

Prüfbericht-Nr.: <i>Test Report No.:</i>	60373718 001	Auftrags-Nr.: <i>Order No.:</i>	158208366	Seite 1 von 17 <i>Page 1 of 17</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	28.04.2020		
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>	370410510				
Auftrags-Inhalt: <i>Order content:</i>	FCC Test				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C, ANSI C63.10-2013 RSS-210 Issue 10, RSS Gen-Issue 5				
Wareneingangsdatum: <i>Date of receipt:</i>	28.04.2020				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A002824464-001				
Prüfzeitraum: <i>Testing period:</i>	12.05.2020 - 04.06.2020				
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:			
28.07.2020	Mika Chan / Project Manager	28.07.2020	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>	Unterschrift <i>Signature</i>
Sonstiges / Other:		FCC ID: YFA370410510 IC: 12260A-370410510			
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	2446 - 2474MHz
Type of modulation	GFSK
Number of channels	8
Type of antenna	Integral Antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	V _{nom} : 3.0 V

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: YFA370410510/ IC: 12260A-370410510

Models	Product description
370410510	Short Range Device - Radio Control Toy Transmitter (2.4GHz)

Submitted documents

User manual

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.
- Normal operation 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.

- During test, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

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:

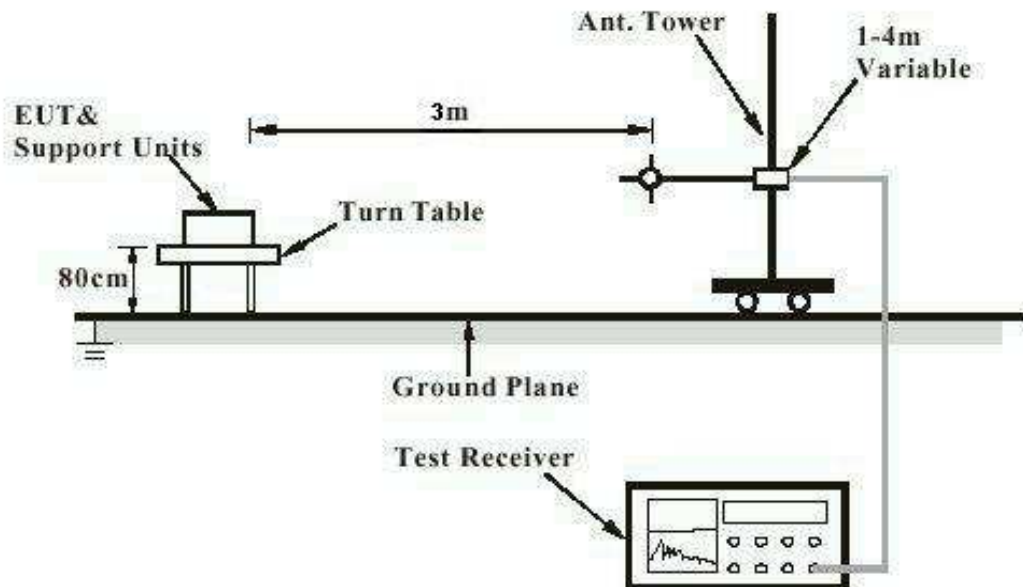
$$FS = R + AF + CF + FA - PA$$

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)

