

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	CN22GXA1 001	Auftrags-Nr.: <i>Order No.:</i>	158254798	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>	27.06.2022		
Auftraggeber: <i>Client:</i>	REVELL GMBH 32257 BUENDE, GERMANY				
Prüfgegenstand: <i>Test item:</i>	Short Range Device - Remote Control Toy Transmitter (2.4GHz)				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	246665010				
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>	27.06.2022				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003287553-001				
Prüfzeitraum: <i>Testing period:</i>	27.06.2022 - 05.07.2022				
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:			
					
15.07.2022	Felicia Chan / Senior Engineer	15.07.2022	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>	Unterschrift <i>Signature</i>
Sonstiges / Other: FCC ID: 2A7EW246665010					
“Decision Rule” document announced in our website (https://www.tuv.com/landingpage/en/qm-gcn/) describes the statement of conformity and its rule of enforcement for test results are applicable throughout this test report.					
Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt <i>Condition of the test item at delivery:</i> 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					
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	2408 - 2475MHz
Type of modulation	GFSK
Number of channels	68
Antenna gain	0 dBi
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: 2A7EW246665010

Models	Product description
246665010	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

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:

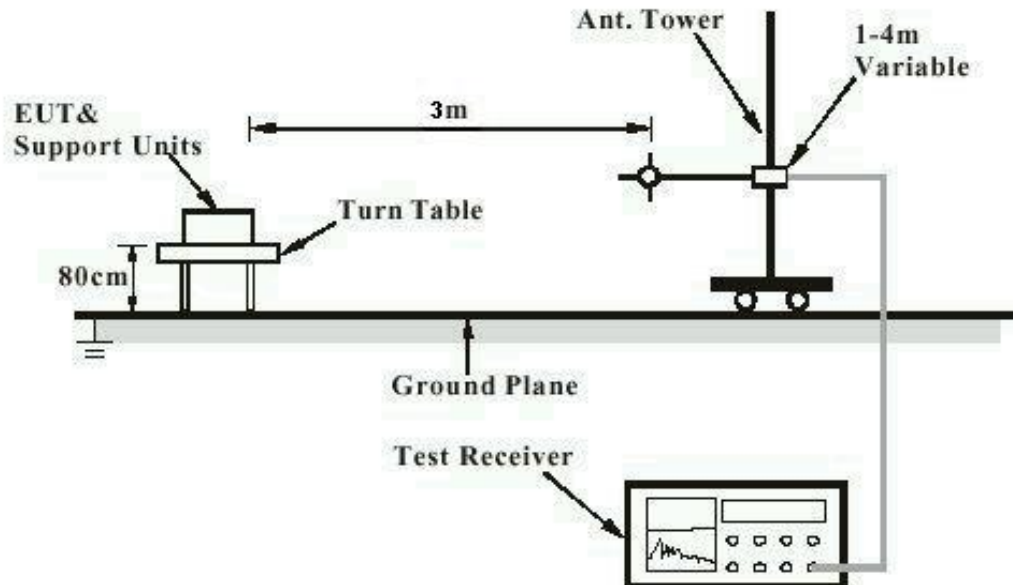
$$FS = R + AF + CF + FA - PA$$

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.

