

Produkte
Products

Prüfbericht - Nr.: 14050303 001		Seite 1 von 14	
<i>Test Report No.:</i>		<i>Page 1 of 14</i>	
Auftraggeber:		Stadlbauer Marketing + Vertrieb GmbH	
<i>Client:</i>		Rennbahn Allee 1, 5412 Puch Salzburg, Austria	
Gegenstand der Prüfung:		Short Range Device - Radio Control Toy Transmitter (2.4GHz)	
<i>Test Item:</i>			
Bezeichnung:	370401018	Serien-Nr.:	Engineering sample
<i>Identification:</i>		<i>Serial No.:</i>	
Wareneingangs-Nr.:	A000571747-004	Eingangsdatum:	23.06.2017
<i>Receipt No.:</i>		<i>Date of Receipt:</i>	
Zustand des Prüfgegenstandes bei Anlieferung:		Test sample is not damaged and suitable for testing.	
<i>Condition of test item at delivery:</i>			
Prüfart:	TÜV Rheinland Hong Kong Ltd.		
<i>Testing Location:</i>	3/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
Prüfgrundlage:	FCC Part 15 Subpart C		
<i>Test Specification:</i>	RSS-210 Issue 9 ANSI C63.10-2013		
Prüfergebnis:	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.		
<i>Test Results:</i>	The above mentioned product was tested and passed .		
Prüflaboratorium:	TÜV Rheinland Hong Kong Ltd.		
<i>Testing Laboratory:</i>	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:	
12.07.2017	Kevin Wong	12.07.2017	Benny Lau
<i>Date</i>	<i>Name/Position</i>	<i>Date</i>	<i>Name/Position</i>
	Project Manager		Senior Project Manager
			
	<i>Unterschrift</i>		<i>Unterschrift</i>
	<i>Signature</i>		<i>Signature</i>
Sonstiges:		FCC ID: YFA370401018	
<i>Other Aspects</i>		IC: 12260A-370401018	
Abkürzungen:		Abbreviations:	
<i>P(ass) = entspricht Prüfgrundlage</i>		<i>P(ass) = passed</i>	
<i>F(ail) = entspricht nicht Prüfgrundlage</i>		<i>F(ail) = failed</i>	
<i>N/A = nicht anwendbar</i>		<i>N/A = not applicable</i>	
<i>N/T = nicht getestet</i>		<i>N/T = not tested</i>	
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>			

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	4
Related Submittal(s) Grants	4
Remark	4
Test Set-up and Operation Mode.....	5
Principle of Configuration Selection	5
Test Operation and Test Software	5
Special Accessories and Auxiliary Equipment.....	5
Countermeasures to achieve EMC Compliance.....	5
Test Methodology	6
Radiated Emission	6
Field Strength Calculation.....	6
Test Setup Diagram	7
List of Test and Measurement Instruments.....	8
Measurement Uncertainty	9
Results FCC Part 15 – Subpart C / RSS-210 Issue 9.....	10
FCC 15.203 – Antenna Requirement 1.....	Pass 10
FCC 15.204 – Antenna Requirement 2.....	Pass 10
RSS-Gen 6.3 – External Control.....	Pass 10
RSS-Gen 8.3 – Antenna Requirement	Pass 10
FCC 15.207/ RSS-Gen 8.8 – Conducted Emission on AC Mains.....	N/A 11
Subclause 15.215 (c) – 20 dB Bandwidth.....	Pass 11
RSS-Gen 6.6 – Occupied Bandwidth.....	Pass 11
Subclause 15.249 (a) / RSS-210 B.10 (a) – Field Strength of Fundamental and Harmonics.....	Pass 12
Subclause 15.249 (d), 15.205 / RSS-210 B.10 (b) – Out Of Band Radiated Emission	Pass 14

Appendix 1 – Test protocols	5 pages
Appendix 2 – Test setup	2 pages
Appendix 3 – EUT External Photos	3 pages
Appendix 4 – EUT Internal Photos	7 pages
Appendix 5 – RF exposure information	2 pages

Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2420 - 2470MHz
Type of modulation	GFSK
Number of channels	6
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nom} : 3.0 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.