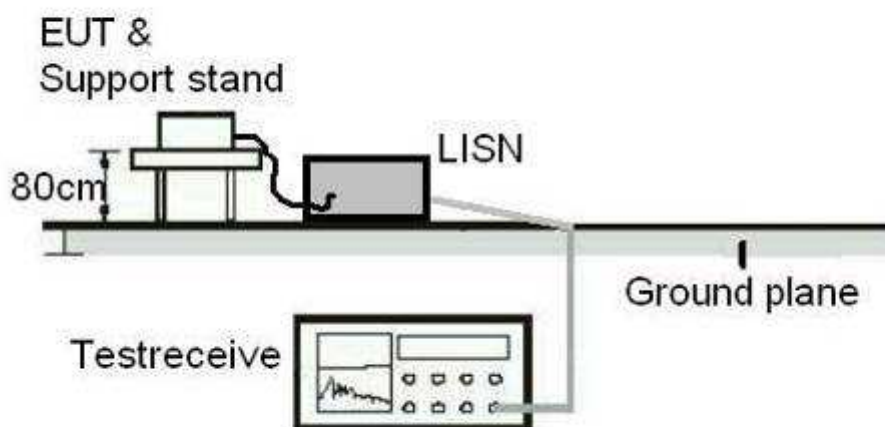
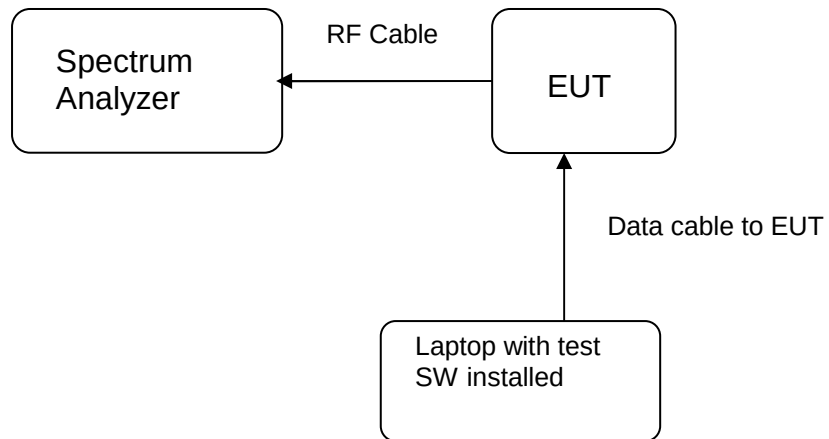


Diagram of Equipment Configuration for Antenna-port Conducted Measurement (if applicable)

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

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

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	20 Mar 2020	20 Mar 2021
Test Receiver	R & S	ESU26	21 Jun 2019	21 Jun 2020
Bi-conical Antenna	R & S	HK116	07 Mar 2019	07 Mar 2021
Log Periodic Antenna	R & S	HL223	06 Mar 2019	06 Mar 2021
Standard Gain Horn	ETS-Lindgren	3160-07	04 Sep 2018	04 Sep 2020
Standard Gain Horn	ETS-Lindgren	3160-08	26 Sep 2018	26 Sep 2020
Standard Gain Horn	ETS-Lindgren	3160-10	03 Oct 2018	03 Oct 2020
Double-Ridged Waveguide Horn	EMCO	3116	05 Oct 2018	05 Oct 2020
Double-Ridged Waveguide Horn	EMCO	3117	30 Aug 2018	30 Aug 2020
Coaxial cable	Huber+Suhner	CNM-NMCMILX800-473	04 Oct 2018	04 Oct 2020
High Frequency Cable	Pasternack	PE3VNA4001-3M	29 Jan 2019	29 Jan 2021
Microwave Preamplifier	COM-POWER Corporation	PAM-118A	25 Jun 2019	25 Jun 2020
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	30 Jan 2019	30 Jan 2021
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30 Oct 2019	30 Oct 2021

Radio Test

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

Measurement Uncertainty

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 estimated combined standard uncertainty for antenna conducted emission is $\pm 2.1\text{dB}$

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 9

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

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: Fixed Integral wire antenna b) Manufacturer: N/A c) model no: N/A d) Gain with reference to an isotropic radiator: 0 dBi	
Verdict:	Pass	

Subclause 15.215 (c) – 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Test date : 04.06.2020 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0VDC 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)
2446	2443.84	> 2400	2447.38	< 2483.5
2458	2456.64	> 2400	2459.26	< 2483.5
2474	2473.24	> 2400	2474.70	< 2483.5

RSS-Gen 6.6 – Occupied Bandwidth				Pass
FCC/ IC Requirement : N/A				
Test Specification : RSS-Gen Test date : 04.06.2020 Mode of operation : Tx mode Port of testing : Temporary antenna port Supply voltage : 3.0VDC Temperature : 23°C Humidity : 50%				
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)	
2446	2443.98	2447.34	3.36	
2458	2456.70	2459.16	2.46	
2474	2473.28	2474.64	1.36	

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

Test Specification : ANSI C63.10 – 2013
 Test date : 20.05.2020
 Mode of operation : Tx mode
 Port of testing : Enclosure
 Frequency range : 9kHz – 25GHz
 Supply voltage : 3.0VDC
 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 2446MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2446.000	94.2	114.0 / PK
2446.000	81.5	94.0 / AV