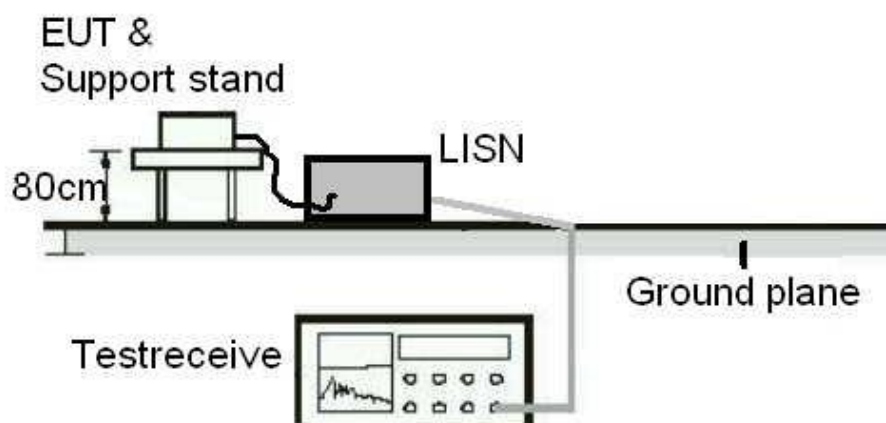
Test Setup Diagram

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

List of Test and Measurement Instruments

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	4-Mar-22	4-Mar-23
Multi-functional Anechoic Chamber	Albatross	Nil	4-Jan-22	4-Jan-23
Test Receiver	R & S	ESU40	13-Jan-22	13-Jan-23
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 amplifier 0.5-26.5GHz, 25dB gain	COM-POWER Corporation	PAM-118A	4-Mar-22	4-Mar-23
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	28-Jan-22	28-Jan-23
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-21	30-Oct-23

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Spectrum Analyzer	R & S	FSP30	9-Nov-21	9-Nov-22

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 / 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: 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 : 27.06.2022 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 3.0 VDC 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)
2408	2407.680	> 2400	2409.130	< 2483.5
2442	2441.680	> 2400	2443.150	< 2483.5
2475	2474.780	> 2400	2476.270	< 2483.5

Subclause 15.249(a) – Field Strength of Fundamental and Harmonics		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 05.07.2022 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 2408MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2408.097	90.0	114.0 / PK
2408.097	75.3	94.0 / AV
Fundamental Frequency 2408MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2408.097	84.6	114.0 / PK
2408.097	69.9	94.0 / AV
Harmonics 2408MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4816.194	48.8	74.0 / PK
4816.194	33.6	54.0 / AV
7224.290	52.1	74.0 / PK
7224.290	35.8	54.0 / AV
Harmonics 2408MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4816.192	50.5	74.0 / PK
4816.192	35.6	54.0 / AV
7224.290	50.6	74.0 / PK
7224.290	34.5	54.0 / AV
Fundamental Frequency 2442MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2442.100	91.0	114.0 / PK
2442.100	76.3	94.0 / AV
Fundamental Frequency 2442MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2442.102	85.1	114.0 / PK
2442.102	70.3	94.0 / AV

Harmonics 2442MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4884.201	49.9	74.0 / PK
4884.201	34.3	54.0 / AV
7326.302	51.9	74.0 / PK
7326.302	35.0	54.0 / AV
Harmonics 2442MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4884.700	48.7	74.0 / PK
4884.700	36.2	54.0 / AV
7326.304	55.0	74.0 / PK
7326.304	38.4	54.0 / AV
Fundamental Frequency 2475MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.107	90.3	114.0 / PK
2475.107	75.5	94.0 / AV
Fundamental Frequency 2475MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.107	86.2	114.0 / PK
2475.107	71.5	94.0 / AV
Harmonics 2475MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4950.211	50.1	74.0 / PK
4950.211	34.1	54.0 / AV
7425.318	55.0	74.0 / PK
7425.318	38.3	54.0 / AV
Harmonics 2475MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4950.214	51.6	74.0 / PK
4950.214	36.3	54.0 / AV
7425.321	52.7	74.0 / PK
7425.321	36.4	54.0 / AV

