Produkte
Products

Prüfbericht-Nr.: *Test Report No.*:	**CN214FW4 001**	**Auftrags-Nr.:** *Order No.*:	**158234834**	**Seite 1 von 15** *Page 1 of 15*
Kunden-Referenz-Nr.: *Client Reference No.*:	**N/A**	**Auftragsdatum:** *Order date*:	**20.07.2021**	
Auftraggeber: *Client*:	**Carrera Toys GmbH** **Rennbahn Allee 1, 5412 Puch, Salzburg, Austria**			
Prüfgegenstand: *Test item*:	**Short Range Device - Remote Control Toy Transmitter (2.4GHz)**			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	**370410523, 410523**			
Auftrags-Inhalt: *Order content*:	**FCC and ISED Certification**			
Prüfgrundlage: *Test specification*:	**FCC Part 15 Subpart C, ANSI C63.10-2013** **RSS-210 Issue 10, RSS-Gen Issue 5**			
Wareneingangsdatum: *Date of receipt*:	**06.08.2021**			
Prüfmuster-Nr.: *Test sample No.*:	**A003105415-001**			
Prüfzeitraum: *Testing period*:	**06.08.2021 – 10.08.2021**			
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*:		
12.08.2021	Felicia Chan / Assistant Engineer		12.08.2021	Sharon Li / Unit Senior Manager	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*: FCC ID: YFA370410523
IC ID: 12260A-370410523

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*

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Product information

Manufacturers declarations

	Transmitter
Operating frequency range	2410 - 2473MHz
Type of modulation	GFSK
Number of channels	64
Type of antenna	Fixed Integral wire antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	3.0 VDC

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: YFA370410523/ IC ID: 12260A-370410523

Models	Product description
370410523, 410523	Short Range Device - Remote Control Toy Transmitter (2.4GHz)

Submitted documents

Nil

Independent Operation Modes

The basic operation modes are:

- 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.

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.

- Test mode samples with maximum RF output power and duty cycle and capable to transmit continuously at the lowest, middle and highest frequency channels is provided by the applicant for the testing.

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:

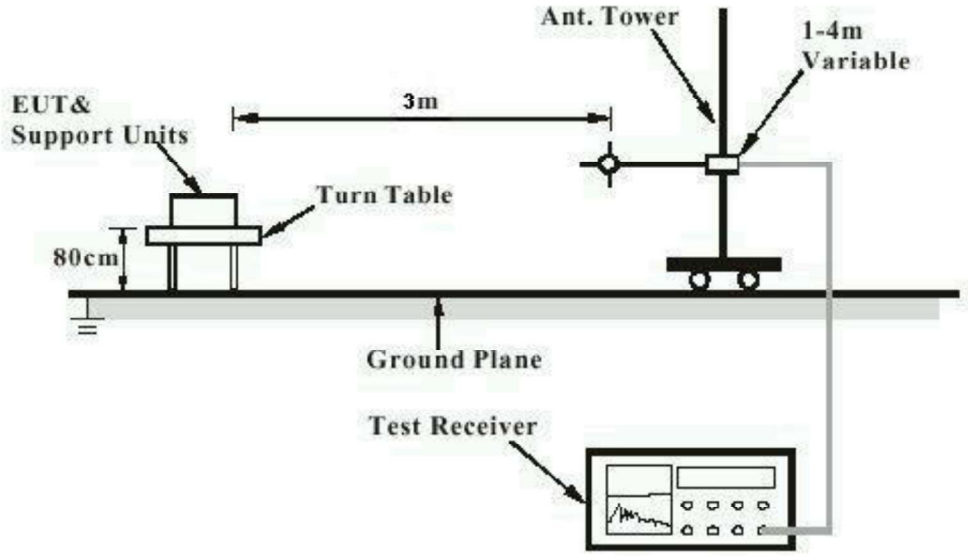
FS = R + AF + CF + FA – PA

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.

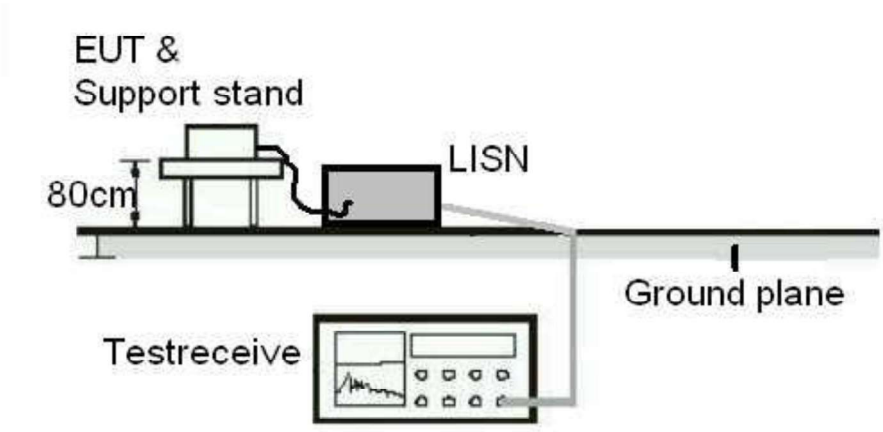
Test Setup Diagram

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)



Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.
Address: 3-4/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

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

FCC

Test Firm Registration Number : 371735

ISED/IC

Test Site Registration Number : 26152

List of Test and Measurement Instruments

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	5-Mar-21	5-Mar-22
Multi-functional Anechoic Chamber	Albatross	Nil	4-Jan-21	4-Jan-22
Test Receiver	R & S	ESU40	7-Oct-20	7-Oct-21
Active Loop Antenna	EMCO	6502	3-Nov-20	3-Nov-22
Bi-conical Antenna	R & S	HK116	15-Sep-20	15-Sep-22
Log Periodic Antenna	R & S	HL223	15-Sep-20	15-Sep-22
Standard Gain Horn	ETS-Lindgren	3160-07	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-08	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-10	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3116	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3117	11-Nov-20	11-Nov-22
Coaxial cable	Harbour	SF118/11n/11n/12000.0	3-Aug-20	3-Aug-22
High Frequency Cable	Pasternack	PE3VNA4001-3M	29-Jan-21	29-Jan-23
Microwave amplifer 0.5-26.5GHz, 25dB gain	COM-POWER Corporation	PAM-118A	5-Mar-21	5-Mar-22
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	29-Jan-21	29-Jan-22
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-19	30-Oct-21

Radio Test

Equipment	**Manufacturer**	**Type**	**Cal. Date**	**Due Date**
Signal and Spectrum Analyzer	R & S	FSV40	3-Nov-20	3-Nov-21

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 10

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	

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: b) Manufacturer c) Model no d) Gain with reference to an isotropic radiator:	Fixed Integral wire antenna N/A N/A 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
Test date : 10.08.2021
Mode of operation : Tx mode
Port of testing : Antenna port
Supply voltage : 3.0 VDC
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	2409.236	> 2400	2410.603	< 2483.5
2442	2441.349	> 2400	2442.579	< 2483.5
2473	2472.356	> 2400	2473.774	< 2483.5

RSS-Gen 6.6 – Occupied Bandwidth	**Pass**

FCC/ IC Requirement : N/A

Test Specification : RSS-Gen
Test date : 11.08.2021
Mode of operation : Tx mode
Port of testing : Antenna port
Supply voltage : 3.0 VDC
Temperature : 25ºC
Humidity : 55%

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)
2410	2409.132	2410.926	1.79
2442	2441.233	2442.883	1.65
2473	2472.233	2473.897	1.66

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

Test Specification : ANSI C63.10 – 2013
Test date : 10.08.2021
Mode of operation : Tx mode
Port of testing : Enclosure
Frequency range : 9kHz – 25GHz
Supply voltage : 3.0 VDC
Temperature : 24°C
Humidity : 52%

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
2410.008	91.8	114.0 / PK
2410.008	66.6	94.0 / AV

Fundamental Frequency 2410MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2410.403	98.0	114.0 / PK
2410.403	72.7	94.0 / AV

Harmonics 2410MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4820.785	49.4	74.0 / PK
4820.785	29.8	54.0 / AV
7231.201	61.6	74.0 / PK
7231.201	37.2	54.0 / AV

Harmonics 2410MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4820.785	57.2	74.0 / PK
4820.785	34.2	54.0 / AV
7231.201	55.0	74.0 / PK
7231.201	33.2	54.0 / AV

Fundamental Frequency 2442MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2442.035	92.6	114.0 / PK
2442.035	67.3	94.0 / AV

Fundamental Frequency 2442MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2442.304	96.8	114.0 / PK
2442.304	71.8	94.0 / AV

Harmonics 2442MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.788	53.6	74.0 / PK
4884.788	32.2	54.0 / AV
7327.205	63.0	74.0 / PK
7327.205	38.2	54.0 / AV
Harmonics 2442MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4884.080	56.5	74.0 / PK
4884.080	34.1	54.0 / AV
7327.185	60.9	74.0 / PK
7327.185	36.7	54.0 / AV
Fundamental Frequency 2473MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2473.400	91.9	114.0 / PK
2473.400	66.5	94.0 / AV
Fundamental Frequency 2473MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
2473.403	97.0	114.0 / PK
2473.403	71.5	94.0 / AV
Harmonics 2473MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4946.800	54.6	74.0 / PK
4946.800	31.3	54.0 / AV
7420.200	60.7	74.0 / PK
7420.200	36.6	54.0 / AV
Harmonics 2473MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
4946.079	56.7	74.0 / PK
4946.079	31.5	54.0 / AV
7417.845	59.6	74.0 / PK
7417.845	33.2	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
Test date : 10.08.2021
Mode of operation : Tx mode
Port of testing : Enclosure
Frequency range : 9kHz – 25GHz
Supply voltage : 3.0 VDC
Temperature : 24°C
Humidity : 55%

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	40.3	74.0 / PK
2400.000	25.9	54.0 / AV

Tx frequency 2410MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	43.7	74.0 / PK
2400.000	26.8	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	40.8	74.0 / PK
2483.500	25.9	54.0 / AV

Tx frequency 2473MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	50.0	74.0 / PK
2483.500	29.4	54.0 / AV