

Produkte
Products

Prüfbericht - Nr.: 14048925 001 <i>Test Report No.:</i>			Seite 1 von 15 <i>Page 1 of 15</i>		
Auftraggeber: <i>Client:</i>			SHANTOU SKYTECH TECHNOLOGY INDUSTRIAL INC. Laimei Industrial Park Chenghai District, Shantou City, 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>		A000610542-001		Eingangsdatum: <i>Date of Receipt:</i>	
				22.06.2017	
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i>			Test sample is not damaged and suitable for testing.		
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:		
11.07.2017 Kevin Wong Project Manager Datum <i>Date</i>			11.07.2017 Benny Lau Senior Project Manager Datum <i>Date</i>		
Name/Stellung <i>Name/Position</i>			Name/Stellung <i>Name/Position</i>		
Unterschrift <i>Signature</i>			Unterschrift <i>Signature</i>		
Sonstiges: <i>Other Aspects</i>			FCC ID: 2AL75-TK20170629		
Abkürzungen:			Abbreviations:		
P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			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	2412 - 2462MHz
Type of modulation	GFSK
Number of channels	50
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nor} : 6.0 V

Product function and intended use

The equipment under test (EUT) is a radio control toy transceiver 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: 2AL75-TK20170629

Models	Product description
M61S, M62, M62R, M66, M66S, M67, M68, M68R, M69, M69S, M70, M70S, M71, M72, M72R, M73, M75, M76, M76R, M76W, M77, M78, M79, M80, M81, M82, M83, M85, M86, M87, M88, M89, M90, M91, M92, M93, M95, M96, M97, M98, M99, TK101, TK102, TK103, TK105, TK106, TK106HW, TK106RHW, TK107, TK107W, TK108, TK108W, TK109, TK109W, TK110, TK110W, TK111, TK111W, TK112, TK112W, TK113, TK113W, TK115, TK115W, TK116, TK116W, TK117, TK117W, TK118, TK118W, TK119, TK119W, TK120, 005A, 005B, 005C, 005D, TK107H, TK107HW, TK108H, TK108HW, TK109H, TK109HW, M76S, L600, L601, L602, L603, L606, L607, L608, L609, L610, L611	Short Range Device - Radio Control Toy Transmitter (2.4GHz)

Submitted documents

Circuit Diagram
 Block Diagram
 Bill of material
 Technical Description
 User manual
 Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.
- Normal operation 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.

- A test mode sample which can transmit continuously in the lowest, middle and highest frequency channels at its maximum power was provided by the applicant..

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:

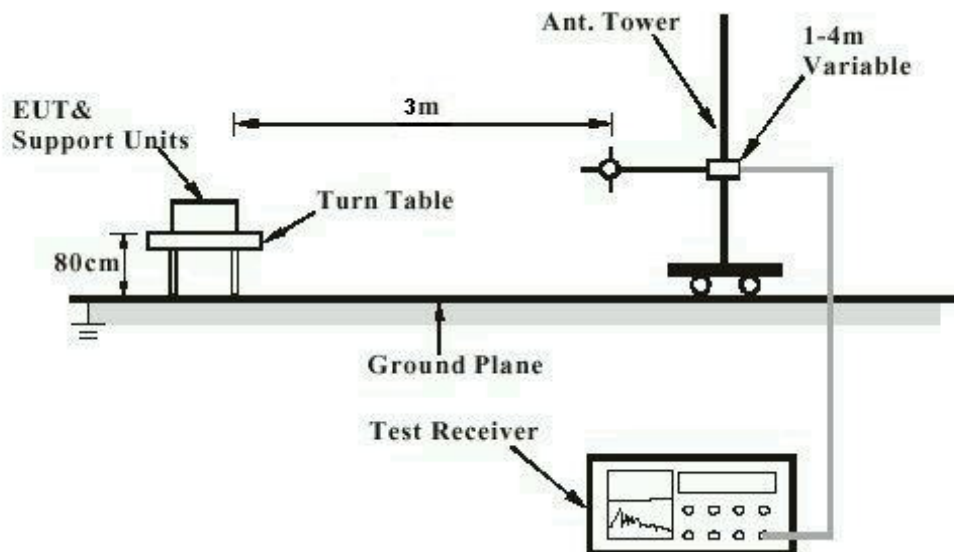
$$FS = R + AF + CF + FA - PA$$

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.

