# Prüfbericht - Nr.: 14040871 001

*Test Report No.:*



| | |
|---|---|
| **Auftraggeber:**<br>*Client:* | **Stadlbauer Marketing + Vertrieb GmbH**<br>**Rennbahn Allee1**<br>**5412 Puch, Salzburg**<br>**Austria** |
| **Gegenstand der Prüfung:**<br>*Test Item:* | **Short Range Device - Radio Control Toy Transmitter (2.4GHz)** |
| **Bezeichnung:**<br>*Identification:* | **401012**<br>**370401012** |
| **Serien-Nr.:**<br>*Serial No.:* | **Engineering sample** |
| **Wareneingangs-Nr.:**<br>*Receipt No.:* | **A000267177-003** |
| **Eingangsdatum:**<br>*Date of Receipt:* | **15.10.2015** |
| **Zustand des Prüfgegenstandes bei Anlieferung:**<br>*Condition of test item at delivery:* | Test sample(s) is/are not damaged and suitable for testing. |
| **Prüfort:**<br>*Testing Location:* | **Global United Technology Services Co., Ltd.**<br>2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, China |
| **Prüfgrundlage:**<br>*Test Specification:* | **FCC Part 15 Subpart C**<br>**ANSI C63.10-2013** |
| **Prüfergebnis:**<br>*Test Results:* | **Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.**<br>The above mentioned product was tested and **passed**. |
| **Prüflaboratorium:**<br>*Testing Laboratory:* | **TÜV Rheinland Hong Kong Ltd.**<br>8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong |

**geprüft/** *tested by:*

| 23.10.2015 | Hugo Wan<br>Senior Project Manager | |
|---|---|---|
| **Datum**<br>*Date* | **Name/Stellung**<br>*Name/Position* | **Unterschrift**<br>*Signature* |

**kontrolliert/** *reviewed by:*

| 23.10.2015 | Sharon Li<br>Department Manager | |
|---|---|---|
| **Datum**<br>*Date* | **Name/Stellung**<br>*Name/Position* | **Unterschrift**<br>*Signature* |

**Sonstiges:** **FCC ID YFA370401012**
Other Aspects

| ***Abkürzungen:*** | | | | ***Abbreviations:*** | | | |
|---|---|---|---|---|---|---|---|
| | ***P(ass)*** | = | ***entspricht Prüfgrundlage*** | | ***P(ass)*** | = | ***passed*** |
| | ***F(ail)*** | = | ***entspricht nicht Prüfgrundlage*** | | ***F(ail)*** | = | ***failed*** |
| | ***N/A*** | = | ***nicht anwendbar*** | | ***N/A*** | = | ***not applicable*** |
| | ***N/T*** | = | ***nicht getestet*** | | ***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.**
*This test report 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 safety mark on this or similar products.*

# Table of Content

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# Product information

## Manufacturers declarations

| | Transmitter |
|---|---|
| Operating frequency range | 2405 - 2475 MHz |
| Type of modulation | GFSK |
| Number of channels | 6<br>(2405, 2411, 2433, 2460, 2465, 2475MHz) |
| Channel separation (MHz) | N/A |
| Type of antenna | Wired antenna |
| Power level | fix |
| Connection to public utility power line | No |
| Nominal voltage | $V_{nor}$: 6.0 V DC (4 x AA size batteries) |

## Product function and intended use

The equipment under test (EUT) is a radio control toy transmitter operating at 2.4GHz.The EUT is powered by batteries only.

The client declared that the EUT consists of 2 models 401012 and 370401012 and both of them are totally identical including schematics, PCB layouts, electronic component used and housing except the model number only. Due to the equivalence of EUT, model 370401012 was provided by client for performing test.

## Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual
Label Artwork

## Independent Operation Modes

The basic operation modes are:

- Radio control to the toy receiver.

For further information refer to User Manual

## Related Submittal(s) Grants

This is a single application for certification of the transmitter.

# Test Set-up and Operation Mode

## Principle of Configuration Selection

**Emission:** The 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 mode transmitter was provided by client with following arrangement:

1)Fixed channel transmission was set by the specific operation of the EUT.
2)The following channels were tested
Lo: 2405MHz
Mid: 2433MHz
Hi: 2475MHz

## 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 were performed according to the procedures in ANSI C63.10-2013.

For emission measurement at or below 1GHz, the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For emission testing above 1GHz, the EUT was placed at the middle of 1.5m height turntable. In above two measurement, the turntable is 3 meters far from the 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.

