

Produkte  
Products

<b>Prüfbericht - Nr.:</b> 14049299 001 <i>Test Report No.:</i>		Seite 1 von 14 <i>Page 1 of 14</i>			
<b>Auftraggeber:</b> <i>Client:</i>		Stadlbauer Marketing + Vertrieb GmbH Rennbahn Allee 1, 5412 Puch Salzburg, Austria			
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>		Short Range Device - Radio Control Toy Transmitter (2.4GHz)			
<b>Bezeichnung:</b> <i>Identification:</i>		370410324	<b>Serien-Nr.:</b> <i>Serial No.:</i> Engineering sample		
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>		A000550319-001	<b>Eingangsdatum:</b> <i>Date of Receipt:</i> 19.05.2017		
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> <i>Condition of test item at delivery:</i>		Test sample is not damaged and suitable for testing.			
<b>Prüfort:</b> <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 Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong			
<b>Prüfgrundlage:</b> <i>Test Specification:</i>		FCC Part 15 Subpart C RSS-210 Issue 9 ANSI C63.10-2013			
<b>Prüfergebnis:</b> <i>Test Results:</i>		Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and <b>passed</b> .			
<b>Prüflaboratorium:</b> <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/ <i>tested by:</i>		kontrolliert/ <i>reviewed by:</i>			
29.05.2017	Kevin Wong Project Manager		29.05.2017	Mika Chan Project 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>
<b>Sonstiges:</b> <i>Other Aspects</i>		FCC ID: YFA370410324 IC: 12260A-370410324			
<b>Abkürzungen:</b> P(ass) = entspricht Prüfgrundlage F(all) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			<b>Abbreviations:</b> P(ass) = passed F(all) = failed N/A = not applicable N/T = not tested		
<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>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.</p>					

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## Product information

### Manufacturers declarations

	<b>Transmitter</b>
Operating frequency range	2405 - 2481MHz
Type of modulation	GFSK
Number of channels	12
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V <sub>nor</sub> : 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: YFA370410324 / IC: 12260A-370410324

<b>Models</b>	<b>Product description</b>
370410324	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.

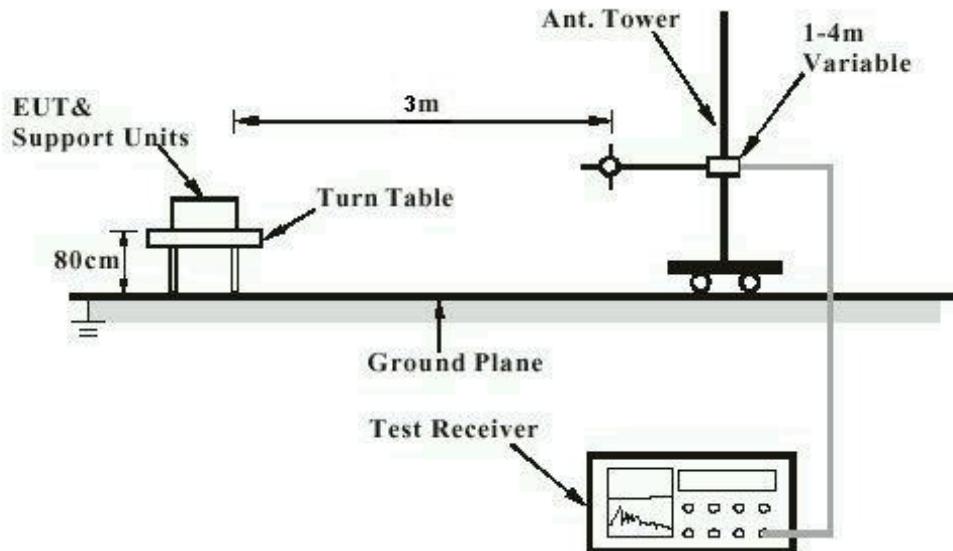
FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