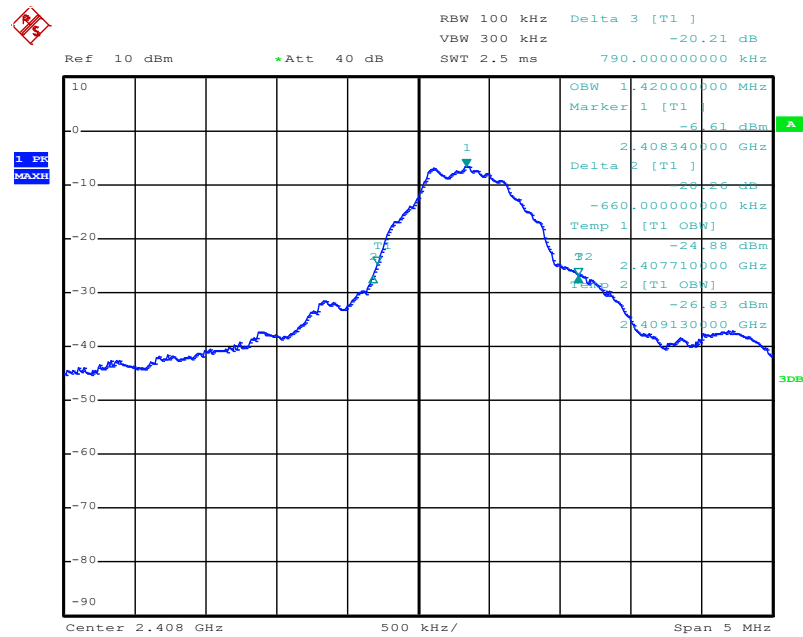
Subclause 15.249(d),15.205 – Out Of Band Radiated Emission		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 05.07.2022 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0 VDC Temperature : 24°C Humidity : 55%		
Requirement:	Emissions radiated 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 2408MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	50.8	74.0 / PK
2400.000	22.2	54.0 / AV
Tx frequency 2408MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	51.0	74.0 / PK
2400.000	22.2	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 2475MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	51.2	74.0 / PK
2483.500	22.4	54.0 / AV
Tx frequency 2475MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	46.3	74.0 / PK
2483.500	22.1	54.0 / AV

