Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14049237 001**	**Seite 1 von 15** *Page 1 of 15*
Auftraggeber: *Client:*	**Stadlbauer Marketing + Vertrieb GmbH** **Rennbahn Allee 1, 5412 Puch** **Salzburg, Austria**	
Gegenstand der Prüfung: *Test Item:*	**Short Range Device - Radio Control Toy Transmitter (2.4GHz)**	
Bezeichnung: *Identification:*	**370900050**	**Serien-Nr.:** *Serial No.:* **Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**A000542309-001**	**Eingangsdatum:** *Date of Receipt:* **05.04.2017**
Zustand des Prüfgegenstandes bei Anlieferung: *Condition of test item at delivery:*	Test sample is not damaged and suitable for testing.	
Prüfort: *Testing Location:*	**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	
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **RSS-210 Issue 9** **ANSI C63.10-2013**	
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.	
Prüflaboratorium: *Testing Laboratory:*	**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:*		
19.06.2017	Kevin Wong Project Manager		19.06.2017	Mika Chan Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges:
Other Aspects

FCC ID: YFA370900050
IC: 12260A-370900050

Abkürzungen:				*Abbreviations:*			
P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*	
F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*	
N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*	
N/T	=	*nicht getestet*		*N/T*	=	*not tested*	

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2403 - 2477MHz
Type of modulation	GFSK
Number of channels	25
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V_{nor}: 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: YFA370900050 / IC: 12260A-370900050

Models	Product description
370900050	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 it 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:

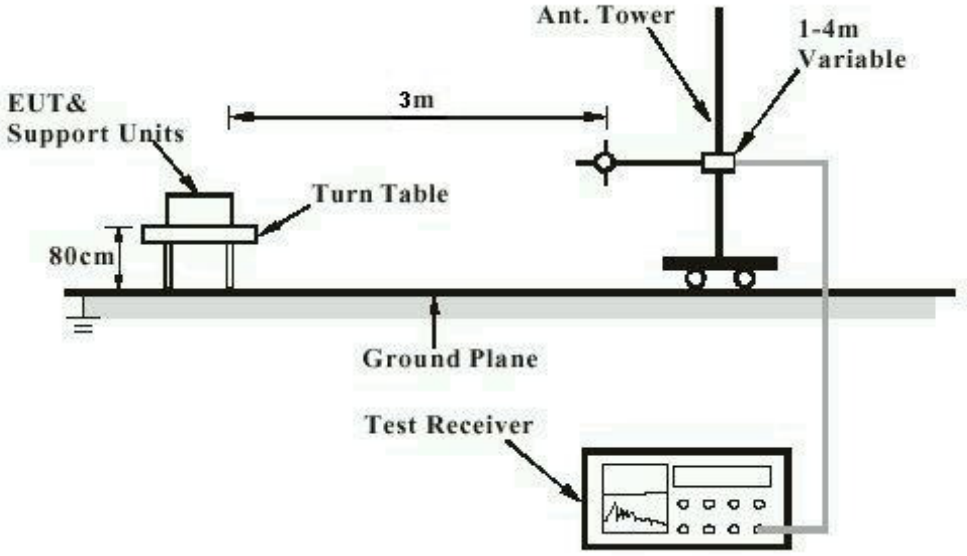
FS = R + AF + CF + FA – PA

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.

