




Prüfbericht-Nr.: <i>Test Report No.:</i>	50191502 001	Auftrags-Nr.: <i>Order No.:</i>	144194137	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>	14.05.2018		
Auftraggeber: <i>Client:</i>	GUANGDONG ATTOP TECHNOLOGY CO., LTD. Linghai Industry Zone, Laimei Road Chenghai District, Shantou Guangdong, China				
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Radio Controlled Toy Quadcopter with CAM				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Refer to page 4				
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>	27.09.2018				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000825137-002				
Prüfzeitraum: <i>Testing period:</i>	17.10.2018 - 22.11.2018				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland Hong Kong Ltd				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
					
26.11.2018	Benny Lau / Senior Project Manager	26.11.2018	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>	Unterschrift <i>Signature</i>
Sonstiges / Other: FCC ID: 2AEVN0754XT1W					
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>			
<p>* 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</p> <p>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</p>					
<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	2412MHz
Type of modulation	802.11n: OFDM (BPSK/QPSK/16QAM/64QAM)
Number of channels	1
Type of antenna	Internal Antenna
Antenna gain (dBi)	2.5 dBi
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V _{nor} : 3.7VDC
Independent Operation Modes	Transmitting

Product function and intended use

The equipment under test (EUT) is toy drone embedded with WiFi camera. It is powered by rechargeable battery.

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 X-PACK 1 was randomly selected as a representative for testing and construction photo taking.

FCC ID: 2AEVN0754XT1W

Models	Product description
X-PACK 1, X-PACK PLUS, X-PACK PRO, X-PACK GPS, X-PACK 2, X-PACK 3, X-PACK 5, X-PACK 6, X-PACK 7, X-PACK 8, X-PACK 9, X-PACK 10, X-PACK 11, X-PACK 12, X-PACK 13, X-PACK 15, X-PACK 16, X-PACK 17, X-PACK 18, X-PACK 19, X-PACK 20, W2, W3, W5, W6, W7, W8, W9, W10, W11, W12, W13, W15, W16, W17, W18, W19, W20, F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, A1, A2, A3, A5, A6, A7, A8, A9, A10, A11, A12, A13, A15, A16, A17, A19, A20, A21, A22, A23, A25, A26, A27/, A28, A29, A30, YD-829, YD-826, YD-212, YD-711, YD-712,, YD-718, YD-218, YD-927, YD-938, YD-118, YD-118C, YD-615, YD-001, YD-003, YD-211, YD-216, P 01, P 02, P 03, P04, P 05, P 06, P 07, P 08, P 09, P 10, P 90, P 91, P 92, P 93, P 94, P 95, P 96, P 97, P 98, P 99, 6182-7BF, 6182-7BFA, 6182-7BAX, 6182-7BAXPC, 6182-7BAXPB, 6182-7BAXP, 6182-5N, 6182-5NX, 6182-5NXB, 6182-3M, 6182-3MN, 6182-7BD, 6182-6BA, YD-211S, YD-822, YD-822S	Short Range Device - Radio Controlled Toy Quadcopter with CAM

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.

- 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

- 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:

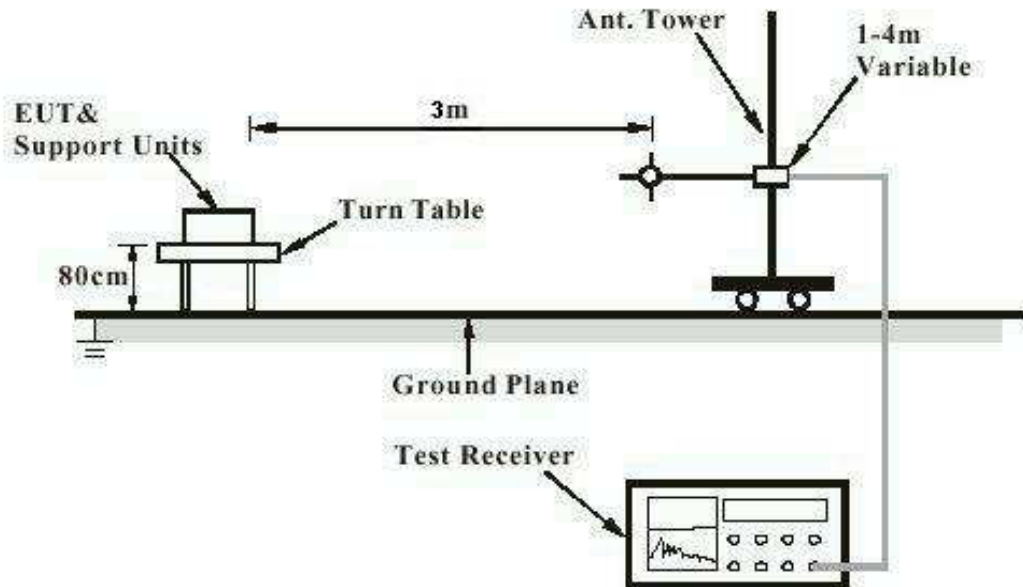
$$FS = R + AF + CF + FA - PA$$

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)

