

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	50171842 001	Auftrags-Nr.: <i>Order No.:</i>	144185486	Seite 1 von 15 <i>Page 1 of 15</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	29.05.2018	
Auftraggeber: <i>Client:</i>	GYMWORLD INC. 2F - 4F, 210, Dosan-daero, Gandnam-gu, Seoul, Korea			
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Radio Controlled Toy (2.4GHz)			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	710013 - BRAIN EVOLUTION SET			
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>	08.06.2018			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000755387-003			
Prüfzeitraum: <i>Testing period:</i>	09.06.2018 - 24.06.2018			
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:		
02.10.2018	Joey Leung Project Manager		02.10.2018	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 <i>Other:</i>	FCC ID: 2AQMNRREMOTE			
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 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				
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	2409MHz, 2430MHz
Type of modulation	GFSK
Number of channels	2
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: 2AQMNRCREMOTE

Models	Product description
710013 - BRAIN EVOLUTION SET	Short Range Device - Radio Controlled Toy (2.4GHz)

Submitted documents

Circuit Diagram
Block Diagram
Technical Description
User manual
Label

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

This toy set is a composition of several devices, including Engine Watch, RC Remote and LED Block.

This is a single application for certification of the transmitter RC Remote.

The transmitter Engine Watch is authorized under the certification procedure (refer to test report 50151572 001 issued by TÜV Rheinland HK Ltd on 02 Oct 2018).

The Class B digital device LED Block is authorized under Supplier's Declaration of Conformity (refer to test report 50171844 001 issued by TÜV Rheinland HK Ltd on 02 Oct 2018).

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.

- 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.

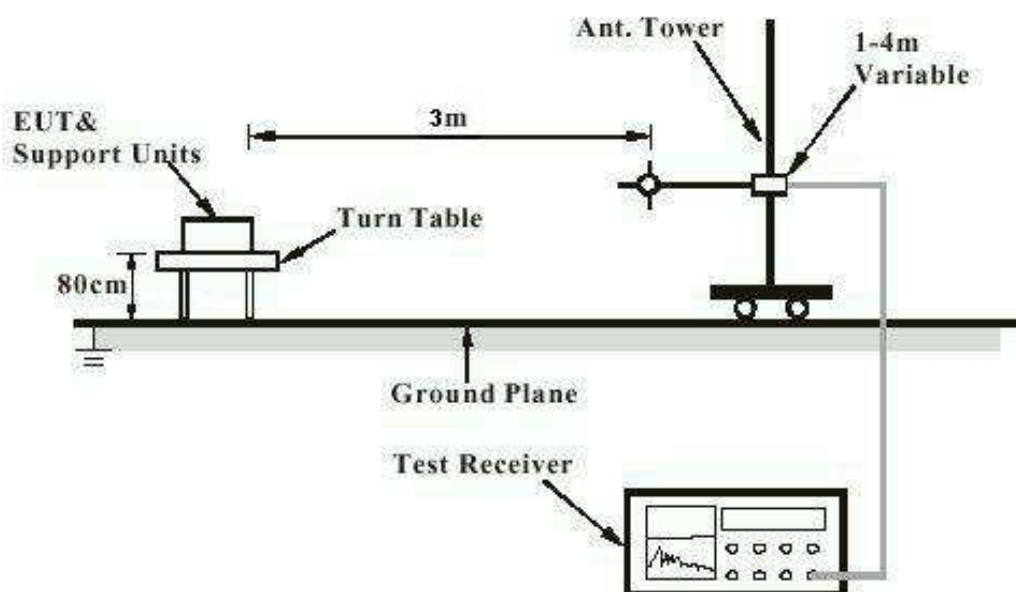
FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

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

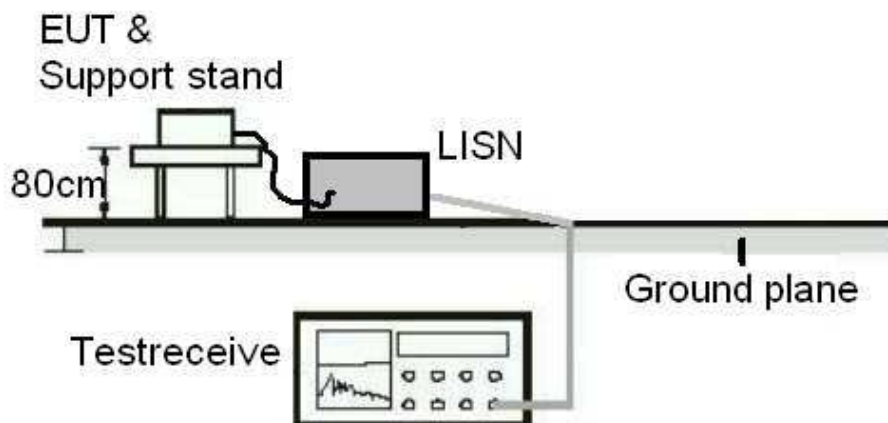
Test Setup Diagram

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

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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