Fundamental Frequency 2446MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2446.000	91.0	114.0 / PK
2446.000	79.5	94.0 / AV

Harmonics 2446MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4892.075	53.2	74.0 / PK
4892.075	40.0	54.0 / AV
7338.112	50.3	74.0 / PK
7338.112	34.0	54.0 / AV
9784.144	48.7	74.0 / PK
9784.144	30.6	54.0 / AV

Harmonics 2446MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4892.080	54.8	74.0 / PK
4892.080	41.7	54.0 / AV
7338.120	51.9	74.0 / PK
7338.120	37.2	54.0 / AV

Fundamental Frequency 2458MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2458.000	92.7	114.0 / PK
2458.000	81.2	94.0 / AV

Fundamental Frequency 2458MHz Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
-------------	-----------------	---------------------------

2458.040	92.1	114.0 / PK
2458.040	80.6	94.0 / AV
Harmonics 2458MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4916.080	52.0	74.0 / PK
4916.080	38.0	54.0 / AV
7374.120	53.1	74.0 / PK
7374.120	39.1	54.0 / AV
Harmonics 2458MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4916.080	55.8	74.0 / PK
4916.080	42.9	54.0 / AV
7374.112	49.8	74.0 / PK
7374.112	34.0	54.0 / AV
Fundamental Frequency 2474MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2474.036	91.4	114.0 / PK
2474.036	79.9	94.0 / AV
Fundamental Frequency 2474MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2474.032	91.0	114.0 / PK
2474.032	79.6	94.0 / AV
Harmonics 2474MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4948.075	51.1	74.0 / PK
4948.075	37.3	54.0 / AV
7422.112	51.7	74.0 / PK
7422.112	37.2	54.0 / AV
Harmonics 2474MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4948.076	57.1	74.0 / PK
4948.076	44.3	54.0 / AV
7422.115	48.4	74.0 / PK
7422.115	31.4	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 : 21.04.2020 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.0VDC 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 2446MHz		Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2390.000	36.7	74.0 / PK	
2390.000	21.1	54.0 / AV	
2400.000	34.3	74.0 / PK	
2400.000	20.9	54.0 / AV	
Tx frequency 2446MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
2390.000	36.3	74.0 / PK	
2390.000	21.1	54.0 / AV	
2400.000	33.5	74.0 / PK	
2400.000	21.0	54.0 / AV	
Tx frequency 2458MHz		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 2458MHz		Horizontal Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m	
No Peak Found	---	74.0 / PK	
No Peak Found	---	54.0 / AV	

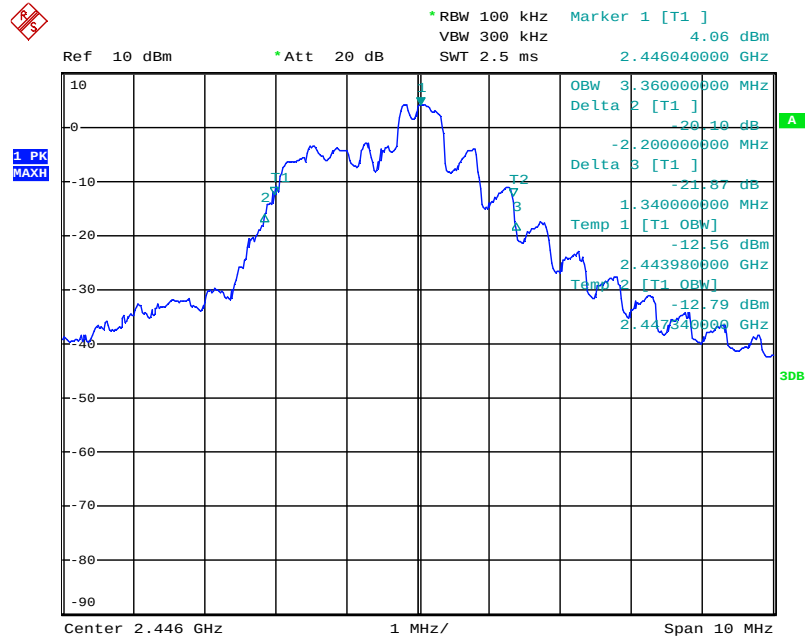
Tx frequency 2474MHz			Vertical Polarization		
Freq MHz		Level dBuV/m	Limit/ Detector dBuV/m		
2483.500		36.6	74.0 / PK		
2483.500		24.0	54.0 / AV		
Tx frequency 2474MHz			Horizontal Polarization		
Freq MHz		Level dBuV/m	Limit/ Detector dBuV/m		
2483.500		34.8	74.0 / PK		
2483.500		21.2	54.0 / AV		

