

Produkte
Products

Prüfbericht - Nr.: 14047122 001		Seite 1 von 14	
<i>Test Report No.:</i>		<i>Page 1 of 14</i>	
Auftraggeber: <i>Client:</i>	HK TECH SCIENCE & TECHNOLOGY CO.,LTD Xiehe Industrial B Zone, Laimei Road, Chenghai District, 515800, Shantou, Guangdong, China		
Gegenstand der Prüfung: <i>Test Item:</i>	Short Range Device - Radio Control Toy Transmitter (2.4GHz)		
Bezeichnung: <i>Identification:</i>	Please refer to "Models" on page 6	Serien-Nr.: <i>Serial No.:</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000542627-001	Eingangsdatum: <i>Date of Receipt:</i>	02.05.2017
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i>	Test sample received are sufficient for testing and not damaged.		
Prüfört: <i>Testing Location:</i>	TÜV Rheinland Hong Kong Ltd. 3/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong Global United Technology Services Co., Ltd. 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China		
Prüfgrundlage: <i>Test Specification:</i>	FCC Part 15 Subpart C ANSI C63.10-2013		
Prüfergebnis: <i>Test Results:</i>	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Hong Kong Ltd. 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong		
geprüft/ tested by:	kontrolliert/ reviewed by:		
29.05.2017	Benny Lau Senior Project Manager	29.05.2017	Sharon Li Department Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
			Name/Stellung <i>Name/Position</i>
			Unterschrift <i>Signature</i>
Sonstiges: <i>Other Aspects</i>	FCC ID: 2AFDJHKFX25		
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
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.			
<i>This test report 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 safety mark on this or similar products.</i>			

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2418 - 2457 MHz
Type of modulation	GFSK
Number of channels	16
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nor} : 6.0 VDC

Product function and intended use

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

The manufacturer declares that the models as listed below table are all identical in electrical, PCB layout and components used except the model number and packaging only.

FCC ID: 2AFDJHKFX25

Models	Product description
FX-2,FX-3,FX-3V,FX-4,FX-4VCI,FX-4V,FX-5,FX-5W,FX-6,FX-6C, FX-6CI,FX-7,FX-7C,FX-7CI,FX-7S,FX-8A,FX-8E,FX-8C,FX-9A,FX-9E, FX-9C,FX-11,FX-12V,FX-12,FX-13,FX-14,FX-15,FX-15C,FX-15CI, FX-16,FX-16C,FX-16CI,FX-17,FX-18,FX-19,FX-20,FX-21,FX-22A, FX-22E,FX-22C,FX-23,FX-24,FX-25,FX-25CI,FX-26,FX-27A,FX-27E, FX-27C,FX-28,FX-29,FX-29CI,FX-30,FX-31,FX-32,FX-33,FX-34, FX-35A,FX-35E,FX-35C,FX-36,FX-37,D2,D3,D3V,D4,D4VCI,D4V,D5, D5W,D6,D6C,D6CI,D7,D7C,D7CI,D7S,D8A,D8E,D8C,D9A,D9E,D9C,D11, D12V,D12,D13,D14,D15,D15C,D15CI,D16,D16C,D16CI,D17,D18,D19, D20,D21,D22A,D22E,D22C,D23,D24,D25,D25CI,D26,D27A,D27E,D27C, D28,D29,D29CI,D30,D31,D32,D33,D34,D35A,D35E,D35C,D36,D37	Short Range Device - Radio Control Toy Transmitter (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 sample which transmitting fixed at the lowest or middle or highest frequency channels is provided by the manufacturer.

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 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:

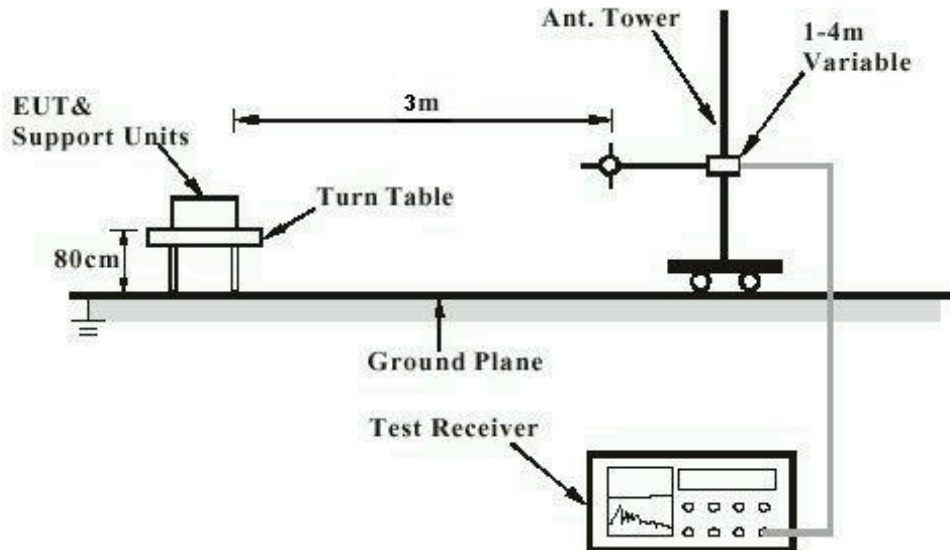
$$FS = R + AF + CF + FA - PA$$

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.

