

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	50319955 001	Auftrags-Nr.: <i>Order No.:</i>	158122025	Seite 1 von 14 <i>Page 1 of 14</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	27.11.2019	
Auftraggeber: <i>Client:</i>	Stadlbauer Marketing + Vertrieb G.m.b.H Rennbahn Allee 1, 5412 Puch, Salzburg, Austria			
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Radio Control Toy Transmitter (2.4GHz)			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Please refer to "Models" on page 3			
Auftrags-Inhalt: <i>Order content:</i>	FCC Certification			
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C ANSI C63.10-2013			
Wareneingangsdatum: <i>Date of receipt:</i>	10.12.2019			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A001040142-004			
Prüfzeitraum: <i>Testing period:</i>	09.12.2019 – 13.12.2019			
Ort der Prüfung: <i>Place of testing:</i>	Hong Kong			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
06.01.2020	Joey Leung Project Manager		06.01.2020	Sharon Li Unit Senior 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>
Sonstiges FCC ID: YFA370410398				
<i>Other:</i>				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
				5 = mangelhaft N/T = nicht getestet
				5 = poor 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 only 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 test mark.</i>				

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2410 - 2473MHz
Type of modulation	GFSK
Number of channels	32
Type of antenna	Wire Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	3.0V, 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: YFA370410398

Models	Product description
370410398, 410398	Short Range Device - Radio Control Toy Transmitter (2.4GHz)

Submitted documents

Circuit Diagram
Block Diagram
Technical Description
User manual
Label

Independent Operation Modes

The basic operation modes 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.

Due to manufacturer declaration of equivalence, the model 370410398 was randomly selected as a representative for testing and construction photo taking.

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 test, RF channel & power was set and loaded into the RF IC by the customer. These settings shall be fixed on the firmware of the final end product.

Special Accessories and Auxiliary Equipment

- Nil.

Countermeasures to achieve EMC Compliance

- Nil.

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.

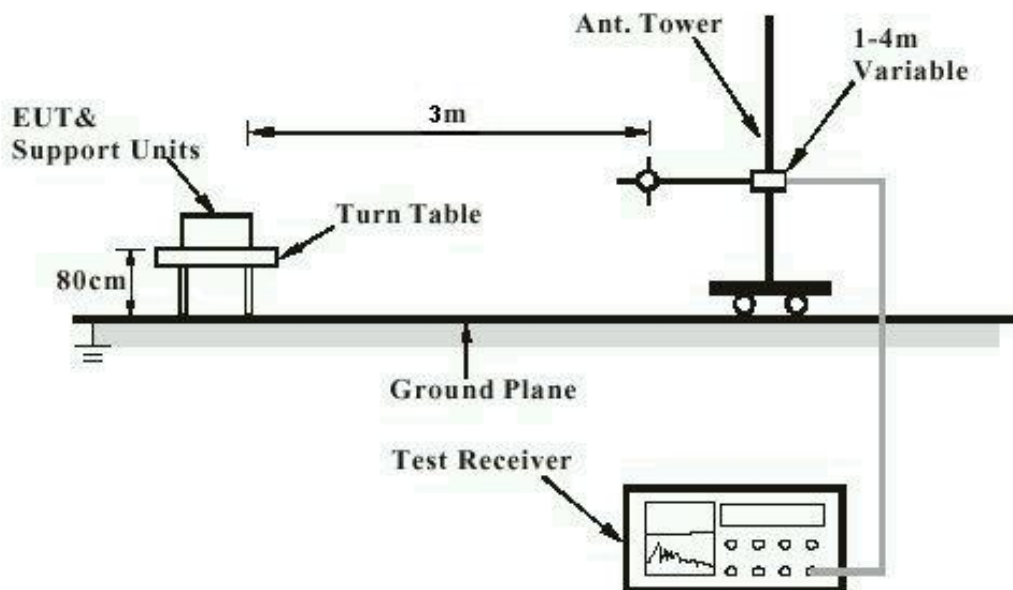
FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

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

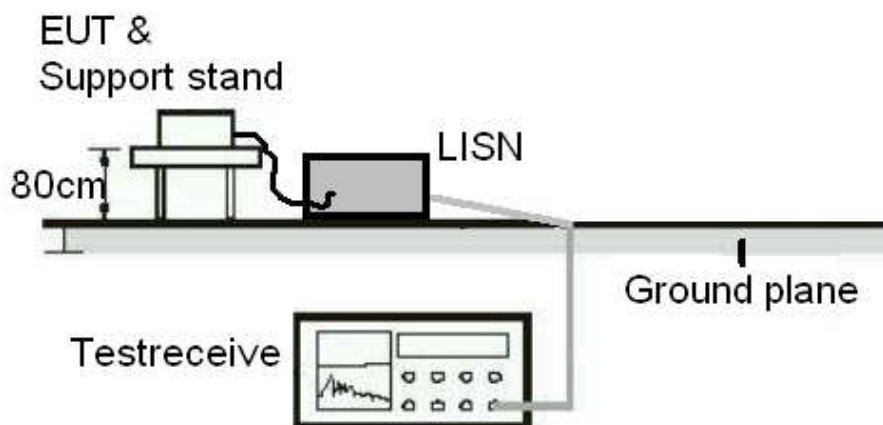
Test Setup Diagram

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)



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Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

Address: 3-4, 11/F., Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong

Tel.: +852 2192 1000

Fax: +852 2192 1001

Email service-gc@tuv.com

Web: www.tuv.com

The test facility is recognized or accredited by the following organizations:

FCC

Type	: Accredited Test Firm
Designation Number	: HK0013
Test Firm Registration Number	: 371735
Scope	: Intentional Radiators

