

Produkte
Products




Prüfbericht-Nr.: <i>Test Report No.:</i>	50176871 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 Control Toy Drone (2.4GHz)				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Refer to page 4				
Auftrags-Inhalt: <i>Order content:</i>	FCC Cerification				
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>	A000825137-001				
Prüfzeitraum: <i>Testing period:</i>	07.11.2018 - 26.11.2018				
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:			
					
06.12.2018	Benny Lau / Senior Project Manager	06.12.2018	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: 2AEVN0754XT1			
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 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					
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 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>					

Table of Content

	Page
Cover Page	1
Table of Content	2
Product information	4
Manufacturers declarations	4
Product function and intended use.....	4
Submitted documents.....	4
Independent Operation Modes	5
Related Submittal(s) Grants	5
Remark	5
Test Set-up and Operation Mode	6
Principle of Configuration Selection	6
Test Operation and Test Software.....	6
Special Accessories and Auxiliary Equipment.....	6
Countermeasures to achieve EMC Compliance.....	6
Test Methodology	7
Radiated Emission	7
Field Strength Calculation.....	7
Test Setup Diagram	8
Test Facility	9
Test Laboratory Information	9
List of Test and Measurement Instruments	10
Measurement Uncertainty	11
Results FCC Part 15 – Subpart C	12
FCC 15.203 – Antenna Requirement 1.....	Pass..... 12
FCC 15.204 – Antenna Requirement 2.....	Pass..... 12
FCC 15.207 – Conducted Emission on AC Mains	N/A..... 12
Subclause 15.215 (c) – 20 dB Bandwidth.....	Pass..... 12
Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics.....	Pass..... 13
Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission	Pass..... 15
Appendix 1 – Test protocols	3 pages
Appendix 2 – Test setup	2 pages

Appendix 3 – EUT External Photos 3 pages
Appendix 4 – EUT Internal Photos 3 pages
Appendix 5 – RF exposure information..... 2 pages

Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2405 - 2475MHz
Type of modulation	GFSK
Number of channels	17
Type of antenna	Integral wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nor} : 4.5 VDC (Rechargeable battery)

Product function and intended use

The equipment under test (EUT) is a remote controller of toy drone 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. 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: 2AEVN0754XT1

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 Control Toy Drone (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

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:

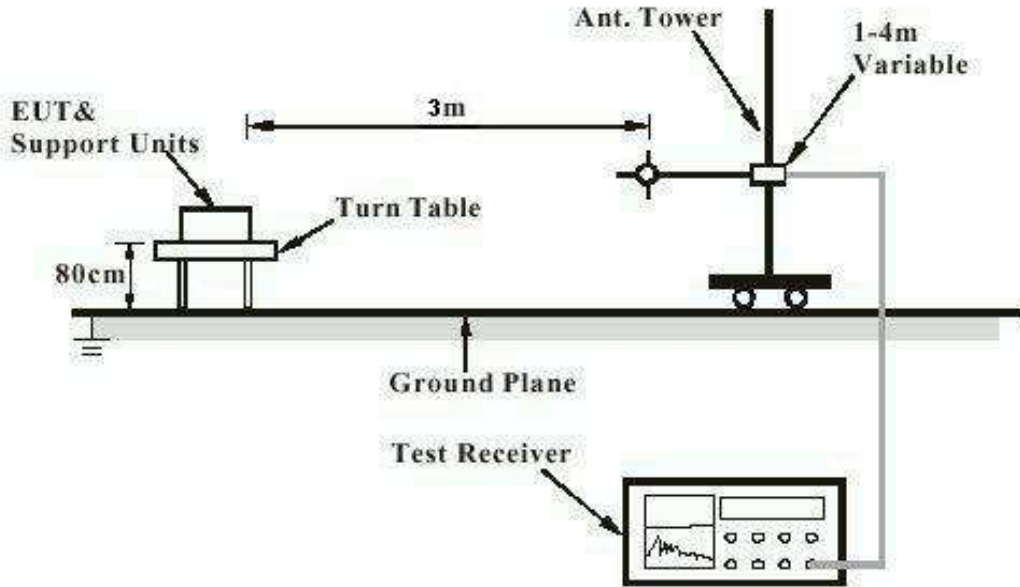
$$FS = R + AF + CF + FA - PA$$

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.