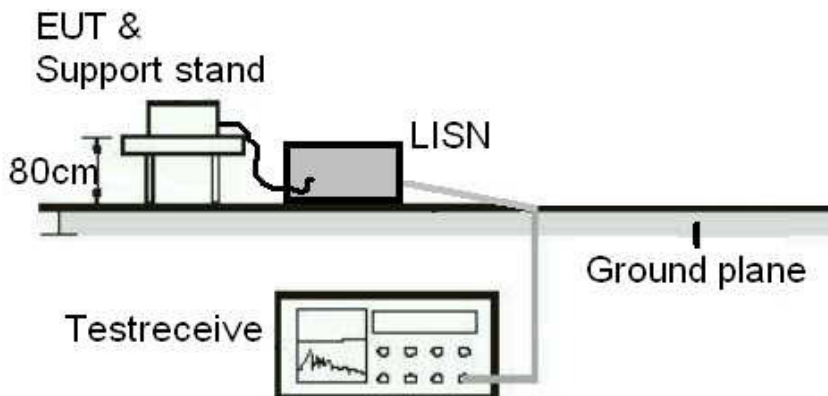
Test Setup Diagram

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)



List of Test and Measurement Instruments

Global United Technology Services Co., Ltd. (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	Cal. Date	Due Date
Spectrum Analyzer	R&S	FSP30	Oct. 15 2016	Oct. 15 2017

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is $\pm 3.43\text{dB}$.

The estimated combined standard uncertainty for radiated emissions measurements is $\pm 5.10\text{dB}$ (30MHz to 200MHz) and $\pm 5.08\text{dB}$ (200MHz to 1000MHz) and is $\pm 5.10\text{dB}$ (30MHz to 200MHz) and $\pm 5.08\text{dB}$ (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 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 fixed 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.	

Subclause 15.215 (c) – 20 dB Bandwidth	Pass			
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 6VDC Temperature : 23°C Humidity : 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.			
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
2418	2417.392	> 2400	2418.816	< 2483.5
2434	2433.388	> 2400	2434.792	< 2483.5
2457	2456.388	> 2400	2457.736	< 2483.5

Subclause 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 Supply voltage : 6VDC Temperature : 23°C 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 2418MHz		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2418.120	83.06	114.0 / PK
2418.120	62.09	94.0 / AV
Fundamental Frequency 2418MHz		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2418.024	80.19	114.0 / PK
2418.024	59.35	94.0 / AV
Harmonics 2418MHz		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4836.810	37.67	74.0 / PK
4836.810	29.43	54.0 / AV
Harmonics 2418MHz		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4836.210	36.63	74.0 / PK
4836.210	28.38	54.0 / AV
Fundamental Frequency 2434MHz		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2434.470	79.31	114.0 / PK
2434.470	60.78	94.0 / AV
Fundamental Frequency 2434MHz		Horizontal Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2434.310	80.39	114.0 / PK
2434.310	61.37	94.0 / AV
Harmonics 2434MHz		Vertical Polarization
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m

4868.980	36.39	74.0 / PK
4868.980	29.20	54.0 / AV
Harmonics 2434MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4868.110	37.19	74.0 / PK
4868.110	30.00	54.0 / AV
Fundamental Frequency 2457MHz Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2457.045	80.89	114.0 / PK
2457.045	60.35	94.0 / AV
Fundamental Frequency 2457MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2457.105	77.57	114.0 / PK
2457.105	58.67	94.0 / AV
Harmonics 2457MHz Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4919.048	37.69	74.0 / PK
4919.048	29.58	54.0 / AV
Harmonics 2457MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
4919.159	39.09	74.0 / PK
4919.159	29.98	54.0 / AV

Subclause 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 Supply voltage : 6VDC Temperature : 23°C 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 2418MHz Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	43.17	74.0 / PK
2400.000	34.43	54.0 / AV
Tx frequency 2418MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	41.07	74.0 / PK
2400.000	31.33	54.0 / AV
Tx frequency 2434MHz Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Tx frequency 2434MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	46.0 / QP
No peak found	---	46.0 / QP
Tx frequency 2457MHz Vertical Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	34.58	74.0 / PK
2483.500	24.80	54.0 / AV
Tx frequency 2457MHz Horizontal Polarization		
Frequency MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	29.90	46.0 / QP
2483.500	22.05	46.0 / QP