# TEST REPORT

| | | |
|---|---|---|
| **Reference No.** | : | WTF24F07155359W |
| **FCC ID** | : | 2BMKR-WMT400RS |
| **Applicant** | : | Zhongshan Kebaishi Electric Appliance Co.,Ltd |
| **Address** | : | 2 of Fifth Floor, No.10 Yongyi 1st Road, Yongxing Industrial Park, Henglan Town, Zhongshan City,Guangdong Province 528478,China |
| **Manufacturer** | : | Shenzhen WELMAG Intelligence technology Co., Ltd. |
| **Address** | : | 5 Floor, 3th building, Hongtu Industrial Zone, Xixiang, Baoan district, Shenzhen,China. |
| **Product Name** | : | Remote Controller |
| **Model No.** | : | WMT400-RS, WMT401-RS |
| **Test specification** | : | FCC CFR47 Part 15 Subpart C (Section 15.231) |
| **Date of Receipt sample** | : | 2024-07-08 |
| **Date of Test** | : | 2024-07-09 to 2024-07-10 |
| **Date of Issue** | : | 2025-05-13 |
| **Test Report Form No.** | : | WEW-15231A-01B |
| **Test Result** | : | **Pass** |

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.


**Prepared By:**
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Tested by: Approved by:

Roy Hong Danny Zhou

# 1 Revision History

| Test Report No. | Date of Issue | Description | Status |
|---|---|---|---|
| WTF24F07155359W | 2025-05-13 | Original | Valid |

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# 3 General Information

## 3.1 General Description of E.U.T

**Product Name** ..... : Remote Controller

**Model No.** ..... : WMT400-RS, WMT401-RS

**Model Description** ..... : Two models are identical except for the printing of keys. Therefore the full tests were performed on model WMT400-RS.

**Rating** ..... : Battery 3V (2*1.5V AAA)

**Battery Capacity** ..... : ---

**Power Adapter** ..... : ---

## 3.2 Technical Characteristics of EUT

**Operating Frequency** ..... : 433.92 MHz

**Max. Field Strength** ..... : 78.77 dBuV/m (at 3m distance)

**Modulation** ..... : ASK

**Type of Antenna** ..... : PCB Printed Antenna

**Antenna Gain** ..... : 2 dBi

## 3.3 Standards Applicable for Testing

The following report is prepared in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

## 3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science an Economic Development Canada(ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number:21895, March 12, 2019

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106, August 16, 2018

- **FCC – Designation No.: CN5034**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation No. CN5034.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

## 3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

## 3.6 Abnormalities from Standard Conditions

None.

## 3.7 Disclaimer

The antenna gain information is provided by the customer. The laboratory is not responsible for the accuracy of the antenna gain information.

# 4 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

**Test Mode List**

| Test Mode | Description | Remark |
|---|---|---|
| TM1 | Transmitting | With modulation(433.92MHz) |

**Test Conditions**

| | |
|---|---|
| Temperature: | 22~25℃ |
| Relative Humidity: | 50~55% |
| Atmospheric pressure: | 101.9kPa |

# 5 Equipment Used during Test

## 5.1 Equipment List

| ☐Conducted Emissions 1# | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Cal Date** | **Cal Due Date** |
| 1. | EMI Test Receiver | R&S | ESR3 | 102423 | 2024-01-05 | 2025-01-04 |
| 2. | LISN | R&S | ENV216 | 101343 | 2024-01-05 | 2025-01-04 |
| 3. | Cable | HUBER+SUHNER | CBL2-NN-6M | 223NN624 | 2024-01-04 | 2025-01-03 |
| 4. | Switch | CD | RSU-A4 18G | RSUA4008 | 2024-01-04 | 2025-01-03 |

| ☐Conducted Emissions 2# | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Cal Date** | **Cal Due Date** |
| 1. | EMI Test Receiver | R&S | ESCI | 101178 | 2024-01-06 | 2025-01-05 |
| 2. | LISN | R&S | ENV216 | 101215 | 2024-01-05 | 2025-01-04 |
| 3. | Cable | HUBER+SUHNER | CBL2-NN-6M | 6102701 | 2024-01-04 | 2025-01-03 |
| 4. | Switch | ESE | RSU/M2 | --- | 2024-01-04 | 2025-01-03 |

| ☐Conducted Emissions 3# | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Cal Date** | **Cal Due Date** |
| 1. | EMI Test Receiver | R&S | ESR3 | 102842 | 2024-01-05 | 2025-01-04 |
| 2. | LISN | R&S | ENV216 | 101542 | 2024-01-05 | 2025-01-04 |
| 3. | Cable | YIHENG | LMR195UF-NMNM-2.5 | --- | 2024-01-04 | 2025-01-03 |
| 4. | Manual RF Switch | YIHENG | SW-2 | RSU0402 | 2024-01-04 | 2025-01-03 |

| ☒Radiation Emissions | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Calibration Date** | **Calibration Due Date** |
| 1. | 3m Semi-anechoic Chamber | CHANGCHUANG | 9m×6m×6m | - | 2024-01-05 | 2025-01-04 |
| 2. | EMI Test Receiver | RS | ESR7 | 101566 | 2024-01-06 | 2025-01-05 |
| 3. | EMC Analyzer | Agilent | N9020A | MY48011796 | 2024-01-04 | 2025-01-03 |
| 4. | Active Loop Antenna | SCHWARZBECK | FMZB1519B | 00004 | 2024-01-05 | 2025-01-04 |
| 5. | Trilog Broadband Antenna | SCHWARZBECK | VULB 9162 | 9162-117 | 2024-01-05 | 2025-01-04 |
| 6. | Coaxial Cable (below 1GHz) | H+S | CBL3-NN-12+3 m | 214NN320 | 2024-01-06 | 2025-01-05 |
| 7. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9120 D | 01561 | 2024-01-05 | 2025-01-04 |
| 8. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9170 | 01119 | 2024-01-05 | 2025-01-04 |
| 9. | Coaxial Cable (above 1GHz) | Times-Micorwave | CBL5-NN | - | 2024-01-04 | 2025-01-03 |
| 10. | Amplifier | Lunar E M | LNA1G18-40 | 20160501002 | 2024-01-04 | 2025-01-03 |