Industry Canada

The 10m Semi-anechoic chamber used by TÜV Rheinland Hong Kong Ltd at Hong Kong Productivity Council has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

Test Site Registration Number : 4780A-1

List of Test and Measurement Instruments

Hong Kong Productivity Council (FCC Registration number: 90656)

Radiated Emission

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	23 Apr 2018	23 Apr 2019
Test Receiver	R & S	ESU40	100190	12 Jun 2018	12 Jun 2019
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
Cable with I-Joint Conector	Huber+Suhner	CNM-NMCMILX800-473	A2803 #0001	11 Dec 2017	11 Dec 2019
Active Loop Antenna	EMCO	6502	9107-2651	30 Oct 2017	30 Oct 2018
Semi-anechoic Chamber (SiteVSWR)	Frankonia	Nil	Nil	17 May 2018	17 May 2019
Double-Ridged Waveguide Horn	EMCO	3116	00109210	11 Oct 2016	10 Oct 2018
Double-Ridged Waveguide Horn	EMCO	3117	00094998	30 Aug 2018	29 Aug 2020
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	18 Jul 2018	17 Jul 2020
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	168	29 Jan 2018	29 Jan 2019
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	30 Oct 2017	30 Oct 2019
High Frequency Cable	Pasternack	PE3VNA4001-3M	20160707C0 2493	29 Jan 2018	29 Jan 2019
Horn Antenna	EMCO	3115	9002-3347	28 Mar 2018	28 Mar 2020

TÜV Rheinland Hong Kong Ltd

Radio Test

Equipment	Manufacturer	Type	S/N	Cal. Date	Cal. Due Date
Spectrum Analyzer	R & S	FSP30	100610	03 May 2018	02 May 2019

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: N/A	
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	

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 : 24.06.2018 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)
2409	2408.550	> 2400	2409.740	< 2483.5
2430	2429.560	> 2400	2430.780	< 2483.5

Subclause 15.249 (a) – Field Strength of Fundamental and Harmonics		Pass
Test specification : ANSI C63.10 – 2013 Test date : 12.06.2018 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 2409MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2408.798	91.8	114.0 / PK
2408.798	78.2	94.0 / AV
Fundamental Frequency 2409MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2408.798	90.0	114.0 / PK
2408.798	76.3	94.0 / AV
Harmonics 2409MHz		Vertical Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4817.596	65.2	74.0 / PK
4817.596	51.6	54.0 / AV
7226.394	67.8	74.0 / PK
7226.394	53.6	54.0 / AV
Harmonics 2409MHz		Horizontal Polarization
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4817.596	64.4	74.0 / PK
4817.596	50.6	54.0 / AV
7226.394	67.8	74.0 / PK
7226.394	50.7	54.0 / AV

Fundamental Frequency 2430MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2429.798	93.4	114.0 / PK	2429.798	70.0	94.0 / AV
2429.798	70.0	94.0 / AV			
Fundamental Frequency 2430MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2429.794	95.7	114.0 / PK	2429.794	73.9	94.0 / AV
2429.794	73.9	94.0 / AV			
Harmonics 2430MHz			Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4859.598	62.1	74.0 / PK	4859.598	40.6	54.0 / AV
4859.598	40.6	54.0 / AV	7289.397	64.9	74.0 / PK
7289.397	64.9	74.0 / PK	7289.397	47.1	54.0 / AV
7289.397	47.1	54.0 / AV			
Harmonics 2430MHz			Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4859.597	65.3	74.0 / PK	4859.597	45.3	54.0 / AV
4859.597	45.3	54.0 / AV	7289.397	68.4	74.0 / PK
7289.397	68.4	74.0 / PK	7289.397	49.1	54.0 / AV
7289.397	49.1	54.0 / AV			

Subclause 15.249 (d), 15.205 – Out Of Band Radiated Emission		Pass
Test specification : ANSI C63.10 – 2013 Test date : 12.06.2018 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 2409MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	48.9	74.0 / PK
2400.000	36.2	54.0 / AV
Tx frequency 2409MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	45.6	74.0 / PK
2400.000	32.1	54.0 / AV
Tx frequency 2458MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	46.2	74.0 / PK
2483.500	32.5	54.0 / AV
Tx frequency 2458MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	45.8	74.0 / PK
2483.500	32.2	54.0 / AV