

Prüfbericht - Nr.: 14040871 001

Test Report No.:

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Auftraggeber: Stadlbauer Marketing + Vertrieb GmbH
Client: Rennbahn Allee1
5412 Puch, Salzburg
Austria

Gegenstand der Prüfung: Short Range Device - Radio Control Toy Transmitter (2.4GHz)
Test Item:

Bezeichnung: 401012 **Serien-Nr.:** Engineering sample
Identification: 370401012 *Serial No.:*

Wareneingangs-Nr.: A000267177-003 **Eingangsdatum:** 15.10.2015
Receipt No.: *Date of Receipt:*

Zustand des Prüfgegenstandes bei Anlieferung: Test sample(s) is/are not damaged and
Condition of test item at delivery: suitable for testing.

Prüfort: Global United Technology Services Co., Ltd.
Testing Location: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China

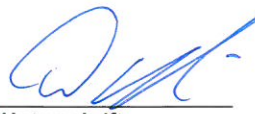
Prüfgrundlage: FCC Part 15 Subpart C
Test Specification: ANSI C63.10-2013

Prüfergebnis: Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben
Test Results: genannter Prüfgrundlage.
The above mentioned product was tested and **passed**.

Prüflaboratorium: TÜV Rheinland Hong Kong Ltd.
Testing Laboratory: 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

geprüft/ tested by:

kontrolliert/ reviewed by:

23.10.2015	Hugo Wan		23.10.2015	Sharon Li	
	Senior Project Manager			Department Manager	
Datum	Name/Stellung	Unterschrift	Datum	Name/Stellung	Unterschrift
<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>	<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>

Sonstiges: FCC ID YFA370401012
Other Aspects

Abkürzungen:	P(ass) = entspricht Prüfgrundlage	Abbreviations:	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

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.
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.

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2405 - 2475 MHz
Type of modulation	GFSK
Number of channels	6 (2405, 2411, 2433, 2460, 2465, 2475MHz)
Channel separation (MHz)	N/A
Type of antenna	Wired antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nom} : 6.0 V DC (4 x AA size batteries)

Product function and intended use

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

The client declared that the EUT consists of 2 models 401012 and 370401012 and both of them are totally identical including schematics, PCB layouts, electronic component used and housing except the model number only. Due to the equivalence of EUT, model 370401012 was provided by client for performing test.

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Label Artwork

Independent Operation Modes

The basic operation modes are:

- Radio control to the toy receiver.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The 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 mode transmitter was provided by client with following arrangement:

- 1) Fixed channel transmission was set by the specific operation of the EUT.
- 2) The following channels were tested
 - Lo: 2405MHz
 - Mid: 2433MHz
 - Hi: 2475MHz

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 emission measurement at or below 1GHz, the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For emission testing above 1GHz, the EUT was placed at the middle of 1.5m height turntable. In above two measurement, the turntable is 3 meters far from the 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.

List of Test and Measurement Instruments

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

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	--	5 Apr 2015	4 Apr 2017
Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	--	N/A	N/A
ESU EMI Test Receiver	R&S	ESU26	--	8 Jun 2015	7 Jun 2016
Loop Antenna	Zhinan	ZN30900A	--	8 Jun 2015	7 Jun 2016
Bi-log Hybrid Antenna	SCHWARZBECK	VULB9163	--	8 Mar 2015	8 Mar 2016
Double-ridged horn antenna	SCHWARZBECK	9120D	--	8 Mar 2015	8 Mar 2016
Horn Antenna	ETS-LINDGREN	3160-09	--	8 Mar 2015	8 Mar 2016
RF Amplifier	HP	8347A	--	8 Jun 2015	7 Jun 2016
RF Amplifier	HP	8349B	--	8 Jun 2015	7 Jun 2016
EMI Test Software	AUDIX	E3	--	N/A	N/A
Coaxial cable	GTS	N/A	--	8 Jun 2015	7 Jun 2016
Coaxial Cable	GTS	N/A	--	8 Jun 2015	7 Jun 2016
Thermo meter	N/A	N/A	--	8 Jun 2015	7 Jun 2016
Spectrum Analyzer	Rohde & Schwarz	FSP30	100007	13 Jan 2015	13 Jan 2017

