




**Produkte**  
*Products*

<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	<b>50113183 001</b>	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	<b>158113183</b>	<b>Seite 1 von 15</b> <i>Page 1 of 15</i>	
<b>Kunden-Referenz-Nr.:</b> <i>Client Reference No.:</i>	<b>N/A</b>	<b>Auftragsdatum:</b> <i>Order date:</i>	<b>12.07.2019</b>		
<b>Auftraggeber:</b> <i>Client:</i>	<b>GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD.</b> <b>No.2 West Xingye Road Laimei Industrial Park Chenghai District Shantou City, Guangdong China</b>				
<b>Prüfgegenstand:</b> <i>Test item:</i>	<b>Short Range Device - Radio Control Toy Boat (2.4GHz)</b>				
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	<b>Refer to page 4</b>				
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	<b>FCC Certification</b>				
<b>Prüfgrundlage:</b> <i>Test specification:</i>	<b>FCC Part 15 Subpart C</b> <b>ANSI C63.10-2013</b>				
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	<b>11.07.2019</b>				
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	<b>A000956294-001</b>				
<b>Prüfzeitraum:</b> <i>Testing period:</i>	<b>18.07.2019 - 01.08.2019</b>				
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	<b>Hong Kong</b>				
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	<b>TÜV Rheinland Hong Kong Ltd</b>				
<b>Prüfergebnis*:</b> <i>Test result*:</i>	<b>Pass</b>				
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>			
					
13.08.2019	Benny Lau / Senior Project Manager	13.08.2019	Sharon Li / Unit Senior Manager		
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges / Other:</b> <b>FCC ID: QV7-GC88752-33</b>					
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of the test item at delivery:</i>		<b>Prüfmuster vollständig und unbeschädigt</b> <i>Test item complete and undamaged</i>			
* Legende: 1 = sehr gut      2 = gut      3 = befriedigend      4 = ausreichend      5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n)      F(ail) = entspricht nicht o.g. Prüfgrundlage(n)      N/A = nicht anwendbar      N/T = nicht getestet Legend: 1 = very good      2 = good      3 = satisfactory      4 = sufficient      5 = poor P(ass) = passed a.m. test specification(s)      F(ail) = failed a.m. test specification(s)      N/A = not applicable      N/T = not tested					
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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## Product information

### Manufacturers declarations

	<b>Transmitter</b>
Operating frequency range	2411 - 2471MHz
Type of modulation	GFSK
Number of channels	4
Type of antenna	Integral wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V <sub>nor</sub> : 3.0 VDC

### Product function and intended use

The equipment under test (EUT) is a remote controller of toy boat operating at 2.4GHz. It is a RF transmitter powered by battery only.

The manufacturer declares that the models as listed below are all identical in electrical, PCB layout, components used except the packaging and model number only. The model Q5 was selected by the manufacturer as a representative for testing and construction photo taking.

FCC ID: QV7-GC88752-33

<b>Models</b>	<b>Product description</b>
Q1/Q2/Q3/Q5/Q6/Q7/Q8/Q9/Q10/Q11/Q12 Q13/Q15/Q16/Q17/Q18/Q19/Q20/Q21/Q22 Q23/Q25/Q26/Q27/Q28/Q29/Q30/Q31/Q32 Q33/Q35/Q36/Q37/Q38/Q39/Q40	Short Range Device - Radio Control Toy Boat (2.4GHz)

### Submitted documents

Circuit Diagram  
Block Diagram  
Technical Description  
User manual  
Label

### Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

### Related Submittal(s) Grants

This is a single application for certification of the transmitter.

## Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

## Test Set-up and Operation Mode

### Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

### Test Operation and Test Software

Test operation should refer to test methodology.

- Test mode samples with maximum RF output power and duty cycle provided by the applicant are used for testing.