FCC ID: YFA370401018 / IC: 12260A-370401018

Models	Product description
370401018	Short Range Device - Radio Control Toy Transmitter (2.4GHz)

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
Technical Description
User manual
Rating 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:

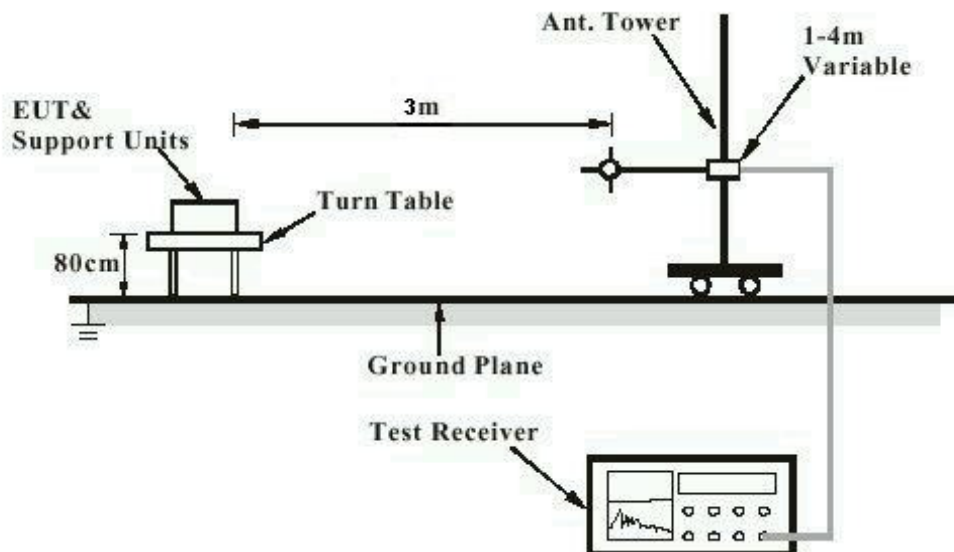
$$FS = R + AF + CF + FA - PA$$

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.

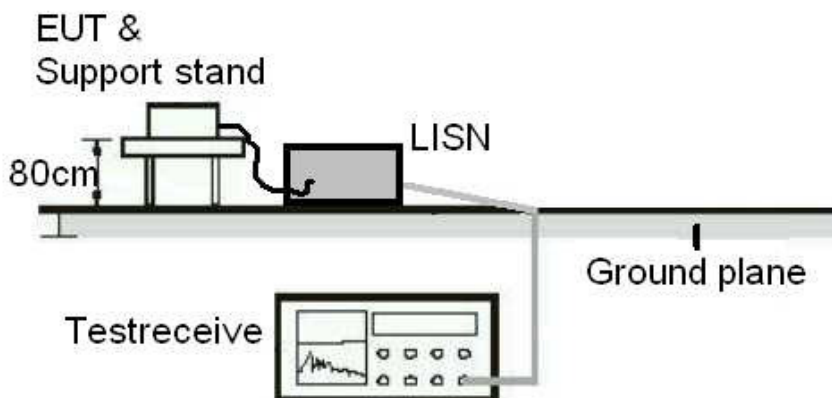
Test Setup Diagram

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

Hong Kong Productivity Council (FCC/ IC Registration number: 90656/ 4780A-1)