List of Test and Measurement Instruments

Hong Kong Productivity Council

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	23 Apr 2019	23 Apr 2020
Test Receiver	R & S	ESU40	100190	21 Jun 2019	12 Jun 2020
Bi-conical Antenna	R & S	HK116	100241	21 Mar 2018	21 Mar 2020
Log Periodic Antenna	R & S	HL223	841516/017	22 Mar 2018	22 Mar 2020
Coaxial Cable	Huber+Suhner	CNM-NMCMILX800-473	A2803 #0001	04 Oct 2018	04 Oct 2020
Active Loop Antenna	EMCO	6502	9107-2651	25 Oct 2019	25 Oct 2020
Semi-anechoic Chamber (SiteVSWR)	Frankonia	Nil	Nil	16 May 2019	16 May 2020
Standard Gain Horn	ETS-Lindgren	3160-07	00205404	04 Sep 2018	04 Sep 2020
Standard Gain Horn	ETS-Lindgren	3160-08	00205636	26 Sep 2018	26 Sep 2020
Standard Gain Horn	ETS-Lindgren	3160-10	00205696	03 Oct 2018	03 Oct 2020
Double-Ridged Waveguide Horn	EMCO	3116	00109210	05 Oct 2018	05 Oct 2020
Double-Ridged Waveguide Horn	EMCO	3117	00094998	30 Aug 2018	30 Aug 2020
Microwave Preamplifier	COM-POWER Corporation	PAM-118A	551091	25 Jun 2019	25 Jun 2020
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	168	30 Jan 2019	30 Jan 2020
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	30 Oct 2019	30 Oct 2020
High Frequency Cable	Pasternack	PE3VNA4001-3M	20160707C0 2493	29 Jan 2019	29 Jan 2020

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Radio Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Spectrum Analyzer	R & S	FSP30	100610	26 Jun 2019	25 Jun 2020

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

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 wire antenna b) Manufacturer and model no: N/A c) Peak Gain: 0 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:	Pass	

FCC 15.207 – 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 Test date : 12.12.2019 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0V, 2 x 1.5V AA size 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)
2410	2409.620	> 2400	2410.940	< 2483.5
2440	2439.620	> 2400	2440.940	< 2483.5
2473	2472.640	> 2400	2473.950	< 2483.5

Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics			Pass
Test specification : ANSI C63.10 – 2013 Test date : 13.12.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0V, 2 x 1.5V AA size 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 2410MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2410.272	85.1	114.0 / PK	
2410.272	46.7	94.0 / AV	
Fundamental Frequency 2410MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2410.272	88.1	114.0 / PK	
2410.272	49.5	94.0 / AV	
Harmonics 2410MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4820.544	56.2	74.0 / PK	
4820.544	29.9	54.0 / AV	
7231.578	54.0	74.0 / PK	
7231.578	31.0	54.0 / AV	
9640.096	50.1	74.0 / PK	
9640.096	32.4	54.0 / AV	
Harmonics 2410MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4820.549	63.5	74.0 / PK	
4820.549	32.4	54.0 / AV	
7231.325	60.7	74.0 / PK	
7231.325	32.1	54.0 / AV	
9640.097	55.7	74.0 / PK	
9640.097	32.8	54.0 / AV	

Fundamental Frequency 2440MHz			Vertical Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
2440.272		81.7		114.0 / PK	
2440.272		43.6		94.0 / AV	
Fundamental Frequency 2440MHz			Horizontal Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
2440.272		87.2		114.0 / PK	
2440.272		48.7		94.0 / AV	
Harmonics 2440MHz			Vertical Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
4880.560		58.5		74.0 / PK	
4880.560		30.6		54.0 / AV	
7321.842		55.7		74.0 / PK	
7321.842		31.2		54.0 / AV	
Harmonics 2440MHz			Horizontal Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
4880.560		63.1		74.0 / PK	
4880.560		32.2		54.0 / AV	
7321.826		62.3		74.0 / PK	
7321.826		32.1		54.0 / AV	
Fundamental Frequency 2473MHz			Vertical Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
2473.044		86.4		114.0 / PK	
2473.044		46.7		94.0 / AV	
Fundamental Frequency 2473MHz			Horizontal Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
2473.285		86.6		114.0 / PK	
2473.285		47.9		94.0 / AV	
Harmonics 2473MHz			Vertical Polarization		
Freq MHz		Level dBuV/m		Limit/ Detector dBuV/m	
4946.064		58.1		74.0 / PK	
4946.064		30.2		54.0 / AV	
7420.842		55.1		74.0 / PK	
7420.842		31.2		54.0 / AV	
9894.131		48.7		74.0 / PK	
9894.131		31.6		54.0 / AV	

Harmonics 2473MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
4946.560	62.6	74.0 / PK	
4946.560	31.9	54.0 / AV	
7418.847	59.0	74.0 / PK	
7418.847	31.7	54.0 / AV	
9892.128	52.7	74.0 / PK	
9892.128	33.4	54.0 / AV	

Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission			Pass
Test specification : ANSI C63.10 – 2013 Test date : 13.12.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0V, 2 x 1.5V AA size 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 2410MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2400.000	42.9	74.0 / PK	
2400.000	22.2	54.0 / AV	
Tx frequency 2410MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2400.000	49.1	74.0 / PK	
2400.000	22.1	54.0 / AV	
Tx frequency 2440MHz		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 2440MHz		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 2473MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	43.5	74.0 / PK	
2483.500	22.0	54.0 / AV	
Tx frequency 2473MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2483.500	50.3	74.0 / PK	
2483.500	22.0	54.0 / AV	