Appendix 1

Test Results

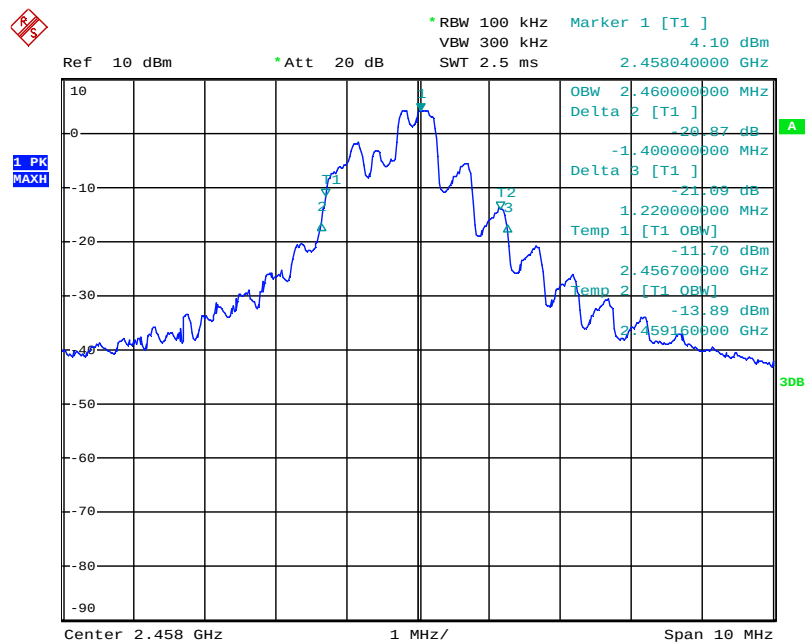
20dB Bandwidth

Tx frequency: 2446MHz



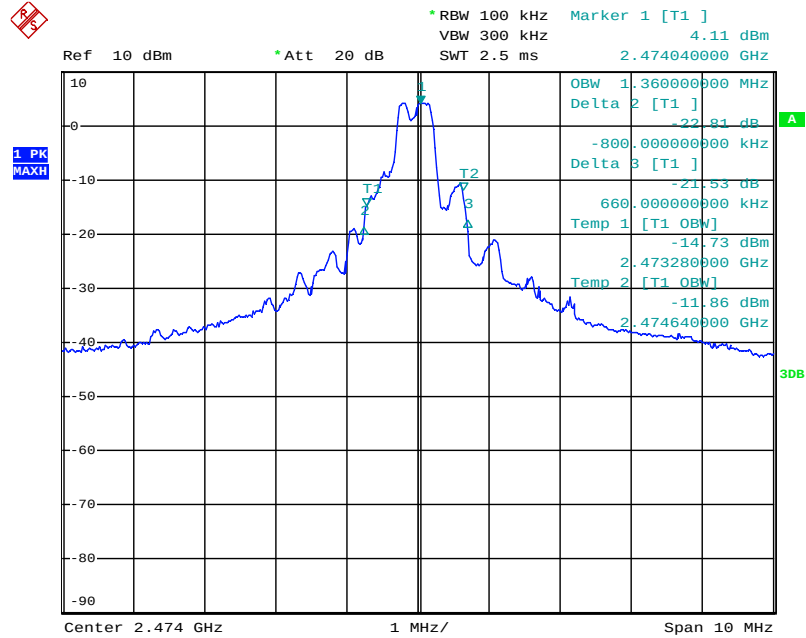
Date: 4.JUN.2020 01:51:07

Tx frequency: 2458MHz



Date: 4.JUN.2020 02:00:10

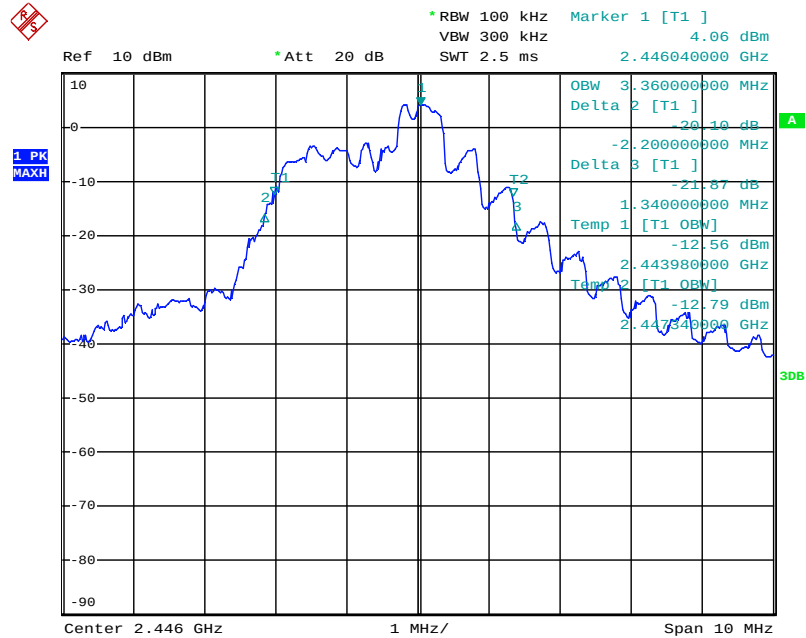
Tx frequency: 2474MHz



Date: 4.JUN.2020 02:04:22

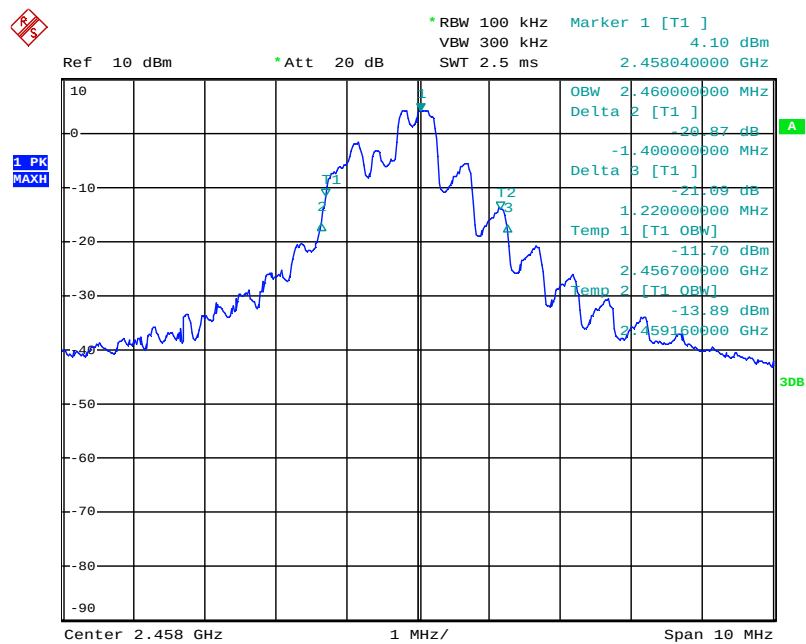
99% Bandwidth

Tx frequency: 2446MHz