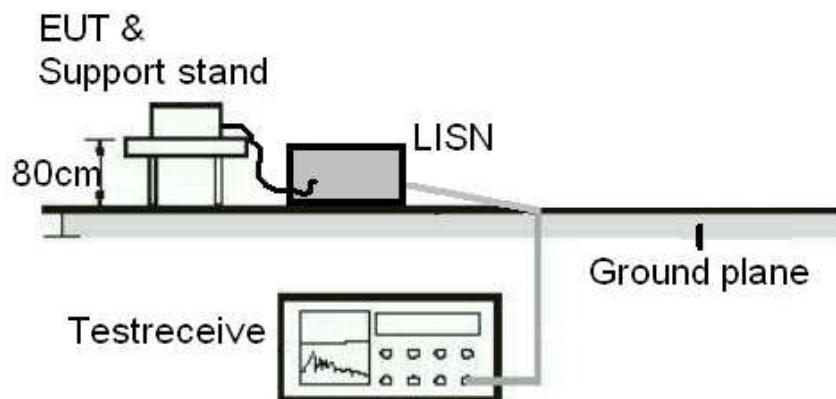
## Test Setup Diagram

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

<b>FCC 15.203 – Antenna Requirement 1</b>	<b>Pass</b>
<b>FCC Requirement:</b> No antenna other than that furnished by the responsible party shall be used with the device	
<b>Results:</b>	a) Antenna type: Fixed Integral antenna b) Manufacturer and model no: N/A c) Peak Gain: 0dBi
<b>Verdict:</b>	Pass
<b>FCC 15.204 – Antenna Requirement 2</b>	<b>Pass</b>
<b>FCC Requirement:</b> 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.	
<b>Results:</b>	Only one integral antenna can be used.
<b>Verdict:</b>	N/A
<b>RSS-Gen 6.3 – External Control</b>	<b>Pass</b>
<b>IC Requirement:</b> 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.	
<b>Results:</b>	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.
<b>Verdict:</b>	Pass
<b>RSS-Gen 8.3 – Antenna Requirement</b>	<b>Pass</b>
<b>IC Requirement:</b> 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.	
<b>Results:</b>	a) Antenna type: Fixed Integral wire antenna b) Manufacturer N/A c) model no N/A d) Gain with reference to an isotropic radiator: 0 dBi
<b>Verdict:</b>	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 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.				
<b>Results:</b> 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	2402.980	> 2400	2405.920	< 2483.5
2449	2447.620	> 2400	2449.700	< 2483.5
2481	2479.740	> 2400	2481.680	< 2483.5

RSS-Gen 6.6 – Occupied Bandwidth		Pass	
<b>FCC/ IC Requirement</b> : 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 AA size new battery			
Temperature : 23°C			
Humidity : 50%			
<b>Results:</b> 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)
2405	2403.160	2405.580	2.420
2449	2447.800	2449.540	1.740
2481	2479.920	2481.540	1.620

**Subclause 15.249 (a) / RSS-210 B.10 (a) – Field Strength of Fundamental and HarmonicsPass**

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 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 2405MHz Vertical Polarization**

<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2403.446	84.12	114.0 / PK
2404.967	59.23	94.0 / AV

**Fundamental Frequency 2405MHz Horizontal Polarization**

<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2403.606	87.54	114.0 / PK
2404.968	61.04	94.0 / AV

**Harmonics 2405MHz Vertical Polarization**

<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4810.449	64.62	74.0 / PK
4809.840	49.82	54.0 / AV
7215.737	67.72	74.0 / PK
7214.744	51.63	54.0 / AV

**Harmonics 2405MHz Horizontal Polarization**

<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
4810.417	57.43	74.0 / PK
4809.904	43.99	54.0 / AV
7215.385	68.68	74.0 / PK
7214.744	53.51	54.0 / AV

**Fundamental Frequency 2449MHz Vertical Polarization**

<b>Freq MHz</b>	<b>Level dBuV/m</b>	<b>Limit/ Detector dBuV/m</b>
2449.359	82.98	114.0 / PK
2448.958	58.72	94.0 / AV

Fundamental Frequency 2449MHz		
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2449.439	83.26	114.0 / PK
2448.878	57.43	94.0 / AV
Harmonics 2449MHz		
Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4898.467	62.12	74.0 / PK
4897.906	47.95	54.0 / AV
7347.687	66.30	74.0 / PK
7346.759	50.93	54.0 / AV
Harmonics 2449MHz		
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4897.436	56.53	74.0 / PK
4897.800	41.67	54.0 / AV
7346.524	65.02	74.0 / PK
7346.524	51.06	54.0 / AV
Fundamental Frequency 2481MHz		
Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2480.801	87.69	114.0 / PK
2480.801	61.60	94.0 / AV
Fundamental Frequency 2481MHz		
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2480.929	83.67	114.0 / PK
2480.929	59.46	94.0 / AV
Harmonics 2481MHz		
Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4962.596	58.78	74.0 / PK
4961.795	43.16	54.0 / AV
7441.859	64.76	74.0 / PK
7442.692	48.78	54.0 / AV
Harmonics 2481MHz		
Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4962.532	58.47	74.0 / PK
4961.891	43.66	54.0 / AV
7442.051	65.98	74.0 / PK
7442.788	50.91	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 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.			
<b>Results:</b> 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	43.82	74.0 / PK	
2400.000	27.61	54.0 / AV	
Tx frequency 2405MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2400.000	44.34	74.0 / PK	
2400.000	27.95	54.0 / AV	
Tx frequency 2449MHz		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 2449MHz		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 2481MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	58.70	74.0 / PK	
2483.500	41.21	54.0 / AV	
Tx frequency 2481MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	55.42	74.0 / PK	
2483.500	39.38	54.0 / AV	