TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14045197 001**	**Seite 1 von 14** *Page 1 of 14*
Auftraggeber: *Client:*	**HELIWAY TOYS** **Wenguan Road, Chenghai District** **Shantou City, Guangdong Province** **China**	
Gegenstand der Prüfung: *Test Item:*	**Short Range Device - Radio Control Toy Transmitter (2.4GHz)**	
Bezeichnung: *Identification:*	**Please refer to "Models" on page 4**	**Serien-Nr.:** *Serial No.:* **Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000404178-001**	**Eingangsdatum:** *Date of Receipt:* **04.08.2016**
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of test item at delivery:*	Test sample is not damaged and suitable for testing.	
Prüfort: *Testing Location:*	**TÜV Rheinland Hong Kong Ltd.** 8/F, First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong **Global United Technology Services Co., Ltd.** 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China	
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **ANSI C63.10-2013**	
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong	

geprüft/ *tested by:*			**kontrolliert**/ *reviewed by:*		
06.09.2016	Mika Chan Project Manager		06.09.2016	Sharon Li Department Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges: Other Aspects — **FCC ID: 2AG7SHLW908A**

Abkürzungen:				*Abbreviations:*			
P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*	
F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*	
N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*	
N/T	=	*nicht getestet*		*N/T*	=	*not tested*	

Table of Content

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2405 - 2480MHz
Type of modulation	GFSK
Number of channels	8
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V_{nor}: 9.0 V

Product function and intended use

The equipment under test (EUT) is a radio control toy transmitter operating at 2.4GHz. It is powered by battery only.

FCC ID: 2AG7SHLW908A

Models	Product description
901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 901A, 902A, 903A, 904A, 905A, 906A, 907A, 908A, 909A, 910A, 901S, 902S, 903S, 904S, 905S, 906S, 907S, 908S, 909S, 910S, 901H, 902H, 903H, 904H, 905H, 906H, 907H, 908H, 909H, 910H, 901HS, 902HS, 903HS, 904HS, 905HS, 906HS, 907HS, 908HS, 909HS, 910HS.	Radio Control Toy Transmitter
The manufacturer declares that the models listed above are all identical in construction including schematics, PCB layout and electronic components except model number and packaging.	

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Rating Label

Independent Operation Modes

The basic operation mode is transmitting control signal for associate receiver.

Refer to User Manual for further information.

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.

During testing, the EUT was programmed to test mode by manufacturer. Change of transmitting frequency can be achieved by pressing a built-in button on EUT. Output power of EUT was set to fixed level throughout testing.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- none

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements 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 the turntable is 3 meters far from the measuring antenna. In addition, 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:

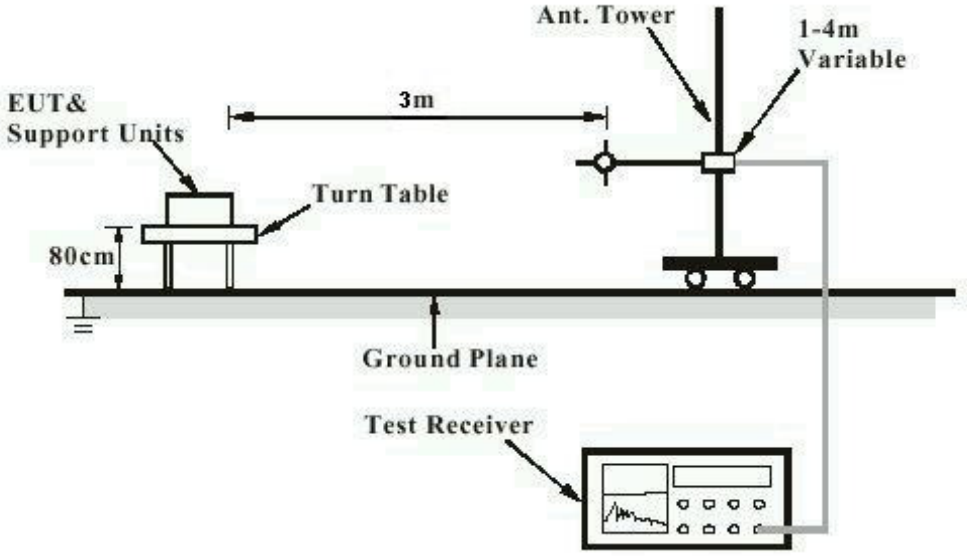
FS = R + AF + CF + FA – PA

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.

