

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	50285823 001	Auftrags-Nr.: <i>Order No.:</i>	158113631	Seite 1 von 15 <i>Page 1 of 15</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	19.07.2019		
Auftraggeber: <i>Client:</i>	Shantou Helicute Model Aircraft Industrial Co., Ltd. Jiangbei Road, Longtian, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China				
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Radio Controlled Toy Drone with WiFi Camera				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Refer to page 3				
Auftrags-Inhalt: <i>Order content:</i>	FCC Certification				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C; ANSI C63.10-2013				
Wareneingangsdatum: <i>Date of receipt:</i>	02.08.2019				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000968204-001				
Prüfzeitraum: <i>Testing period:</i>	09.08.2019 – 21.08.2019				
Ort der Prüfung: <i>Place of testing:</i>	Hong Kong				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
30.08.2019	Joey Leung Project Manager		30.08.2019	Sharon Li Unit Senior 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>	
					
Sonstiges: <i>Others:</i>	FCC ID: 2AKPP2019HELI1				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>				
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
<p>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.</p> <p><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></p>					

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	802.11B: DSSS
Number of channels	1
Channel separation	N/A
Type of antenna	Copper tubed antenna
Antenna gain (dBi)	3 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Operating voltage	V _{oper} : 7.4 VDC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is a radio controlled toy drone with detachable WiFi camera. The drone does not transmit RF signals. The drone is powered by 7.4VDC rechargeable Li-Po battery while the camera is powered by regulated DC from the drone.

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. Due to the manufacturer declaration of equivalence, the model DRC-445 was randomly selected as a representative for testing and construction photo taking.

FCC ID: 2AKPP2019HELI1

Models	Product description
DRC-445, H823HW, H05NL, H05NCL, H07NL, H07NCL, H09NL, H09NCL, M801R, M803R, H805, H805C, H805W, H806, H806C, H806W, H809H, H809HC, H809HW, H809S, H809SC, H809SW, H811C, H811W, H812, H812R, S812, H815H, H815HW, H815HC, H815S, H815SC, H815SW, H816H, H816HC, H816HW, H817, H817C, H817W, H817H, H817HC, H817HW, H818H, H818HW, H818HC, H818S, H818SC, H818SW, H818HP, H818HPC, H818HPW, H819, H819C, H819W, H819HC, H819HW, H820H, H820HC, H820HW, H821H, H821HC, H821HW, H822HW, H823, H823C, H823W, H823H, H823HC, H802G, H802W, H02G, H01C, H825, H825G, H825W, H826H, H826HC, H826HW, H826HP, H826HPC, H826HPW, H827S, H827SC, H827SW, H828P, H828PC, H828PW, H829S, H829SC, H829SW	Short Range Device - Radio Controlled Toy Drone with WiFi Camera

Submitted documents

Circuit Diagram
 Block Diagram
 Technical Description
 User manual
 Label

www.tuv.com

Independent Operation Modes

The basic operation mode is 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.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

Special Accessories and Auxiliary Equipment

- A DC regulated power supply provided by TÜV Rheinland Hong Kong Ltd. Was used to supply 5.0VDC during testing.

Countermeasures to achieve EMC Compliance

- Nil.

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 3m 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:

