

Produkte
Products

Prüfbericht - Nr.: 14050825 001		Seite 1 von 13	
<i>Test Report No.:</i>		<i>Page 1 of 13</i>	
Auftraggeber: <i>Client:</i>		Haiboxing Toys Factory Long Tian Guang Tou Industrial Estate, Guang Yi Street, Cheng Hai Area, Shan Tou City, China	
Gegenstand der Prüfung: <i>Test Item:</i>		Short Range Device - Radio Controlled Toy Transmitter (2.4GHz)	
Bezeichnung: <i>Identification:</i>	Please refer to "Models" on page 3	Serien-Nr.: <i>Serial No.:</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	A000559612-002	Eingangsdatum: <i>Date of Receipt:</i>	06.06.2017
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i>		Test sample received is sufficient for testing and not damaged.	
Prüfort: <i>Testing Location:</i>		TÜV Rheinland Hong Kong Ltd. 3/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, 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	Joey Leung	11.07.2017	Benny Lau
<i>Datum</i>	<i>Project Manager</i>	<i>Datum</i>	<i>Senior Project Manager</i>
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	<i>Unterschrift</i>		<i>Unterschrift</i>
	<i>Signature</i>		<i>Signature</i>
Sonstiges: Other Aspects		FCC ID: SX2LS-L103A-24GT	
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	2404 - 2470MHz
Type of modulation	GFSK
Type of antenna	Integral wire antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V_{nor} : 3.0 V (2 x 1.5V AA size battery)

Product function and intended use

The equipment under test (EUT) is a radio control toy transmitter operating at 2.4GHz. It is powered by battery only.

FCC ID: SX2LS-L103A-24GT

Models	Product description
LS-L103A-2.4GT, LS-L122-2.4GT, 12811B, 12813, 12812, 12891, 12889, 18857, 18858, 18859, 18856, 10685, 12815, 12895, 2628, 2638, 2118, 2128, 2138	Radio Controlled Toy Transmitter

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual

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 testing, the EUT was programmed to test mode by manufacturer. Change of transmitting frequency can be achieved by pressing a built-in button on EUT. Output power of EUT was set to fixed level throughout 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 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 the turntable is 3 meters far from the measuring antenna. In addition, 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:

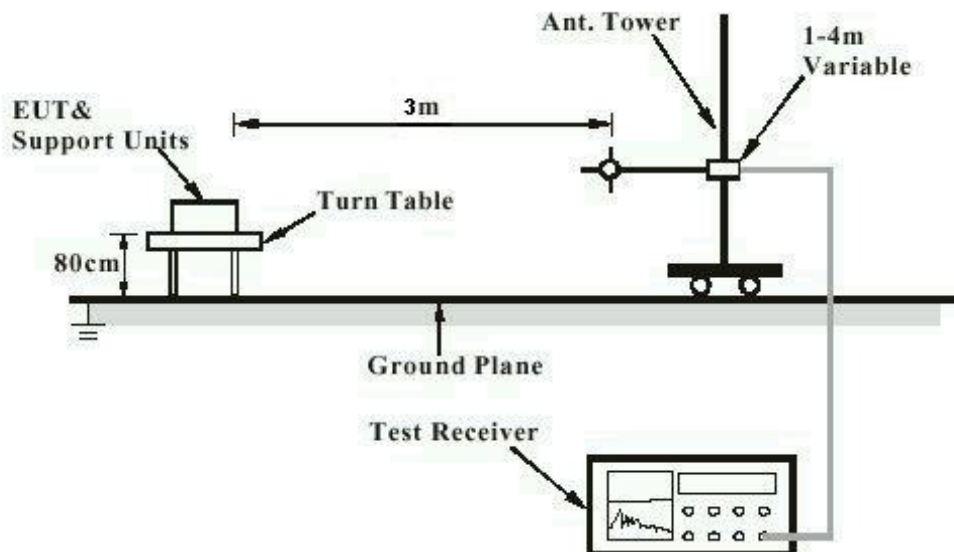
$$FS = R + AF + CF + FA - PA$$

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.

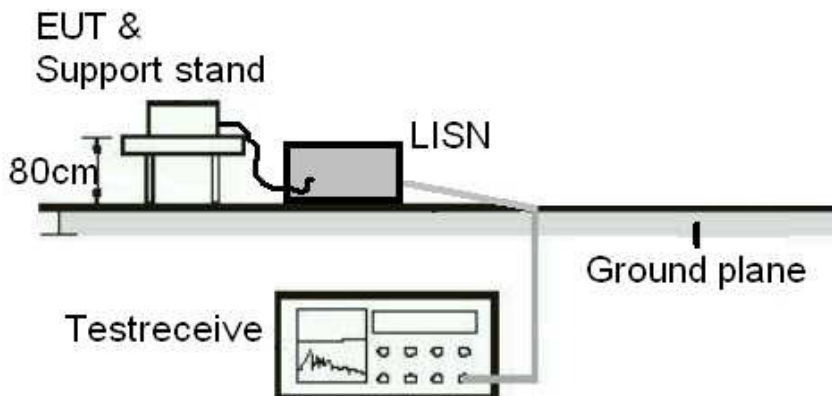
Test Setup Diagram

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

TÜV Rheinland Hong Kong Ltd

Radio Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	100610	16 Oct 2016	15 Oct 2017