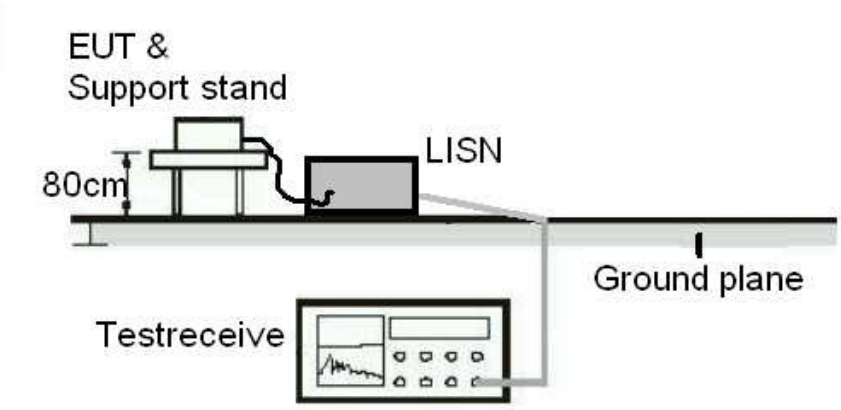
Test Setup Diagram

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)



List of Test and Measurement Instruments

Global United Technology Services Co., Ltd. (FCC Registration number: 600491)

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	July. 03 2015	July. 02 2020
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	N/A	N/A
ESU EMI Test Receiver	R&S	ESU26	June. 29 2016	June. 28 2017
Loop Antenna	Zhinan	ZN30900A	June. 29 2016	June. 28 2017
BiConiLog Antenna	SCHWARZBECK	VULB9163	June. 29 2016	June. 28 2017
Double-ridged horn antenna	SCHWARZBECK	9120D	June. 29 2016	June. 28 2017
Horn Antenna	ETS-LINDGREN	3160-09	June. 29 2016	June. 28 2017
RF Amplifier	HP	8347A	June. 29 2016	June. 28 2017
RF Amplifier	HP	8349B	June. 29 2016	June. 28 2017
Broadband Preamplifier	SCHWARZBECK	BBV9718	June. 29 2016	June. 28 2017
EMI Test Software	AUDIX	E3	N/A	N/A
Coaxial cable	GTS	N/A	N/A	N/A
Coaxial Cable	GTS	N/A	N/A	N/A
Thermo meter	N/A	N/A	June. 29 2016	June. 28 2017

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Radio Frequency Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Due Date
Spectrum Analyzer	Rohde & Schwarz	FSP30	100610	20 Jan 2016	19 Jan 2017

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ±3.43dB.

The estimated combined standard uncertainty for radiated emissions measurements is ±5.10dB (30MHz to 200MHz) and ±5.08dB (200MHz to 1000MHz) and ±5.08dB (above 1GHz).

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

FCC 15.203 – Antenna Requirement 1		**Pass**
FCC Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Antenna type:	Fixed Integral wire antenna
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		**Pass**
FCC Requirement:	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.	
Results:	Only one integral antenna can be used.	
Verdict:	N/A	

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

FCC 15.215 (c) – 20 dB Bandwidth		**Pass**
Test Specification Mode of operation Port of testing RBW/VBW Supply voltage Temperature Humidity	: : : : : : :	ANSI C63.10 – 2013 Tx mode Enclosure 100 kHz / 300 kHz 9.0VDC, 6 x 1.5V AA size new battery 23ºC 50%
Requirement:	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.	
Results:	For test protocols refer to Appendix 1, page 2-3.	

Frequency (MHz)	**20 dB left (MHz)**	**Limit (MHz)**	**20 dB right (MHz)**	**Limit (MHz)**
2405	2403.73	> 2400	2406.38	< 2483.5
2440	2438.71	> 2400	2441.44	< 2483.5
2480	2478.72	> 2400	2481.48	< 2483.5

FCC 15.249 (a) – Field Strength of Fundamental and Harmonics **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Enclosure
Frequency range : 9kHz – 25GHz
RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 9.0VDC, 6 x 1.5V AA size new battery
Temperature : 23ºC
Humidity : 50%

Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.

Results: PASS.

Fundamental Frequency 2405MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2405.077	83.26	114.0 / PK
2405.077	66.23	94.0 / AV

Fundamental Frequency 2405MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2405.071	81.14	114.0 / PK
2405.077	64.11	94.0 / AV

Harmonics 2405MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

Harmonics 2405MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

Fundamental Frequency 2440MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2440.020	83.36	114.0 / PK
2440.020	66.33	94.0 / AV

Fundamental Frequency 2440MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2440.025	81.23	114.0 / PK
2440.025	64.18	94.0 / AV

Harmonics 2440MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV
Harmonics 2440MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV
Fundamental Frequency 2480MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2480.085	82.88	114.0 / PK
2480.085	66.25	94.0 / AV
Fundamental Frequency 2480MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2480.087	81.00	114.0 / PK
2480.087	64.07	94.0 / AV
Harmonics 2480MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV
Harmonics 2480MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

FCC 15.249 (d), 15.205 – Out Of Band Radiated Emission **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Enclosure
Detector : Peak
Frequency range : 9kHz – 25GHz
RBW/VBW : 1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 9.0VDC, 6 x 1.5V AA size new battery
Temperature : 23ºC
Humidity : 50%

Requirement: 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.

Results: All three transmit frequency modes comply with the field strength limit of section 15.209. There is no spurious found below 30MHz.

Tx frequency 2405MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

Tx frequency 2405MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

Tx frequency 2440MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Tx frequency 2440MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV

Tx frequency 2480MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV

Tx frequency 2480MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
No Peak Found	---	74.0 / PK
No Peak Found	---	54.0 / AV