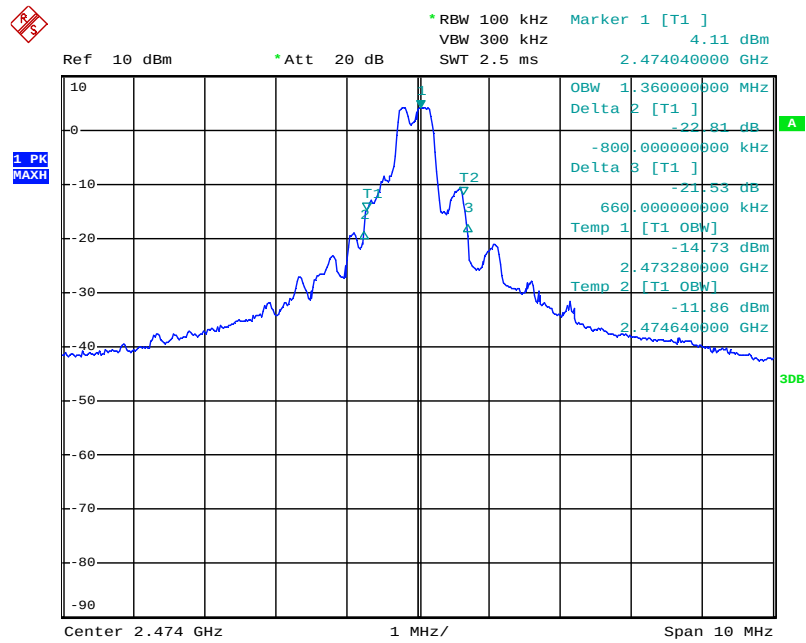
Date: 4.JUN.2020 01:51:07

Tx frequency: 2458MHz



Date: 4.JUN.2020 02:00:10

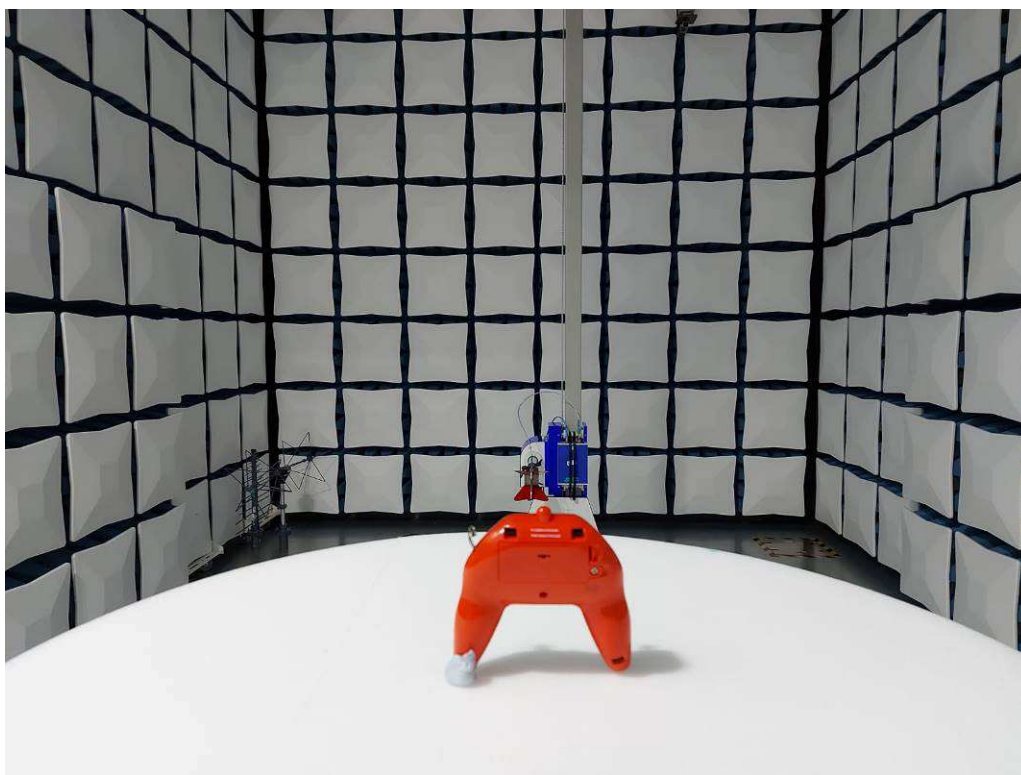
Tx frequency: 2474MHz



Date: 4.JUN.2020 02:04:22

Appendix 2

Test Setup Photos



Set-up for Radiated Emission

Appendix 3

EUT External Photos



External View



External View



External View



External View

Appendix 4