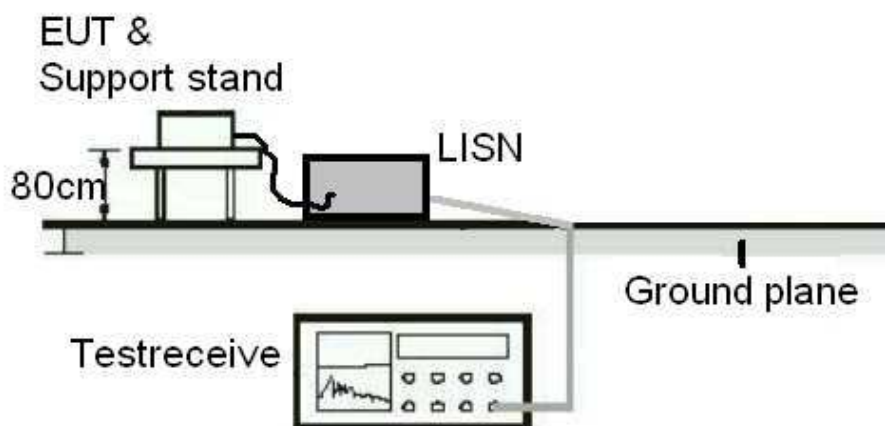
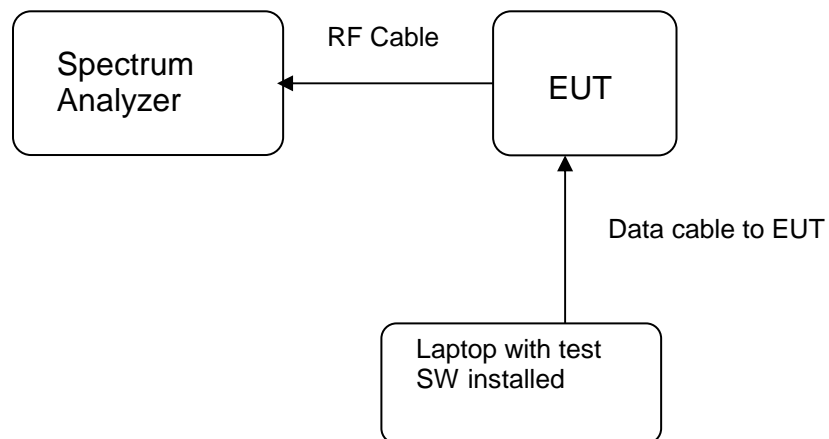


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)

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

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	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	23-Apr-18	23-Apr-19
Test Receiver	R & S	ESU40	12-Jun-18	12-Jun-19
Active Loop Antenna	EMCO	6502	25-Oct-18	25-Oct-19
Bi-conical Antenna	R & S	HK116	21-Mar-18	21-Mar-20
Log Periodic Antenna	R & S	HL223	22-Mar-18	22-Mar-20
Standard Gain Horn	ETS-Lindgren	3160-07	4-Sep-18	4-Sep-20
Standard Gain Horn	ETS-Lindgren	3160-08	26-Sep-18	26-Sep-20
Standard Gain Horn	ETS-Lindgren	3160-10	3-Oct-18	3-Oct-20
Double-Ridged Waveguide Horn	EMCO	3116	5-Oct-18	5-Oct-20
Double-Ridged Waveguide Horn	EMCO	3117	30-Aug-18	30-Aug-20
Coaxial cable	Harbour	LL335	12-Jun-18	12-Jun-19
High Frequency Cable	Pasternack	PE3VNA4001-3M	11-Dec-17	11-Dec-19
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	25-Jun-18	25-Jun-19
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	29-Jan-18	29-Jan-19
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-17	30-Oct-19

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	3-May-18	2-May-19

Measurement Uncertainty

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

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

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: Integral wire antenna b) Manufacturer and model no: N/A c) Peak Gain: 2.5 dBi	
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		N/A
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 15.247 (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 : 17.10.2018 Mode of operation : 802.11n Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC 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	2403.120	2420.820	17.7
Remark: Nil			

FCC 15.247(b)(3) – Maximum Couducted (Average) 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 : 17.10.2018 Mode of operation : 802.11n Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%				
Results: For test protocols please refer to Appendix 1				
802.11b				
Frequency (MHz)	Cable loss (dB)	Output Power (dBm)	Limit (dBm)	Verdict
2412	2	18.52	30.0	Pass
Remark: 1) Cable loss is included in the offset of the SA.				

FCC 15.247(e) – Maximum (Average) 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 : 17.10.2018 Mode of operation : 802.11n Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC Temperature : 23°C Humidity : 50%				
Results: For test protocols please refer to Appendix 1.				
Frequency (MHz)	Cable loss (dB)	Power density (dBm)	Limit (dBm)	Verdict
2412	2	1.14	8.0	Pass
Remark: 1) Cable loss is included in the offset of the SA.				

FCC 15.247(d) – Spurious Conducted Emissions				Pass
Test Specification : ANSI C63.10 – 2013 Test date : 17.10.2018 Mode of operation : 802.11n Tx mode Port of testing : Temporary antenna port Supply voltage : 3.7VDC 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 30 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: 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	2399.900	-31.98	3.06	35.04	Pass

Remark: Nil

FCC 15.205/ RSS-Gen 8.9 – Radiated Emissions in Restricted Frequency Bands **Pass**

Test Specification : ANSI C63.10 – 2013
 Test Date : 12.11.2018
 Tested Model : AC00013
 Mode of operation : Tx mode
 Port of testing : Enclosure
 Frequency range : 9kHz – 25GHz
 Supply voltage : 120VAC 60Hz
 Temperature : 23°C
 Humidity : 50%

FCC/ IC 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 must also comply with the radiated emission general limits.

Results: No peak is found below 1GHz.

Mode: 802.11n@2412MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	69.6	74.0 / PK
2390.000	51.9	54.0 / AV
2483.500	40.4	74.0 / PK
2483.500	26.5	54.0 / AV
4824.647	46.7	74.0 / PK
4824.647	32.8	54.0 / AV

Mode: 802.11n@2412MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2390.000	68.7	74.0 / PK
2390.000	50.9	54.0 / AV
2483.500	40.0	74.0 / PK
2483.500	26.1	54.0 / AV
4825.314	47.7	74.0 / PK
4825.314	33.9	54.0 / AV

Remark: 1) Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate.