Produkte
Products

Prüfbericht-Nr.: *Test Report No.*:	**50319931 001**	**Auftrags-Nr.:** *Order No.*:	**158122067**	**Seite 1 von 13** *Page 1 of 13*
Kunden-Referenz-Nr.: *Client Reference No.*:	**N/A**	**Auftragsdatum:** *Order date*:	**27.11.2019**	
Auftraggeber: *Client*:	**Stadlbauer Marketing + Vertrieb G.m.b.H** **Rennbahn Allee 1, 5412 Puch, Salzburg, Austria**			
Prüfgegenstand: *Test item*:	**Short Range Device - Radio Control Toy Transmitter (2.4GHz)**			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	**Please refer to "Models" on page 3**			
Auftrags-Inhalt: *Order content*:	**FCC Certification**			
Prüfgrundlage: *Test specification*:	**FCC Part 15 Subpart C** **ANSI C63.10-2013**			
Wareneingangsdatum: *Date of receipt*:	**10.12.2019**			
Prüfmuster-Nr.: *Test sample No.*:	**A001040142-001**			
Prüfzeitraum: *Testing period*:	**09.12.2019 – 13.12.2019**			
Ort der Prüfung: *Place of testing*:	**Hong Kong**			
Prüflaboratorium: *Testing laboratory*:	**TÜV Rheinland Hong Kong Ltd.**			
Prüfergebnis*: *Test result**:	**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 *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges **FCC ID: YFA370410395**
Other:

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Table of Content

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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 AAA 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: YFA370410395

Models	Product description
370410395, 410395 370410397, 410397	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 370410395 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:

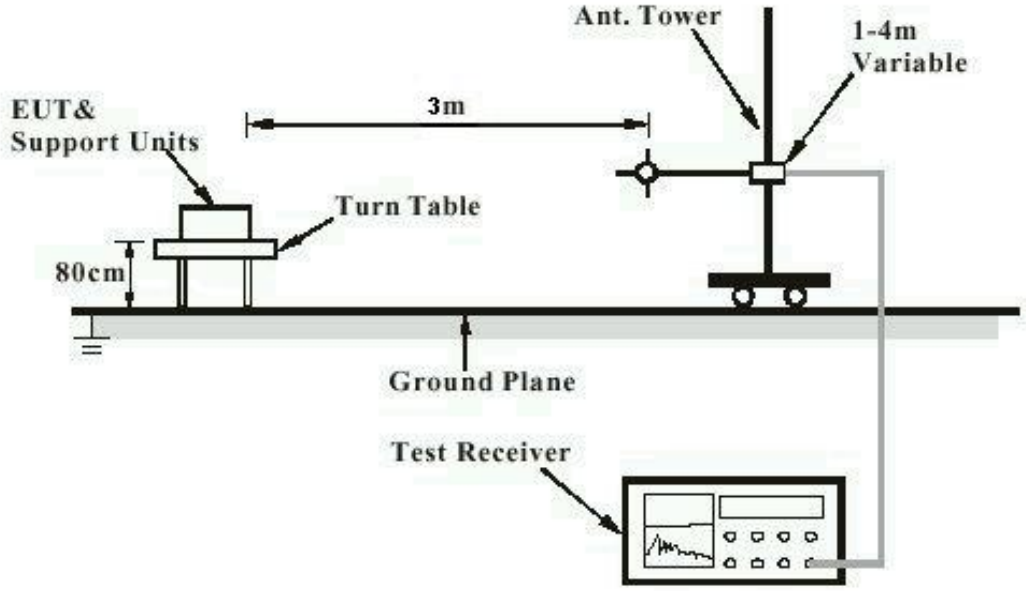
FS = R + AF + CF + FA – PA

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.