# List of Test and Measurement Instruments

## Global United Technology Services Co., Ltd. (FCC Registration number: 600491)

**Radiated Emission**

| Equipment | Manufacturer | Type | S/N | Cal. Date | Cal. Due Date |
|---|---|---|---|---|---|
| 3m Semi- Anechoic Chamber | ZhongYu Electron | 9.0(L)*6.0(W)* 6.0(H) | -- | 5 Apr 2015 | 4 Apr 2017 |
| Control Room | ZhongYu Electron | 6.2(L)*2.5(W)* 2.4(H) | -- | N/A | N/A |
| ESU EMI Test Receiver | R&S | ESU26 | -- | 8 Jun 2015 | 7 Jun 2016 |
| Loop Antenna | Zhinan | ZN30900A | -- | 8 Jun 2015 | 7 Jun 2016 |
| Bi-log Hybrid Antenna | SCHWARZBECK | VULB9163 | -- | 8 Mar 2015 | 8 Mar 2016 |
| Double-ridged horn antenna | SCHWARZBECK | 9120D | -- | 8 Mar 2015 | 8 Mar 2016 |
| Horn Antenna | ETS-LINDGREN | 3160-09 | -- | 8 Mar 2015 | 8 Mar 2016 |
| RF Amplifier | HP | 8347A | -- | 8 Jun 2015 | 7 Jun 2016 |
| RF Amplifier | HP | 8349B | -- | 8 Jun 2015 | 7 Jun 2016 |
| EMI Test Software | AUDIX | E3 | -- | N/A | N/A |
| Coaxial cable | GTS | N/A | -- | 8 Jun 2015 | 7 Jun 2016 |
| Coaxial Cable | GTS | N/A | -- | 8 Jun 2015 | 7 Jun 2016 |
| Thermo meter | N/A | N/A | -- | 8 Jun 2015 | 7 Jun 2016 |
| Spectrum Analyzer | Rohde & Schwarz | FSP30 | 100007 | 13 Jan 2015 | 13 Jan 2017 |

# Results FCC Part 15 – Subpart C

| **Subclause 15.203 – Antenna Information** | | **Pass** |
|---|---|---|
| **Requirement:** | No antenna other than that furnished by the responsible party shall be used with the device | |
| **Results:** | Permanent attached antenna | |
| **Verdict:** | Pass | |

| **Subclause 15.204 – Antenna Information** | | **Pass** |
|---|---|---|
| **Requirement:** | Provide information for every antenna proposed for the use with the EUT | |
| **Results:** | a) Antenna type: | Wired |
| | b) Manufacturer and model no: | N/A |
| | c) Gain with reference to an isotropic radiator: | 0 dBi |
| **Verdict:** | Pass | |

| **Subclause 15.207 – Disturbance Voltage on AC Mains** | **N/A** |
|---|---|
| **Results:** | The EUT does not have AC mains input/output port and hence this test is not applicable. |

| **Subclause 15.205 – Restricted Bands Next to The Band Edge** | **Pass** |
|---|---|
| Test Specification : ANSI C63.10 – 2013<br>Mode of operation : Tx mode<br>Port of testing : Enclosure<br>Detector : Peak<br>RBW/VBW : 1 MHz / 3 MHz<br>Supply voltage : 6.0VDC, 4x1.5V AA size new battery<br>Temperature : 23ºC<br>Humidity : 50% | |
| Requirement : Radiated emissions which fall in the restricted bans, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a). | |
| **Results** : The emissions found in the restricted bands were below the limit. For details, please refer to Appendix 1. | |

| **Subclause 15.215 (c) – 20 dB Bandwidth** | **Pass** |
|---|---|
| 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. |

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Temporary antenna port
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 6.0VDC, 4x1.5V AA size new battery
Temperature : 23ºC
Humidity : 50%