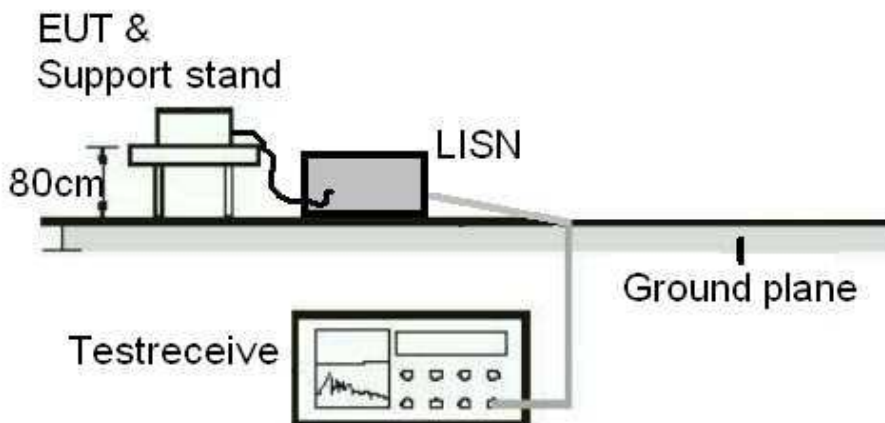
Test Setup Diagram

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)



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 ± 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 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:	N/A
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.		

Subclause 15.215 (c) – 20 dB Bandwidth		Pass		
Test Specification : ANSI C63.10 – 2013 Test date : 26.11.2018 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 4.5VDC 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:	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.			
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
2405	2403.68	> 2400	2406.52	< 2483.5
2445	2443.78	> 2400	2446.26	< 2483.5
2475	2473.88	> 2400	2476.00	< 2483.5

Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 07.11.2018 - 13.11.2018 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 4.5VDC 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 2405MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2405.064	85.4	114.0 / PK
2405.064	60.4	94.0 / AV
Fundamental Frequency 2405MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2405.064	86.1	114.0 / PK
2405.064	61.2	94.0 / AV
Harmonics 2405MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4810.125	60.4	74.0 / PK
4810.125	36.9	54.0 / AV
7215.224	62.1	74.0 / PK
7215.224	37.7	54.0 / AV
Harmonics 2405MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4810.166	57.0	74.0 / PK
4810.166	34.8	54.0 / AV
7215.217	58.1	74.0 / PK
7215.217	35.7	54.0 / AV
Fundamental Frequency 2445MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2445.128	83.5	114.0 / PK
2445.128	58.6	94.0 / AV
Fundamental Frequency 2445MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2445.128	81.2	114.0 / PK
2445.128	56.3	94.0 / AV

Harmonics 2445MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4890.141	56.7	74.0 / PK	
4890.141	34.2	54.0 / AV	
7335.211	45.3	74.0 / PK	
7335.211	31.7	54.0 / AV	
Harmonics 2445MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4890.153	58.9	74.0 / PK	
4890.153	35.9	54.0 / AV	
7335.230	59.7	74.0 / PK	
7335.230	36.6	54.0 / AV	
Fundamental Frequency 2475MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2475.076	86.6	114.0 / PK	
2475.076	61.7	94.0 / AV	
Fundamental Frequency 2475MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2475.076	83.4	114.0 / PK	
2475.076	58.6	94.0 / AV	
Harmonics 2475MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4950.125	55.5	74.0 / PK	
4950.125	34.0	54.0 / AV	
7425.227	60.5	74.0 / PK	
7425.227	37.2	54.0 / AV	
Harmonics 2475MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4950.689	55.5	74.0 / PK	
4950.689	32.4	54.0 / AV	
7425.753	61.4	74.0 / PK	
7425.753	37.9	54.0 / AV	

Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 07.11.2018 - 13.11.2018 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 4.5VDC 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 2405MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	46.8	74.0 / PK
2400.000	40.1	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 2445MHz		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 2445MHz		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 2475MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	54.0	74.0 / PK
2483.500	23.7	54.0 / AV
Tx frequency 2475MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	53.1	74.0 / PK
2483.500	23.5	54.0 / AV