Appendix 1

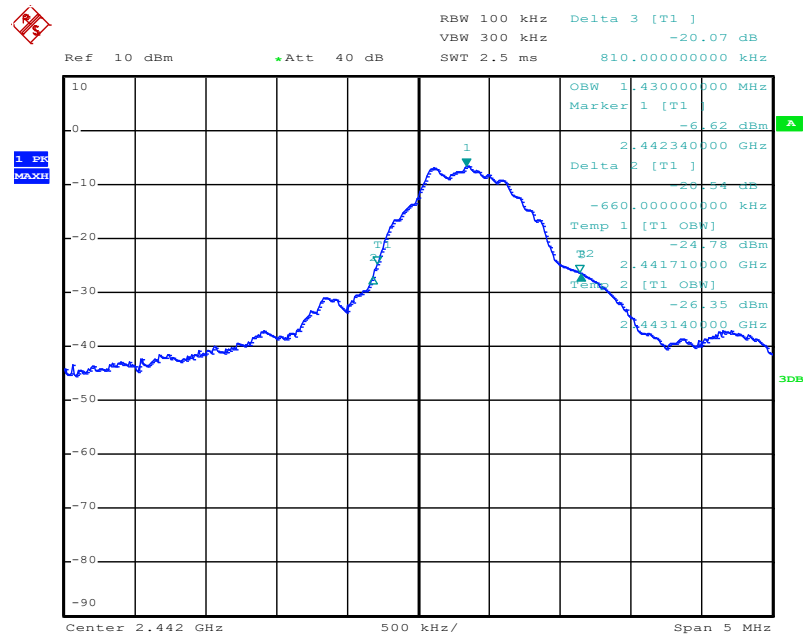
Test Results

20dB Bandwidth

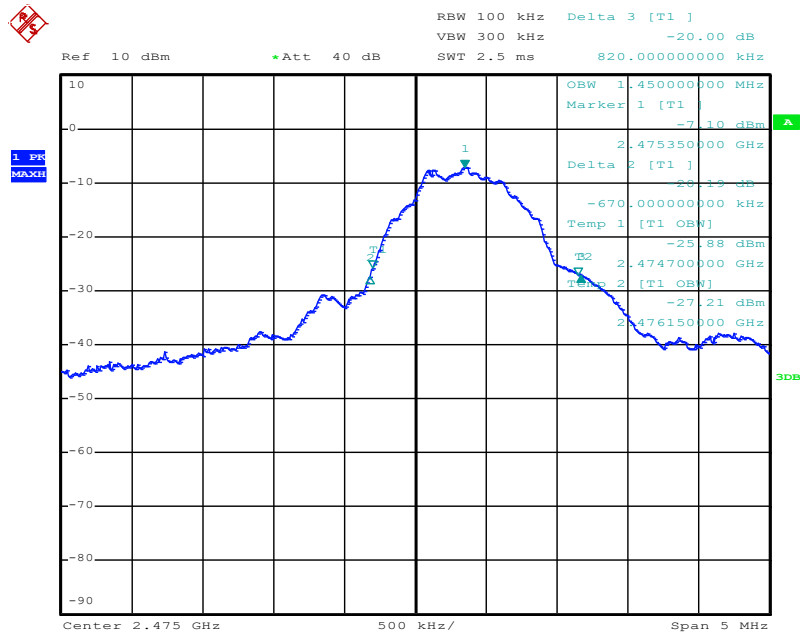
Tx frequency: 2408MHz



Tx frequency: 2442MHz

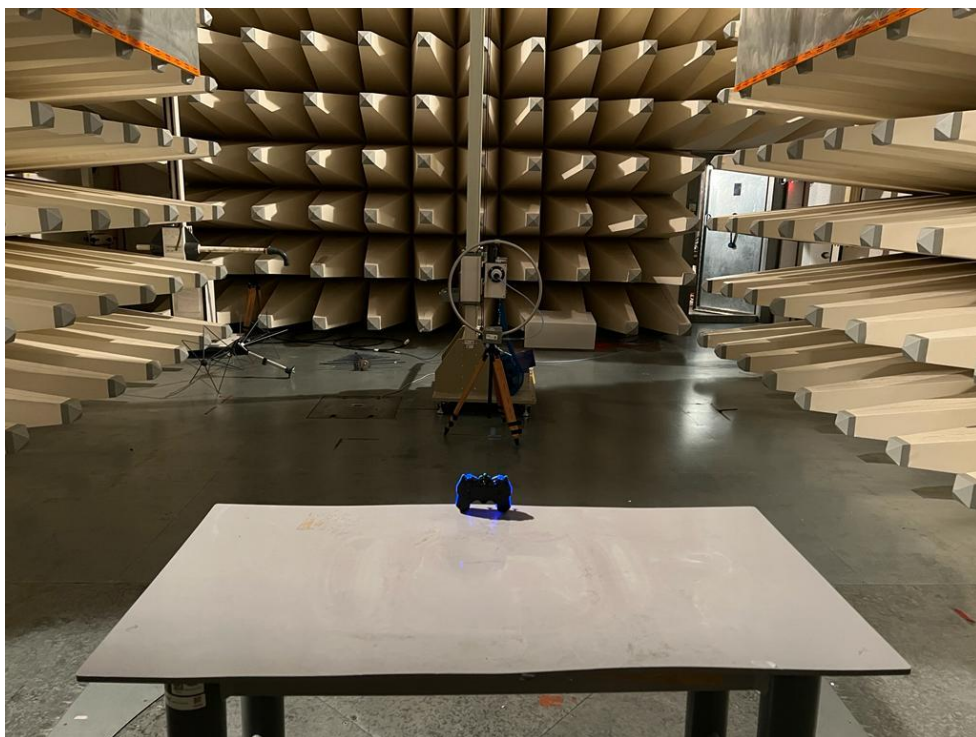


Tx frequency: 2475MHz

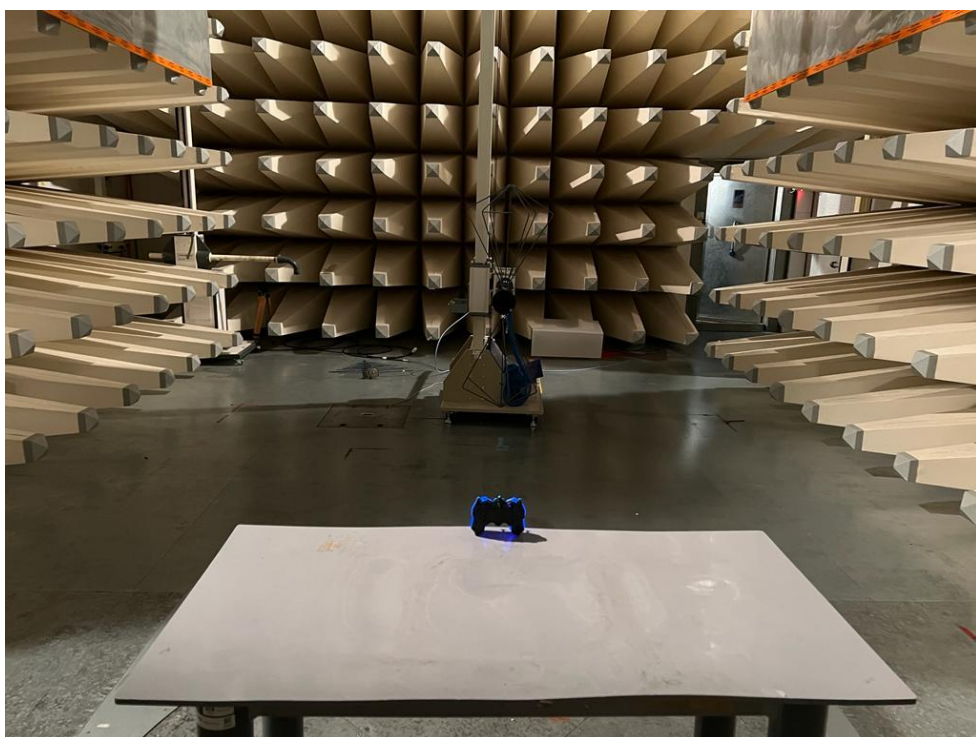