**Results** : For test protocols refer to Appendix 1, page 2-3.

| **Frequency (MHz)** | **20 dB left (MHz)** | **Limit (MHz)** | **20 dB right (MHz)** | **Limit (MHz)** |
|---|---|---|---|---|
| 2405 | 2404.310 | > 2400 | 2405.590 | < 2483.5 |
| 2433 | 2432.310 | > 2400 | 2433.590 | < 2483.5 |
| 2475 | 2474.290 | > 2400 | 2475.590 | < 2483.5 |

**Subclause 15.249 (a) – Radiated Emission (Fundamental and Harmonics)** **Pass**

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Enclosure
RBW/VBW : 120 kHz / 300 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 6.0VDC, 4x1.5V AA size new 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**

Fundamental Frequency 2405MHz Vertical Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 2405.155 | 93.35 | 114.0 / P |
| 2405.155 | 71.76 | 94.0 / A |

Fundamental Frequency 2405MHz Horizontal Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 2405.160 | 96.25 | 114.0 / P |
| 2405.160 | 74.87 | 94.0 / A |

Harmonics 2405MHz Vertical Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 4810.090 | 51.96 | 74.0 / P |
| 4810.090 | 36.24 | 54.0 / A |
| 7215.150 | 51.98 | 74.0 / P |
| 7215.150 | 33.80 | 54.0 / A |

Harmonics 2405MHz Horizontal Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 4810.080 | 53.75 | 74.0 / P |
| 4810.080 | 35.03 | 54.0 / A |

Fundamental Frequency 2433MHz Vertical Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 2433.180 | 92.30 | 114.0 / P |
| 2433.180 | 71.25 | 94.0 / A |

Fundamental Frequency 2433MHz Horizontal Polarization

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|---|---|
| 2433.180 | 95.32 | 114.0 / P |
| 2433.180 | 73.27 | 94.0 / A |

| Harmonics 2433MHz | Vertical Polarization | |
|---|---|---|
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 4866.170 | 52.61 | 74.0 / P |
| 4866.170 | 35.97 | 54.0 / A |
| 7299.050 | 52.85 | 74.0 / P |
| 7299.050 | 32.98 | 54.0 / A |
| Harmonics 2433MHz | Horizontal Polarization | |
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 4866.280 | 54.96 | 74.0 / P |
| 4866.280 | 35.32 | 54.0 / A |
| Fundamental Frequency 2475MHz | Vertical Polarization | |
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 2475.190 | 94.45 | 114.0 / P |
| 2475.190 | 72.86 | 94.0 / A |
| Fundamental Frequency 2475MHz | Horizontal Polarization | |
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 2475.180 | 94.14 | 114.0 / P |
| 2475.180 | 72.26 | 94.0 / A |
| Harmonics 2475MHz | Vertical Polarization | |
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 4950.060 | 55.26 | 74.0 / P |
| 4950.060 | 34.73 | 54.0 / A |
| 7426.000 | 51.39 | 74.0 / P |
| 7426.000 | 34.94 | 54.0 / A |
| Harmonics 2475MHz | Horizontal Polarization | |
| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
| 4950.125 | 56.65 | 74.0 / P |
| 4950.125 | 35.13 | 54.0 / A |

| **Subclause 15.249 (d) – Spurious Radiated Emissions** | **Pass** |
|---|---|

Test Specification : ANSI C63.10 – 2013
Mode of operation : Tx mode
Port of testing : Enclosure
Detector : Peak
RBW/VBW : 120 kHz / 300 kHz for f < 1 GHz
1 MHz / 3 MHz for f > 1 GHz
Supply voltage : 6.0VDC, 4x1.5V AA size new 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 within the restricted bands. There is no spurious found between 10MHz to 30MHz, of which 16MHz is the lowest oscillating frequency in EUT.

Tx frequency 2405MHz — Vertical Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

Tx frequency 2405MHz — Horizontal Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

Tx frequency 2433MHz — Vertical Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

Tx frequency 2433MHz — Horizontal Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

Tx frequency 2475MHz — Vertical Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

Tx frequency 2475MHz — Horizontal Polarization

| **Freq MHz** | **Level dBuV/m** | **Limit/ Detector dBuV/m** |
|---|---|---|
| No peak found | -- | -- |

| Safety Human Exposure – Radio Frequency Exposure Compliance | Pass |
|---|---|
| Please refer to Appendix 5 for details. | |