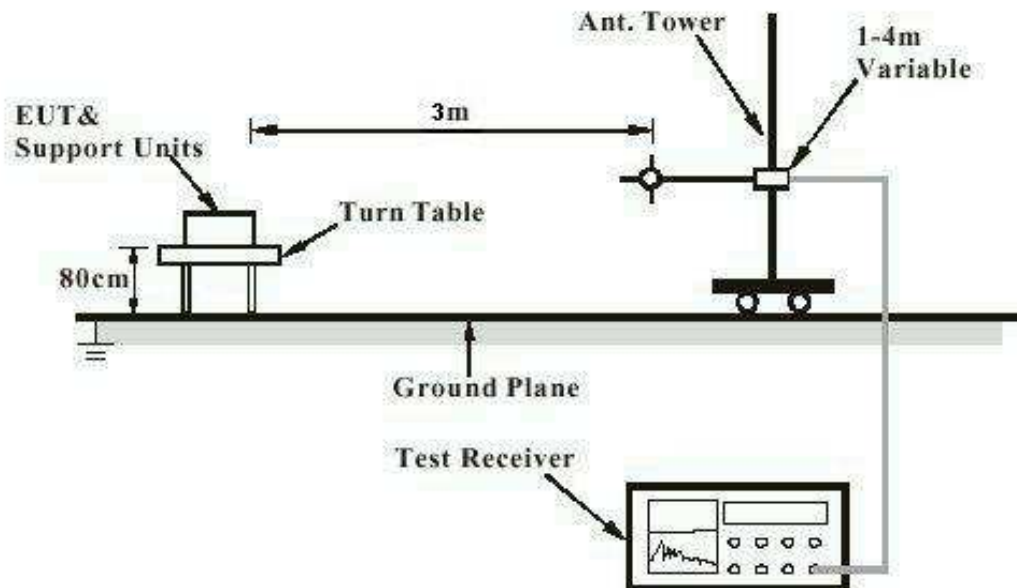
$$FS = R + AF + CF + FA - PA$$

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)

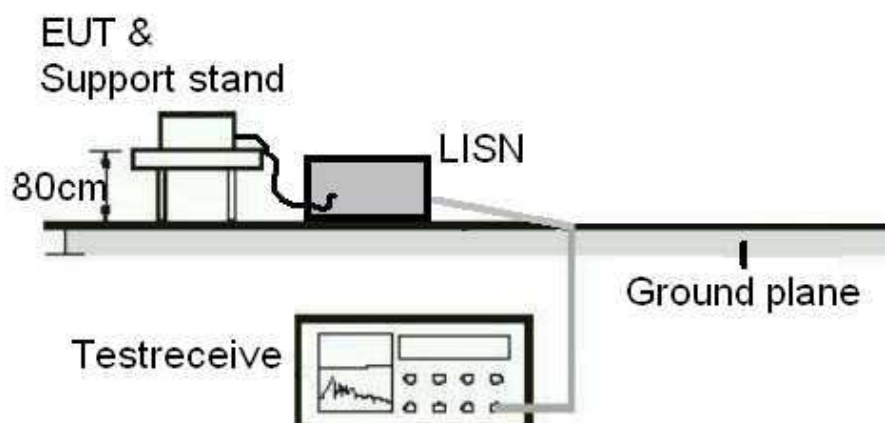
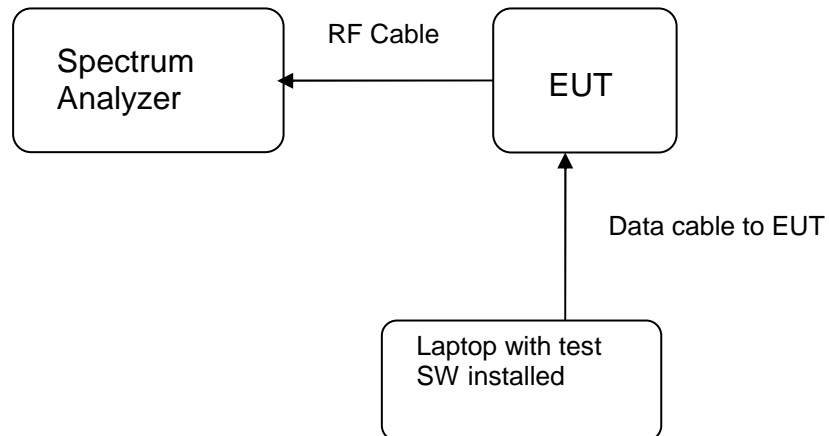


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)



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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