Appendix 2

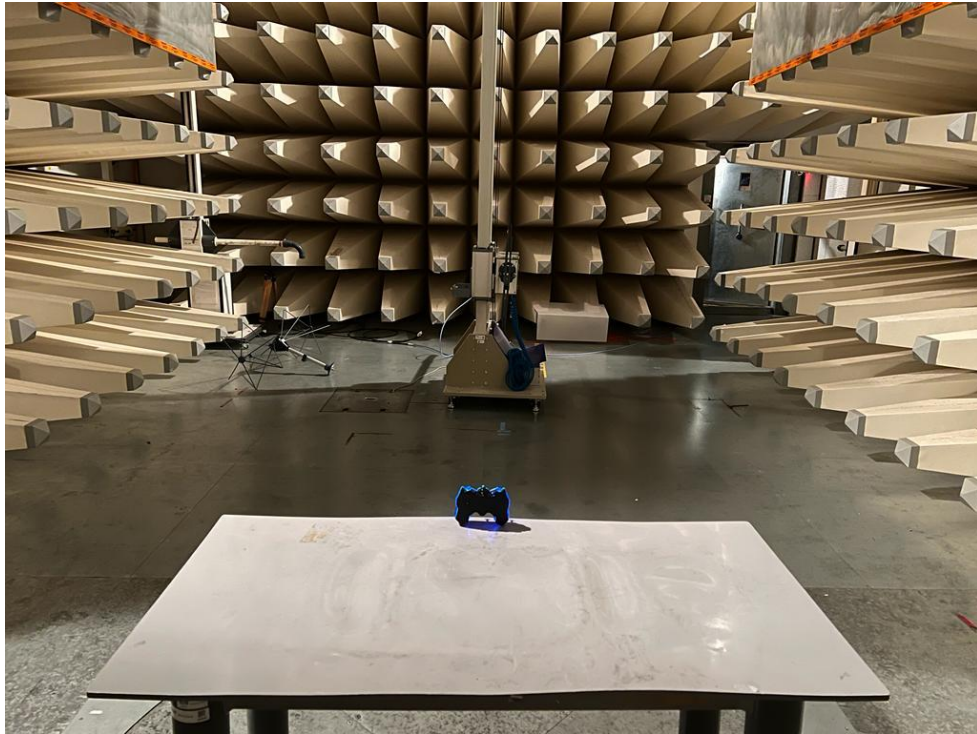
Test Setup Photos



Set-up for Radiated Emission (9k-30MHz)



Set-up for Radiated Emission (30-200MHz)



Set-up for Radiated Emission (200-1000MHz)



Set-up for Radiated Emission (1GHz above)

