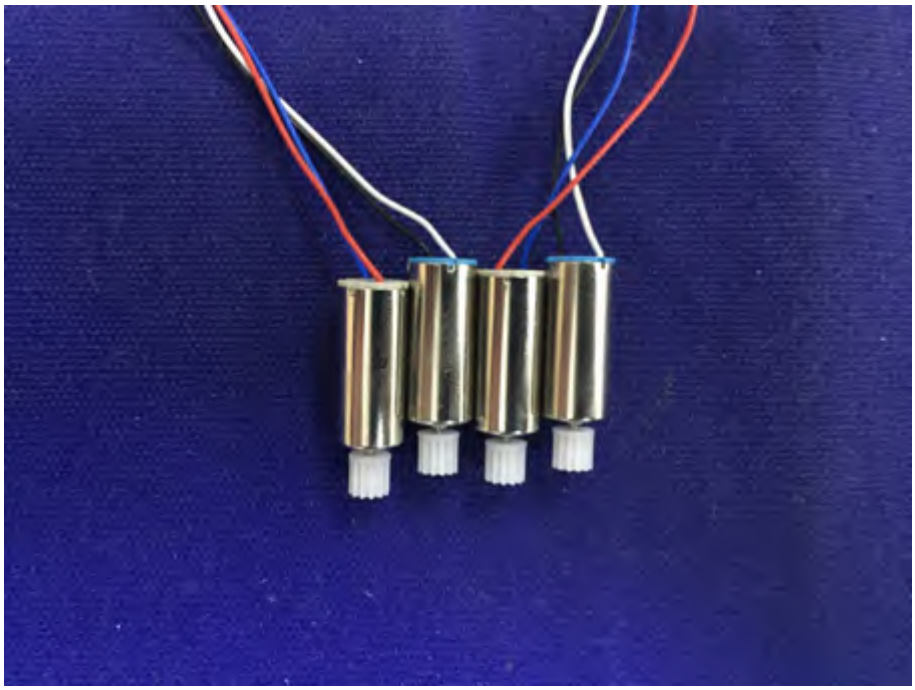

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