Web: 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	S/N	Cal. Date	Cal. Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	23 Apr 2019	23 Apr 2020
Test Receiver	R & S	ESU26	100050	11 Jun 2019	11 Jun 2020
Bi-conical Antenna	R & S	HK116	100241	21 Mar 2018	21 Mar 2020
Log Periodic Antenna	R & S	HL223	841516/017	22 Mar 2018	22 Mar 2020
Cable with I-Joint Conector	Huber+Suhner	CNM-NMCMILX800-473	A2803 #0001	04 Oct 2018	04 Oct 2020
Active Loop Antenna	EMCO	6502	9107-2651	25 Oct 2018	25 Oct 2019
Semi-anechoic Chamber (SiteVSWR)	Frankonia	Nil	Nil	16 May 2019	16 May 2020
Double-Ridged Waveguide Horn	EMCO	3116	00109210	05 Oct 2018	05 Oct 2019
Double-Ridged Waveguide Horn	EMCO	3117	00094998	30 Aug 2018	30 Aug 2020
Cable with I-Joint Conector	Huber+Suhner	CNM-NMCMILX800-473	A2803 #0001	04 Oct 2018	04 Oct 2020
Microwave Preamplifier	COM-POWER Corporation	PAM-118A	551091	25 Jun 2019	25 Jun 2020
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	168	30 Jan 2019	30 Jan 2020
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	30 Oct 2017	30 Oct 2019
High Frequency Cable	Pasternack	PE3VNA4001-3M	20160707C02493	29 Jan 2019	29 Jan 2020
Horn Antenna	EMCO	3115	9002-3347	28 Mar 2018	28 Mar 2020

Radio Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Spectrum Analyzer	R & S	FSP30	100610/030	26 Jun 2019	25 Jun 2020

Measurement Uncertainty

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

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

The estimated combined standard uncertainty for antenna conducted emission is ± 2.1 dB

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:	a) Antenna type: Copper tubed antenna b) Manufacturer and model no: Shenzhen SKYLinkTechnology Co. Ltd. / WF64A.C113.130B.122600.211 c) Peak Gain: 3dBi	
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:	Pass	

FCC 15.207 – Conducted Emission on AC Mains		N/A
This test is not applicable as there is no AC mains input port on EUT.		

FCC 15.247 (a)(2) – 6dB Bandwidth Measurement		Pass	
FCC Requirement:	Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.		
Test Specification : ANSI C63.10 – 2013 Test date : 09.08.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 7.4 VDC Temperature : 23°C Humidity : 50%			
Results:	For test protocols please refer to Appendix 1		
Channel frequency (MHz)	6 dB left (MHz)	6 dB right (MHz)	6dB bandwidth (MHz)
2412	2407.020	2416.560	9.540

FCC 15.247 (b)(3) – Maximum Peak Conducted Output Power			Pass
FCC Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)			
Test Specification : ANSI C63.10 – 2013 Test date : 09.08.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 7.4 VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1			
Frequency (MHz)	Measured Output Power (dBm)	Limit (W/dBm)	Verdict
2412	10.79	1 / 30.0	Pass

FCC 15.247 (e) 5.2 – Power Spectral Density			Pass
FCC Requirement: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.			
Test Specification : ANSI C63.10 – 2013 Test date : 09.08.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 7.4 VDC Temperature : 23°C Humidity : 50%			
Results: For test protocols please refer to Appendix 1.			
Operating frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
2412	5.92	8.0	Pass

FCC 15.247 (d) – Spurious Conducted Emissions					Pass
Test Specification : ANSI C63.10 – 2013 Test date : 09.08.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 7.4 VDC Temperature : 23°C Humidity : 50%					
FCC Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Only the worst cases is shown below. For test protocols refer to Appendix 1					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	2372.000	-44.54	5.92	50.46	Pass
	2399.000	-26.52	5.92	32.44	Pass

FCC 15.205 – Radiated Emissions in Restricted Frequency Bands		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 19.06.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 7.4 VDC Temperature : 23°C Humidity : 50%		
FCC Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).		
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Simultaneous transmission was investigated and no new emissions were found. All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.		
Mode: 2402MHz TX		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
625.085	44.3	74.0 / PK
1375.155	40.5	74.0 / PK
1375.155	35.6	54.0 / AV
2390.000	57.0	74.0 / PK
2390.000	26.3	54.0 / AV
2483.500	27.7	74.0 / PK
2483.500	14.0	54.0 / AV
4824.036	60.8	74.0 / PK
4824.036	46.9	54.0 / AV
Mode: 2402 MHz TX		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
375.050	39.2	46.0 / QP
625.100	43.0	46.0 / QP
1375.185	43.3	74.0 / PK
1375.185	39.3	54.0 / AV
2390.000	63.5	74.0 / PK
2390.000	28.9	54.0 / AV
2483.500	31.2	74.0 / PK
2483.500	18.2	54.0 / AV
4824.025	57.8	74.0 / PK
4824.025	43.5	54.0 / AV
9648.064	61.1	74.0 / PK
9648.064	36.8	54.0 / AV