Global United Technology Services Co., Ltd. (FCC Registration number: 600491)

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Due Date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W) * 6.0(H)	GTS250	03 Jul 2015	02 Jul 2020
Control Room	ZhongYu Electron	6.2(L)*2.5(W) * 2.4(H)	GTS251	N/A	N/A
ESU EMI Test Receiver	R&S	ESU26	GTS203	26 Jun 2017	25 Jun 2018
Loop Antenna	Zhinan	ZN30900A	GTS534	26 Jun 2017	25 Jun 2018
BiConiLog Antenna	SCHWARZBECK	VULB9163	GTS214	26 Jun 2017	25 Jun 2018
Double-ridged horn antenna	SCHWARZBECK	9120D	GTS208	26 Jun 2017	25 Jun 2018
Horn Antenna	ETS-LINDGREN	3160-09	GTS218	26 Jun 2017	25 Jun 2018
RF Amplifier	HP	8347A	GTS204	26 Jun 2017	25 Jun 2018
RF Amplifier	HP	8349B	GTS206	26 Jun 2017	25 Jun 2018
Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	26 Jun 2017	25 Jun 2018
EMI Test Software	AUDIX	E3	N/A	N/A	N/A
Coaxial cable	GTS	N/A	GTS210	N/A	N/A
Coaxial Cable	GTS	N/A	GTS211	N/A	N/A
Thermo meter	N/A	N/A	GTS256	26 Jun 2017	25 Jun 2018

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is $\pm 2.96\text{dB}$.

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 $\pm 4.83\text{dB}$ (1GHz to 18GHz) and $\pm 5.20\text{dB}$ (18GHz to 25GHz).

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 wire 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 integral antenna can be used.	
Verdict:	Pass	

FCC 15.207 – Conducted Emission on AC Mains		N/A
There is no AC power input or output ports on the EUT.		

FCC 15.215(c) – 20 dB Bandwidth		Pass		
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.0VDC, 2 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:	For test protocols refer to Appendix 1, page 2-3.			
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
2404	2401.760	> 2400	2406.180	< 2483.5
2437	2435.300	> 2400	2438.800	< 2483.5
2470	2468.560	> 2400	2471.460	< 2483.5

FCC 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 RBW/VBW : 120kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 3.0VDC, 2 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 2404MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2404.260	75.00	114.0 / PK	
2404.260	70.07	94.0 / AV	
Fundamental Frequency 2404MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2404.370	77.12	114.0 / PK	
2404.370	70.80	94.0 / AV	
Harmonics 2404MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4808.120	34.14	74.0 / PK	
4808.120	24.59	54.0 / AV	
Harmonics 2404MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4808.051	33.06	74.0 / P	
4808.051	23.89	54.0 / A	
Fundamental Frequency 2437MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2437.045	75.77	114.0 / PK	
2437.045	68.68	94.0 / AV	
Fundamental Frequency 2437MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2437.087	76.36	114.0 / PK	
2437.087	69.42	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
4874.076	35.33	74.0 / P	4874.076	25.33	54.0 / A
Harmonics 2437MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4874.015	33.33	74.0 / P	4874.015	23.46	54.0 / A
Fundamental Frequency 2470MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2470.560	74.35	114.0 / PK	2470.560	67.72	94.0 / AV
Fundamental Frequency 2470MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2470.380	75.31	114.0 / PK	2470.380	68.90	94.0 / AV
Harmonics 2470MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4940.033	35.41	74.0 / P	4940.033	25.69	54.0 / A
Harmonics 2470MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4940.062	34.27	74.0 / P	4940.062	24.21	54.0 / A

FCC 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 RBW/VBW : 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 3.0VDC, 2 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 2404MHz Vertical Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
40.417	9.28	40.0 / QP	
348.027	12.76	46.0 / QP	
2400.000	52.38	74.0 / PK	
2400.000	23.09	54.0 / AV	
Tx frequency 2404MHz Horizontal Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
37.155	8.27	40.0 / QP	
612.064	19.06	46.0 / QP	
2400.000	54.61	74.0 / PK	
2400.000	24.33	54.0 / AV	
Tx frequency 2437MHz Vertical Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
36.766	9.00	40.0 /QP	
103.442	9.63	43.5 /QP	
348.027	12.97	46.0 /QP	
Tx frequency 2437MHz Horizontal Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
41.132	8.38	40.0 /QP	
98.487	8.26	43.5 /QP	
519.065	17.42	46.0 /QP	
Tx frequency 2470MHz Vertical Polarization			
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	33.37	74.0 / PK	
2483.500	17.90	54.0 / AV	

Tx frequency 2470MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	31.87	74.0 / PK	
2483.500	16.64	54.0 / AV	