### Special Accessories and Auxiliary Equipment

- None

### Countermeasures to achieve EMC Compliance

- None

## Test Methodology

### Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

### Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

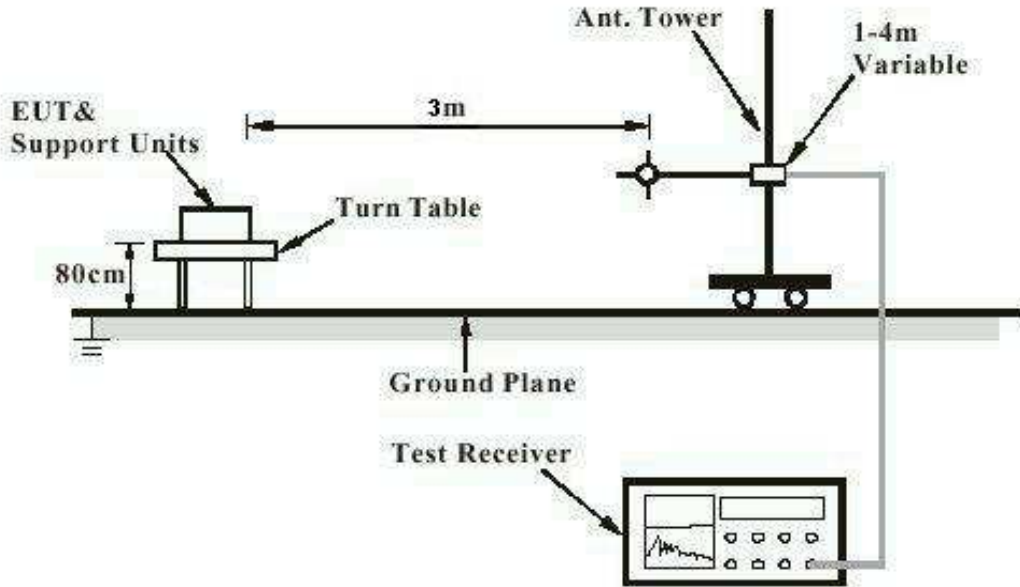
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.  
R = Reading of Spectrum Analyzer in dBuV.  
AF = Antenna Factor in dB.  
CF = Cable Attenuation Factor in dB.  
FA = Filter Attenuation Factor in dB.  
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

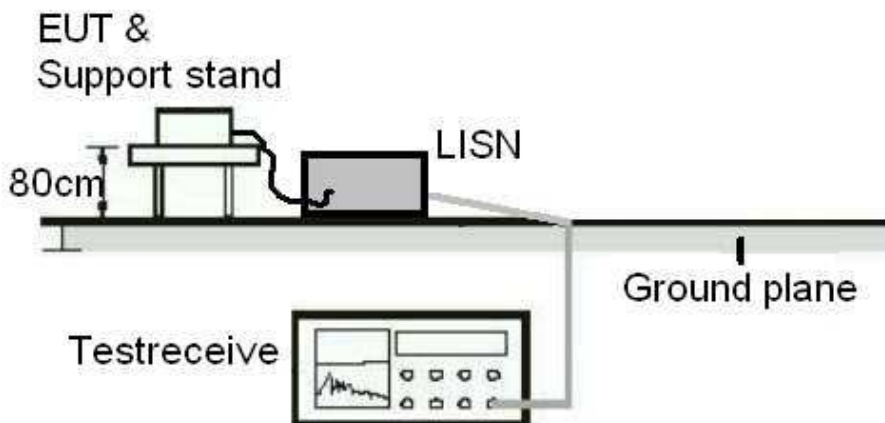
## Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)





## Test Facility

### Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

Address: 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong

Tel.: +852 2192 1000

Fax: +852 2192 1001

Email [service-gc@tuv.com](mailto:service-gc@tuv.com)

Web: [www.tuv.com](http://www.tuv.com)

The test facility is recognized or accredited by the following organizations:

#### **FCC**

Type	: Accredited Test Firm
Designation Number	: HK0013
Test Firm Registration Number	: 371735
Scope	: Intentional Radiators

## List of Test and Measurement Instruments

### Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	23 Apr 2019	23 Apr 2020
Test Receiver	R & S	ESU26	11 Jun 2019	11 Jun 2020
Bi-conical Antenna	R & S	HK116	21 Mar 2018	21 Mar 2020
Log Periodic Antenna	R & S	HL223	22 Mar 2018	22 Mar 2020
Cable with I-Joint Connector	Huber+Suhner	CNM-NMCMILX800-473	04 Oct 2018	04 Oct 2020
Active Loop Antenna	EMCO	6502	25 Oct 2018	25 Oct 2019
Double-Ridged Waveguide Horn	EMCO	3116	05 Oct 2018	05 Oct 2019
Double-Ridged Waveguide Horn	EMCO	3117	30 Aug 2018	30 Aug 2020
Cable with I-Joint Connector	Huber+Suhner	CNM-NMCMILX800-473	04 Oct 2018	04 Oct 2020
Microwave Preamplifier	COM-POWER Corporation	PAM-118A	25 Jun 2019	25 Jun 2020
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	30 Jan 2019	30 Jan 2020
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30 Oct 2017	30 Oct 2019
High Frequency Cable	Pasternack	PE3VNA4001-3M	29 Jan 2019	29 Jan 2020
Horn Antenna	EMCO	3115	28 Mar 2018	28 Mar 2020

### Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	26-Jun-2019	26-Jun-2020

## Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is  $\pm 2.42$ dB.

The estimated combined standard uncertainty for radiated emissions measurements is  $\pm 4.81$ dB (9kHz to 30MHz) and  $\pm 4.62$ dB (30MHz to 200MHz) and  $\pm 5.67$ dB (200MHz to 1000MHz) and is  $\pm 5.07$ dB (1GHz to 8.2GHz) and  $\pm 4.58$ dB (8.2GHz to 12.4GHz) and  $\pm 4.78$ dB (12.4GHz to 18GHz)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of  $k=2$ , which for the level of confidence is approximately 95%.