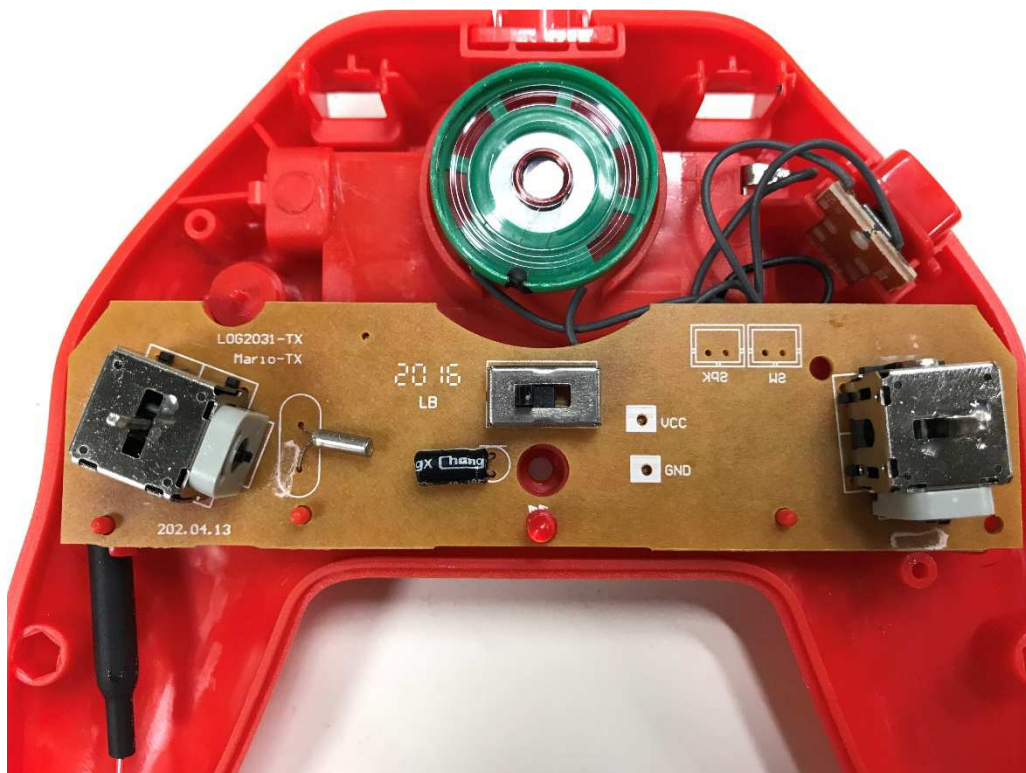
EUT Internal Photos



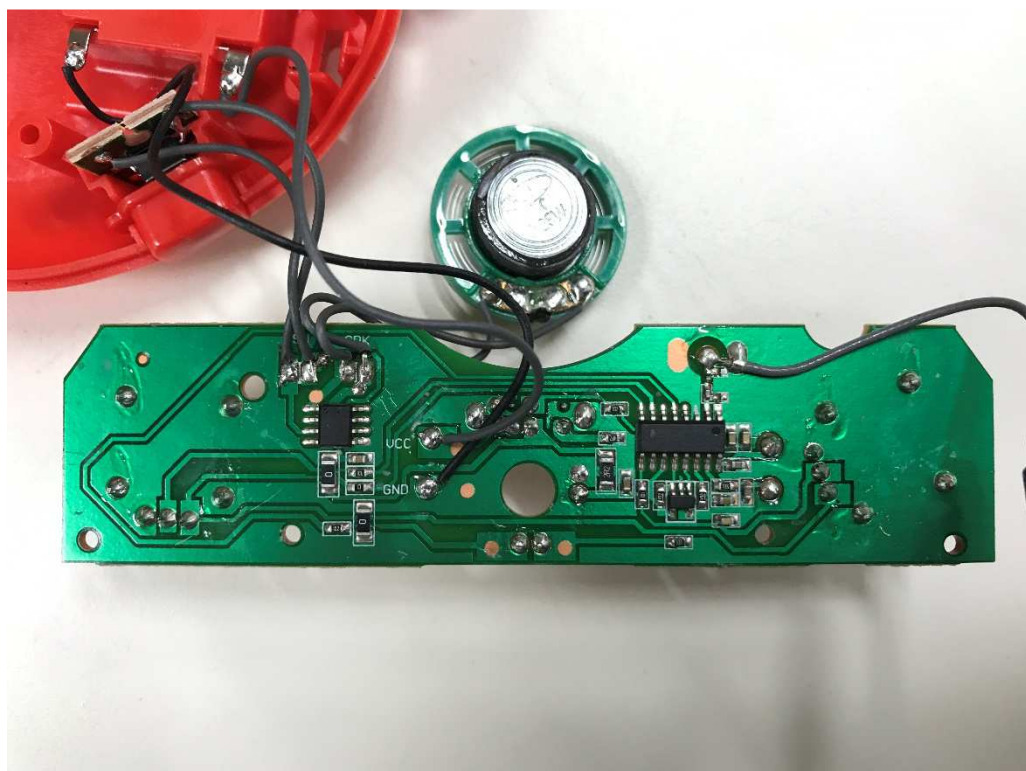
Internal View



Internal View



Internal View



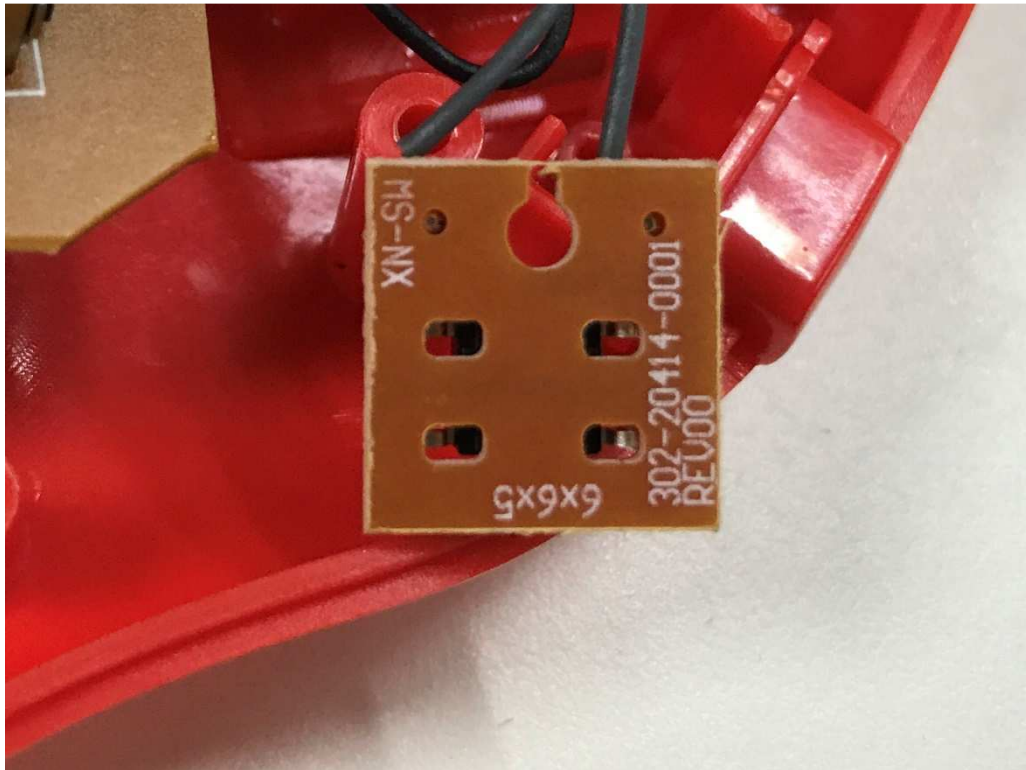
Internal View



Internal View



Internal View



Internal View

Appendix 5

RF Exposure Information

Maximum transmitter power:

Frequency (MHz)	Maximum peak output power (dBuV/m)	Output power (mW)	Separation distance (mm)
2446	94.2	0.7891	5
2458	92.7	0.5586	5
2474	91.4	0.4141	5

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(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:

$$(0.7891/5) \cdot \sqrt{2.446} = 0.2468 < 3.0$$

$$(0.5586/5) \cdot \sqrt{2.458} = 0.1751 < 3.0$$

$$(0.4141/5) \cdot \sqrt{2.474} = 0.1302 < 3.0$$

Conclusion:

No SAR is required.

For IC

According to table 1 in RSS-102 Issue 5, below exemption limit is applied

Frequency: 2450MHz

At separation distance of ≤ 5mm

Exemption limits: 4mW

Results:

max. power of channel = 94.2 dBuV/m = 0.7891 mW < 4mW

Conclusion:

The maximum peak output power of the transmitter is less than the SAR evaluation exemption threshold and hence it complies with the RSS-102 RF exposure requirement