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	25-Apr-17	25-Apr-18
Test Receiver	R & S	ESU40	26-Jul-16	26-Jul-17
Active Loop Antenna	EMCO	6502	27-Oct-16	27-Oct-17
Bi-conical Antenna	R & S	HK116	1-Sep-15	1-Sep-17
Log Periodic Antenna	R & S	HL223	1-Sep-15	1-Sep-17
Standard Gain Horn	ETS-Lindgren	3160-07	3-Mar-16	3-Mar-18
Standard Gain Horn	ETS-Lindgren	3160-08	3-Mar-16	3-Mar-18
Standard Gain Horn	ETS-Lindgren	3160-10	3-Mar-16	3-Mar-18
Double-Ridged Waveguide Horn	EMCO	3116	17-Jun-16	17-Jun-18
Double-Ridged Waveguide Horn	EMCO	3117	22-Jun-16	22-Jun-18
Coaxial cable	Harbour	LL335	10-Jun-16	10-Jun-18
High Frequency Cable	Pasternack	PE3VNA4001-3M	27-Jan-17	27-Jan-18
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	18-Jul-16	18-Jul-18
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	27-Jan-17	27-Jan-18
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	28-Oct-15	28-Oct-17

TÜV Rheinland Hong Kong Ltd

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 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 / RSS-210 Issue 9

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: 2 dBi	
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	

RSS-Gen 6.3 – External Control		Pass
IC Requirement: The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.		
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.	
Verdict:	Pass	

RSS-Gen 8.3 – Antenna Requirement		Pass
IC Requirement: When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer.		
Results:	a) Antenna type: Fixed Integral wire antenna b) Manufacturer: N/A c) model no: N/A d) Gain with reference to an isotropic radiator: 2 dBi	
Verdict:	Pass	

FCC 15.207/ RSS-Gen 8.8 – 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 : 3.0VDC, 2 x 1.5V AAA 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)
2420	2414.480	> 2400	2428.480	< 2483.5
2445	2438.840	> 2400	2453.640	< 2483.5
2470	2464.080	> 2400	2477.920	< 2483.5

RSS-Gen 6.6 – Occupied Bandwidth		Pass	
FCC/ IC Requirement : N/A			
Test Specification : RSS-Gen Mode of operation : Tx mode Port of testing : Temporary antenna port Detector : Peak Supply voltage : 3.0VDC, 2 x 1.5V AAA size new battery Temperature : 23°C Humidity : 50%			
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)	Left (MHz)	Right (MHz)	99% bandwidth (MHz)
2420	2414.960	2427.920	12.960
2445	2439.320	2453.080	13.760
2470	2464.560	2477.360	12.800

Subclause 15.249 (a)/RSS-210 B.10 (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 : 3.0VDC, 2 x 1.5V AAA 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 2420MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2419.712	88.16	114.0 / PK
2419.712	39.80	94.0 / AV
Fundamental Frequency 2420MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2419.792	90.96	114.0 / PK
2419.792	40.01	94.0 / AV
Harmonics 2420MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4840.321	55.66	74.0 / PK
4839.936	39.75	54.0 / AV
Harmonics 2420MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4840.096	60.24	74.0 / PK
4839.936	40.51	54.0 / AV
Fundamental Frequency 2445MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2450.000	87.53	114.0 / PK
2444.872	38.82	94.0 / AV
Fundamental Frequency 2445MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2445.112	87.89	114.0 / PK
2445.112	39.12	94.0 / AV

Harmonics 2445MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4889.968	56.19	74.0 / PK	4889.936	39.02	54.0 / AV
Harmonics 2445MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4890.032	56.75	74.0 / PK	4889.968	39.74	54.0 / AV
Fundamental Frequency 2470MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2473.478	87.29	114.0 / PK	2469.952	39.40	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
2470.032	88.68	114.0 / PK	2470.032	39.96	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
4939.551	56.02	74.0 / PK	4940.000	39.54	54.0 / AV
Harmonics 2470MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4939.712	59.33	74.0 / PK	4939.904	40.60	54.0 / AV

Subclause 15.249 (d), 15.205 / RSS-210 B.10 (b) – 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 : 3.0VDC, 2 x 1.5V AAA 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 2420MHz			Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2401.122	53.56	74.0 / PK	
2401.122	33.57	54.0 / AV	
Tx frequency 2420MHz			Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2401.843	55.40	74.0 / PK	
2401.843	33.52	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 2470MHz			Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	54.64	74.0 / PK	
2483.500	32.93	54.0 / AV	
Tx frequency 2470MHz			Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	54.89	74.0 / PK	
2483.500	33.01	54.0 / AV	