Results FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information		Pass
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Permanent attached antenna	
Verdict:	Pass	

Subclause 15.204 – Antenna Information		Pass
Requirement:	Provide information for every antenna proposed for the use with the EUT	
Results:	a) Antenna type: Wired b) Manufacturer and model no: N/A c) Gain with reference to an isotropic radiator: 0 dBi	
Verdict:	Pass	

Subclause 15.207 – Disturbance Voltage on AC Mains		N/A
Results:	The EUT does not have AC mains input/output port and hence this test is not applicable.	

Subclause 15.205 – Restricted Bands Next to The Band Edge		Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 6.0VDC, 4x1.5V AA size new battery Temperature : 23°C Humidity : 50%		
Requirement	: Radiated emissions which fall in the restricted bans, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a).	
Results	: The emissions found in the restricted bands were below the limit. For details, please refer to Appendix 1.	

Subclause 15.215 (c) – 20 dB Bandwidth			Pass	
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.			
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Temporary antenna port RBW/VBW : 100 kHz / 300 kHz Supply voltage : 6.0VDC, 4x1.5V AA size new battery Temperature : 23°C Humidity : 50%				
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)
2405	2404.310	> 2400	2405.590	< 2483.5
2433	2432.310	> 2400	2433.590	< 2483.5
2475	2474.290	> 2400	2475.590	< 2483.5

Subclause 15.249 (a) – Radiated Emission (Fundamental and Harmonics)			Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure RBW/VBW : 120 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 6.0VDC, 4x1.5V 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			
Fundamental Frequency 2405MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2405.155	93.35	114.0 / P	
2405.155	71.76	94.0 / A	
Fundamental Frequency 2405MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2405.160	96.25	114.0 / P	
2405.160	74.87	94.0 / A	
Harmonics 2405MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4810.090	51.96	74.0 / P	
4810.090	36.24	54.0 / A	
7215.150	51.98	74.0 / P	
7215.150	33.80	54.0 / A	
Harmonics 2405MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4810.080	53.75	74.0 / P	
4810.080	35.03	54.0 / A	
Fundamental Frequency 2433MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2433.180	92.30	114.0 / P	
2433.180	71.25	94.0 / A	
Fundamental Frequency 2433MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2433.180	95.32	114.0 / P	
2433.180	73.27	94.0 / A	

Harmonics 2433MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4866.170	52.61	74.0 / P	4866.170	35.97	54.0 / A
7299.050	52.85	74.0 / P	7299.050	32.98	54.0 / A
Harmonics 2433MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4866.280	54.96	74.0 / P	4866.280	35.32	54.0 / A
Fundamental Frequency 2475MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.190	94.45	114.0 / P	2475.190	72.86	94.0 / A
Fundamental Frequency 2475MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.180	94.14	114.0 / P	2475.180	72.26	94.0 / A
Harmonics 2475MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4950.060	55.26	74.0 / P	4950.060	34.73	54.0 / A
7426.000	51.39	74.0 / P	7426.000	34.94	54.0 / A
Harmonics 2475MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4950.125	56.65	74.0 / P	4950.125	35.13	54.0 / A

Subclause 15.249 (d) – Spurious Radiated Emissions		Pass
Test Specification : ANSI C63.10 – 2013 Mode of operation : Tx mode Port of testing : Enclosure Detector : Peak RBW/VBW : 120 kHz / 300 kHz for $f < 1$ GHz 1 MHz / 3 MHz for $f > 1$ GHz Supply voltage : 6.0VDC, 4x1.5V 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 within the restricted bands. There is no spurious found between 10MHz to 30MHz, of which 16MHz is the lowest oscillating frequency in EUT.		
Tx frequency 2405MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--
Tx frequency 2405MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--
Tx frequency 2433MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--
Tx frequency 2433MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--
Tx frequency 2475MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--
Tx frequency 2475MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	--	--

Safety Human Exposure – Radio Frequency Exposure Compliance	Pass
Please refer to Appendix 5 for details.	