Appendix 3

EUT External Photos

FCC ID: 2A7EW246665010



External View



External View

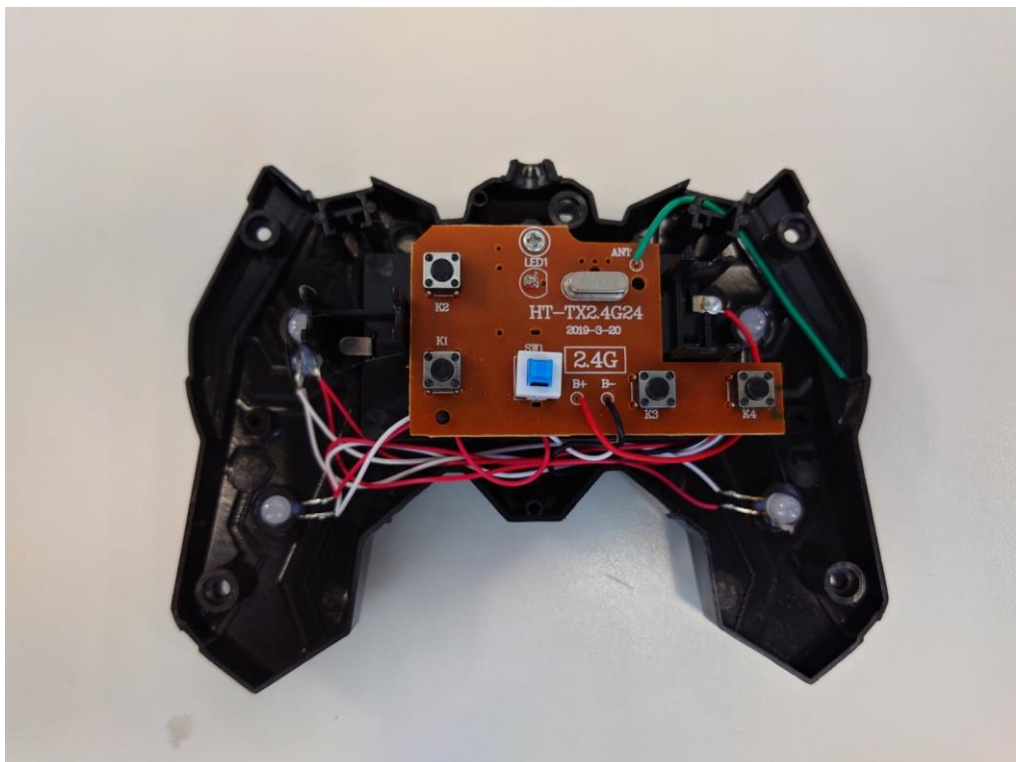
Appendix 4

EUT Internal Photos

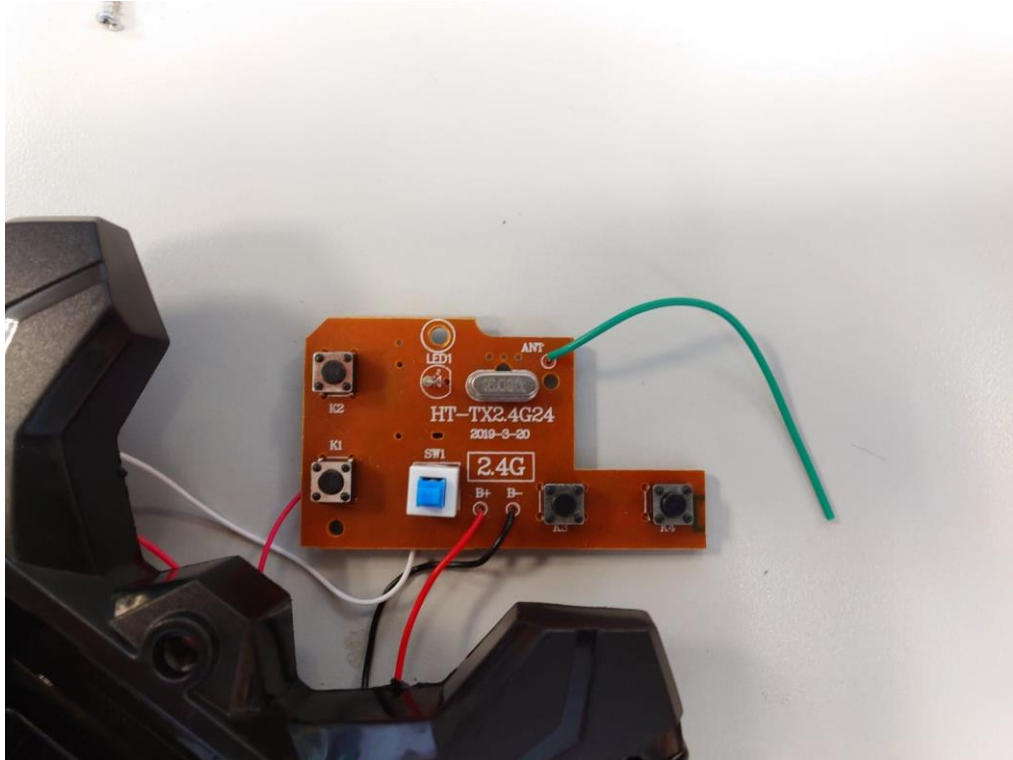
FCC ID: 2A7EW246665010



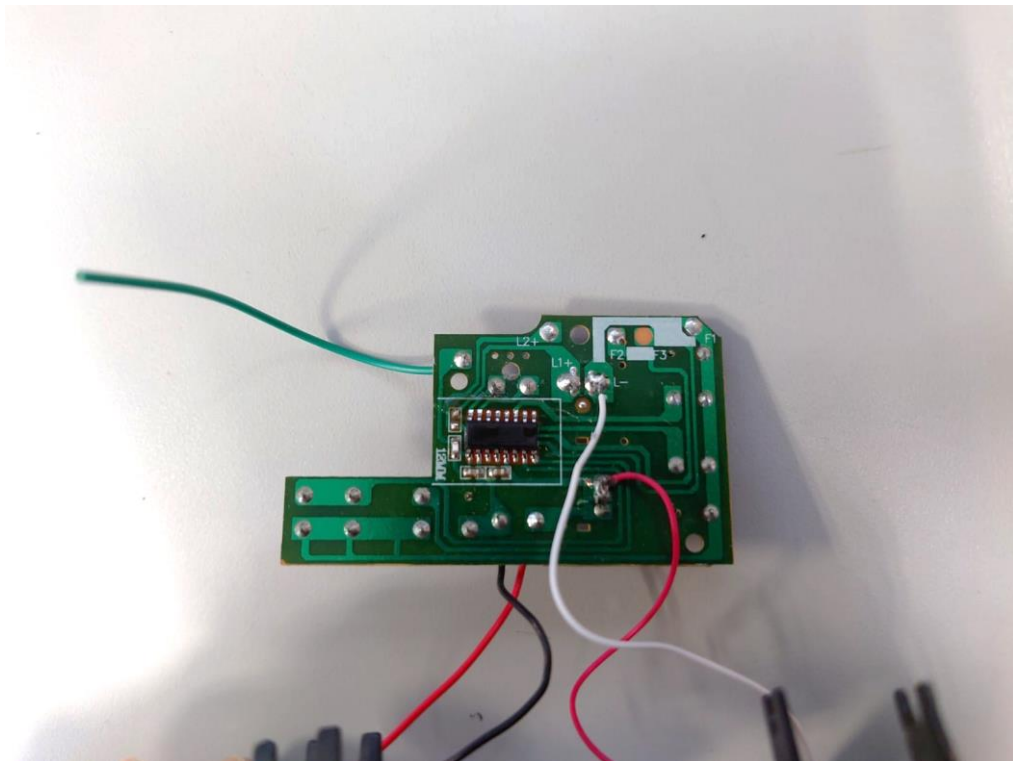
Internal View



Internal View



Internal View



Internal View

Appendix 5

RF Exposure Information

FCC ID: 2A7EW246665010

Maximum transmitter power:

Frequency (MHz)	Maximum peak output power (dBm)	Maximum peak output power (mW)	Maximum peak field strength (dBuV/m)
2408	-5.23	0.300	90.0
2442	-4.23	0.377	91.0
2475	-4.93	0.321	90.3

Note: The maximum peak field strength was taken from table of “Subclause 15.249(a) – Field Strength of Fundamental and Harmonics”.

For FCC

According to KDB 447498 D01:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

Result:

$$(0.300/5) \cdot \sqrt{2.408} = 0.093 < 3.0$$

$$(0.377/5) \cdot \sqrt{2.442} = 0.117 < 3.0$$

$$(0.321/5) \cdot \sqrt{2.475} = 0.101 < 3.0$$

Conclusion:

No SAR is required.