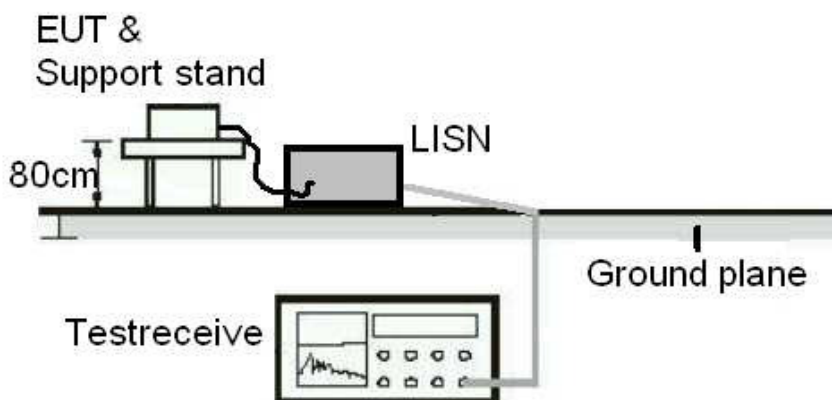
Test Setup Diagram

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)	03-Jul-2015	02-Jul-2018
Control Room	ZhongYu Electron	6.2(L)*2.5(W)*2.4(H)	N/A	N/A
ESU EMI Test Receiver	R&S	ESU26	26-Jun-2017	25-Jun-2018
Loop Antenna	Zhinan	ZN30900A	26-Jun-2017	25-Jun-2018
BiConiLog Antenna	SCHWARZBECK	VULB9163	26-Jun-2017	25-Jun-2018
Double-ridged horn antenna	SCHWARZBECK	9120D	26-Jun-2017	25-Jun-2018
Horn Antenna	ETS-LINDGREN	3160-09	26-Jun-2017	25-Jun-2018
RF Amplifier	HP	8347A	26-Jun-2017	25-Jun-2018
RF Amplifier	HP	8349B	26-Jun-2017	25-Jun-2018
Broadband Preamplifier	SCHWARZBECK	BBV9718	26-Jun-2017	25-Jun-2018
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	26-Jun-2017	25-Jun-2018

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Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	15-Oct-16	15-Oct-2017

Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions measurements is $\pm 3.70\text{dB}$ (9kHz to 30MHz) and $\pm 4.64\text{dB}$ (30MHz to 1000MHz) and is $\pm 4.83\text{dB}$ (1GHz to 18GHz) and $\pm 5.20\text{dB}$ (18GHz to 25GHz)

The estimated combined standard uncertainty for antenna conducted emission is $\pm 2.1\text{dB}$

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:	Fixed Integral antenna
	b) Manufacturer and model no:	N/A
	c) Peak Gain:	N/A
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.		

Subclause 15.215 (c) – 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure Supply voltage : 6.0VDC, 4 x 1.5V AA size new battery 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)
2412	2411.582	> 2400	2412.582	< 2483.5
2437	2436.576	> 2400	2437.576	< 2483.5
2462	2461.462	> 2400	2462.582	< 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 : 6.0VDC, 4 x 1.5V AA size new battery 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 2412MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2412.110	72.08	114.0 / PK
2412.110	61.86	94.0 / AV
Fundamental Frequency 2412MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2412.024	70.18	114.0 / PK
2412.024	59.23	94.0 / AV
Harmonics 2412MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Harmonics 2412MHz		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 2437MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2437.056	71.90	114.0 / PK
2437.056	61.64	94.0 / AV
Fundamental Frequency 2437MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2437.095	69.74	114.0 / PK
2437.095	59.57	94.0 / AV

Harmonics 2437MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK	No peak found	---	74.0 / PK
No peak found	---	54.0 / AV	No peak found	---	54.0 / AV
Harmonics 2437MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK	No peak found	---	74.0 / PK
No peak found	---	54.0 / AV	No peak found	---	54.0 / AV
Fundamental Frequency 2462MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2462.000	71.89	114.0 / PK	2462.000	71.89	114.0 / PK
2462.000	61.83	94.0 / AV	2462.000	61.83	94.0 / AV
Fundamental Frequency 2462MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2462.000	69.37	114.0 / PK	2462.000	69.37	114.0 / PK
2462.000	59.43	94.0 / AV	2462.000	59.43	94.0 / AV
Harmonics 2462MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK	No peak found	---	74.0 / PK
No peak found	---	54.0 / AV	No peak found	---	54.0 / AV
Harmonics 2462MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK	No peak found	---	74.0 / PK
No peak found	---	54.0 / AV	No peak found	---	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 : 6.0VDC, 4 x 1.5V AA size new battery 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 2412MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	33.96	74.0 / PK
2400.000	24.22	54.0 / AV
Tx frequency 2412MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	32.06	74.0 / PK
2400.000	23.32	54.0 / AV
Tx frequency 2437MHz 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 2437MHz 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 2462MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	28.88	74.0 / PK
2483.500	22.11	54.0 / AV
Tx frequency 2462MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	27.71	74.0 / PK
2483.500	21.94	54.0 / AV