## Results FCC Part 15 – Subpart C

<b>FCC 15.203 – Antenna Requirement 1</b>		<b>Pass</b>
<b>FCC Requirement:</b>	No antenna other than that furnished by the responsible party shall be used with the device	
<b>Results:</b>	a) Antenna type:	Integral wire Antenna
	b) Manufacturer and model no:	N/A
	c) Peak Gain:	N/A
<b>Verdict:</b>	Pass	

<b>FCC 15.204 – Antenna Requirement 2</b>		<b>N/A</b>
<b>FCC Requirement:</b>	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.	
<b>Results:</b>	Only one integral antenna can be used.	
<b>Verdict:</b>	N/A	

<b>FCC 15.207 – Conducted Emission on AC Mains</b>		<b>N/A</b>
There is no AC power input or output ports on the EUT.		

<b>Subclause 15.215 (c) – 20 dB Bandwidth</b>		<b>Pass</b>		
Test Specification : ANSI C63.10 – 2013 Test date : 01.08.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0VDC Temperature : 23°C Humidity : 50%				
<b>Requirement:</b>	The intentional radiators must be designed to ensure that the 20dB bandwidth of the emission, is contained within the frequency band designated in the rule section under which the equipment is operated.			
<b>Results:</b>	Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.  For test protocols refer to Appendix 1.			
<b>Frequency (MHz)</b>	<b>20 dB left (MHz)</b>	<b>Limit (MHz)</b>	<b>20 dB right (MHz)</b>	<b>Limit (MHz)</b>
2411	2404.20	> 2400	2416.88	< 2483.5
2451	2444.04	> 2400	2456.76	< 2483.5
2471	2464.92	> 2400	2476.28	< 2483.5

<b>Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics</b>		<b>Pass</b>
Test Specification : ANSI C63.10 – 2013 Test date : 18.07.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0VDC Temperature : 25°C Humidity : 52%		
Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.		
<b>Results:</b> PASS.		
Fundamental Frequency 2411MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2411.120	95.2	114.0 / PK
2411.120	81.5	94.0 / AV
Fundamental Frequency 2411MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2411.120	100.8	114.0 / PK
2411.120	87.1	94.0 / AV
Harmonics 2411MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4822.244	44.6	74.0 / PK
4822.244	30.7	54.0 / AV
Harmonics 2411MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4822.242	46.8	74.0 / PK
4822.242	23.4	54.0 / AV
Fundamental Frequency 2451MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2451.118	98.4	114.0 / PK
2451.118	88.7	94.0 / AV
Fundamental Frequency 2451MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2451.125	101.2	114.0 / PK
2451.125	91.4*	94.0 / AV
Harmonics 2451MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>

4902.232	46.8	74.0 / PK
4902.232	34.4	54.0 / AV
Harmonics 2451MHz Horizontal Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4902.232	51.7	74.0 / PK
4902.232	40.6	54.0 / AV
Fundamental Frequency 2471MHz Vertical Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2471.121	98.8	114.0 / PK
2471.121	89.0	94.0 / AV
Fundamental Frequency 2471MHz Horizontal Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2471.121	101.1	114.0 / PK
2471.121	91.3*	94.0 / AV
Harmonics 2471MHz Vertical Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4942.243	49.1	74.0 / PK
4942.243	37.5	54.0 / AV
Harmonics 2471MHz Horizontal Polarization		
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4942.256	53.3	74.0 / PK
4942.256	42.0	54.0 / AV
Remark: *) Margin less than 3dB and client accepted.		

<b>Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission</b>		<b>Pass</b>
Test Specification : ANSI C63.10 – 2013 Test date : 18.07.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0VDC Temperature : 23°C Humidity : 50%		
<b>Requirement:</b> Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.		
<b>Results:</b> All three transmit frequency modes comply with the field strength limit of section 15.209. There is no spurious found below 30MHz.		
Tx frequency 2411MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2400.000	50.0	74.0 / PK
2400.000	17.6	54.0 / AV
Tx frequency 2411MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
No peak found	52.3	74.0 / PK
No peak found	19.5	54.0 / AV
Tx frequency 2451MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
79.050	23.9	40.0 / QP
370.73	42.0	46.0 / QP
Tx frequency 2451MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
336.17	32.6	46.0 / QP
Tx frequency 2471MHz		Vertical Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2483.500	60.2	74.0 / PK
2483.500	26.6	54.0 / AV
Tx frequency 2471MHz		Horizontal Polarization
<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2483.500	62.6	74.0 / PK
2483.500	27.7	54.0 / AV