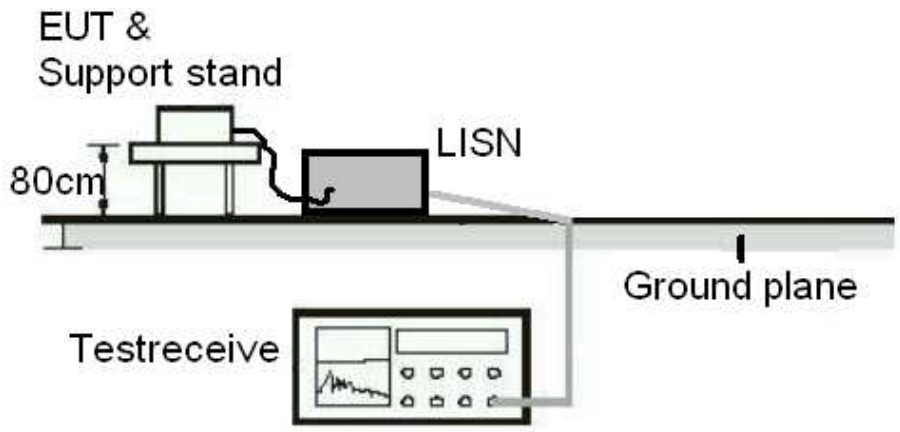
Test Setup Diagram

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)



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	20160707C02493	29 Jan 2019	29 Jan 2020

TÜV Rheinland Hong Kong Ltd

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 ±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

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: b) Manufacturer and model no: c) Peak Gain:	Fixed Integral wire antenna N/A 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 AAA size 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)**
2410	2409.200	> 2400	2410.880	< 2483.5
2442	2441.170	> 2400	2442.910	< 2483.5
2473	2472.170	> 2400	2473.940	< 2483.5

Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics		**Pass**
Test specification : ANSI C63.10 – 2013 Test date : 07.12.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0V, 2 x 1.5V AAA size 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 2410MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2410.400	87.9	114.0 / PK
2410.400	63.0	94.0 / AV
Fundamental Frequency 2410MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2410.400	87.8	114.0 / PK
2410.400	62.9	94.0 / AV
Harmonics 2410MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4819.342	57.3	74.0 / PK
4819.342	31.8	54.0 / AV
7231.217	49.1	74.0 / PK
7231.217	31.5	54.0 / AV
Harmonics 2410MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4820.801	61.3	74.0 / PK
4820.801	37.0	54.0 / AV
7231.201	50.7	74.0 / PK
7231.201	31.9	54.0 / AV
Fundamental Frequency 2442MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2442.403	87.7	114.0 / PK
2442.403	62.7	94.0 / AV

Fundamental Frequency 2442MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2442.403	87.9	114.0 / PK
2442.403	63.0	94.0 / AV
Harmonics 2442MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.807	62.9	74.0 / PK
4884.807	38.4	54.0 / AV
7327.195	51.6	74.0 / PK
7327.195	32.3	54.0 / AV
Harmonics 2442MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.807	61.9	74.0 / PK
4884.807	37.5	54.0 / AV
7327.195	49.2	74.0 / PK
7327.195	31.5	54.0 / AV
Fundamental Frequency 2473MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2473.397	87.8	114.0 / PK
2473.397	62.8	94.0 / AV
Fundamental Frequency 2473MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2473.400	87.4	114.0 / PK
2473.400	62.2	94.0 / AV
Harmonics 2473MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4946.801	60.7	74.0 / PK
4946.801	36.7	54.0 / AV
7420.217	52.3	74.0 / PK
7420.217	32.5	54.0 / AV
9893.618	53.9	74.0 / PK
9893.618	33.8	54.0 / AV
Harmonics 2473MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4946.817	59.7	74.0 / PK
4946.817	35.9	54.0 / AV
7420.217	50.8	74.0 / PK
7420.217	32.1	54.0 / AV

Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission		**Pass**
Test specification : ANSI C63.10 – 2013 Test date : 07.12.2019 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0V, 2 x 1.5V AAA size 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 2410MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2400.000	36.4	74.0 / PK
2400.000	21.1	54.0 / AV
Tx frequency 2410MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2400.000	34.1	74.0 / PK
2400.000	21.3	54.0 / AV
Tx frequency 2442MHz	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 2442MHz	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	41.7	74.0 / PK
2483.500	21.4	54.0 / AV
Tx frequency 2473MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2483.500	38.6	74.0 / PK
2483.500	21.2	54.0 / AV