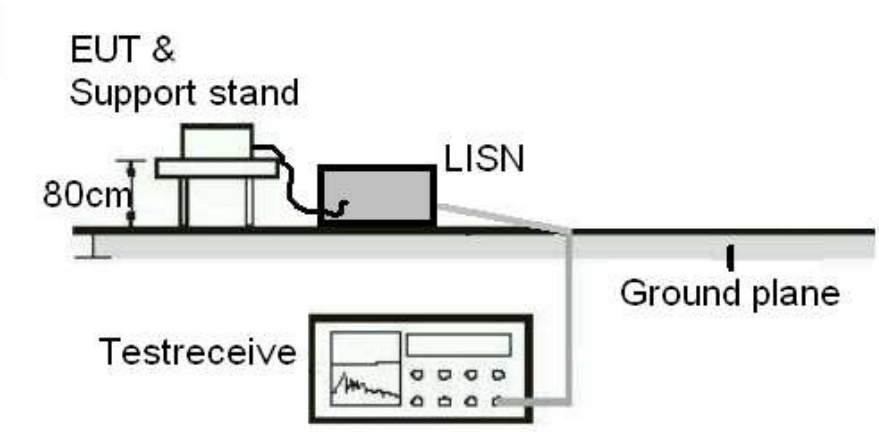
Test Setup Diagram

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 amplifer 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 ±2.42dB.

The estimated combined standard uncertainty for radiated emissions measurements is ±4.81dB (9kHz to 30MHz) and ±4.62dB (30MHz to 200MHz) and ±5.67dB (200MHz to 1000MHz) and is ±5.07dB (1GHz to 8.2GHz) and ±4.58dB (8.2GHz to 12.4GHz) and ±4.78dB (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:	0dBi
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:	0 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 AA size new battery Temperature : 23ºC 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)**
2403	2402.650	> 2400	2404.090	< 2483.5
2442	2441.720	> 2400	2442.960	< 2483.5
2477	2476.770	> 2400	2477.900	< 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 AA size new battery Temperature : 23ºC 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)**
2403	2476.770	2403.840	1.060
2442	2441.940	2442.780	0.840
2477	2477.090	2477.570	0.480

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 AA size new battery
Temperature : 23ºC
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 2403MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2403.108	76.22	114.0 / PK
2403.269	44.56	94.0 / AV

Fundamental Frequency 2403MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2403.160	78.02	114.0 / PK
2403.240	45.07	94.0 / AV

Harmonics 2403MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4806.282	59.11	74.0 / PK
4806.426	42.24	54.0 / AV

Harmonics 2403MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4806.417	58.97	74.0 / PK
4806.513	42.91	54.0 / AV

Fundamental Frequency 2442MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2442.304	80.70	114.0 / PK
2442.144	45.66	94.0 / AV

Fundamental Frequency 2442MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2442.080	77.12	114.0 / PK
2442.321	44.75	94.0 / AV
Harmonics 2442MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.213	56.52	74.0 / PK
4884.406	40.95	54.0 / AV
Harmonics 2442MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.471	55.77	74.0 / PK
4884.529	41.14	54.0 / AV
Fundamental Frequency 2477MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2477.692	80.09	114.0 / PK
2477.244	46.11	94.0 / AV
Fundamental Frequency 2477MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2477.324	75.09	114.0 / PK
2477.356	43.51	94.0 / AV
Harmonics 2477MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4954.897	58.78	74.0 / PK
4954.577	42.18	54.0 / AV
Harmonics 2477MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4954.744	56.81	74.0 / PK
4954.487	41.77	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 : 23ºC
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 2403MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2390.000	44.74	74.0 / PK
2390.000	32.94	54.0 / AV
2748.795	56.86	74.0 / PK
2748.924	45.64	54.0 / AV

Tx frequency 2403MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2390.000	46.53	74.0 / PK
2390.000	32.83	54.0 / AV
2748.910	54.40	74.0 / PK
2748.910	43.45	54.0 / AV

Tx frequency 2442MHz Vertical Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2793.548	58.04	74.0 / PK
2793.372	47.51	54.0 / AV

Tx frequency 2442MHz Horizontal Polarization

Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2793.382	56.52	74.0 / PK
2793.478	45.34	54.0 / AV

Tx frequency 2477MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2483.500	53.23	74.0 / PK
2483.500	32.73	54.0 / AV
2833.461	58.09	74.0 / PK
2833.429	46.92	54.0 / AV
Tx frequency 2477MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2483.500	46.98	74.0 / PK
2483.500	32.69	54.0 / AV
2833.526	55.75	74.0 / PK
2833.494	44.44	54.0 / AV