| ☒RF Conducted Testing | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Calibration Date** | **Calibration Due Date** |
| 1. | Spectrum Analyzer | Agilent | N9020A | MY48011796 | 2024-01-04 | 2025-01-03 |
| 2. | Analog Signal Generator | Agilent | N5181A | MY48180720 | 2024-01-04 | 2025-01-03 |
| 3. | RF Control Unit | CHANGCHUANG | JS0806-2 | - | 2024-01-04 | 2025-01-03 |

☐: ***Not Used***

☒: ***Used***

## 5.2 Test Software

| Description | Manufacturer | Model | Version |
|---|---|---|---|
| EMI Test Software (Conducted Emission 1#) | FARATRONIC | EZ-EMC | EMEC-3A1 |
| EMI Test Software (Conducted Emission 2#) | FARATRONIC | EZ-EMC | CON-03A1 |
| EMI Test Software (Conducted Emission 3#) | FARATRONIC | EZ-EMC | COM 3A1.1 |
| EMI Test Software (Radiated Emission) | FARATRONIC | EZ-EMC | RA-03A1-1 |
| RF Conducted Test Software | TONSCEND | JS1120-2 | V2.6 |

## 5.3 Special Accessories and Auxiliary Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. |
|---|---|---|---|---|
| 1. | / | / | / | / |

## 5.4 Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| RF Output Power | ±2.2dB |
| Occupied Bandwidth | ±1.5% |
| Conducted Emission | ±2.6dB |
| Transmitter Spurious Emission | ±3.8dB (for 25MHz-1GHz) |
| | ±5.0dB (for 1GHz-18GHz) |

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

# 6 Summary of Test Result

| Test Items | FCC Rules | Result |
|---|---|---|
| Antenna Requirement | §15.203 | Compliant |
| Restricted Band of Operation | §15.205 | Compliant |
| Conducted Emissions | §15.207(a) | N/A |
| Radiated Spurious Emissions | §15.209 | Compliant |
| Deactivation Testing | §15.231(a) | Compliant |
| Radiated Emissions | §15.231(b) | Compliant |
| 20dB Bandwidth Testing | §15.231(c) | Compliant |

Remark:

Pass Test item meets the requirement

Fail Test item does not meet the requirement

N/A Test case does not apply to the test object

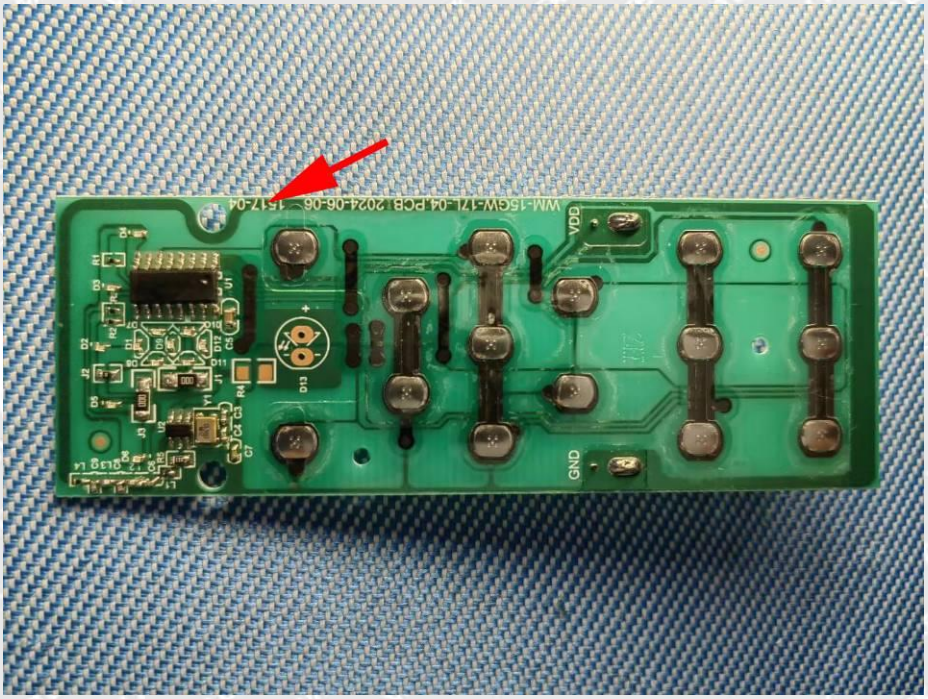
## 6.1 Antenna Requirement

### 6.1.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

### 6.1.2 Evaluation Information

The EUT has a PCB Antenna, the gain is 2dBi, fulfil the requirement of this section.



## 6.2 Radiated Spurious Emissions

### 6.2.1 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|---|---|---|
| 40.66 - 40.70 | 2,250 | 225 |
| 70 - 130 | 1,250 | 125 |
| 130 - 174 | 1,250 to 3,750 ** | 125 to 375 ** |
| 174 - 260 | 3,750 | 375 |
| 260 - 470 | 3,750 to 12,500 ** | 375 to 1,250 ** |
| Above 470 | 12,500 | 1,250 |

** linear interpolations

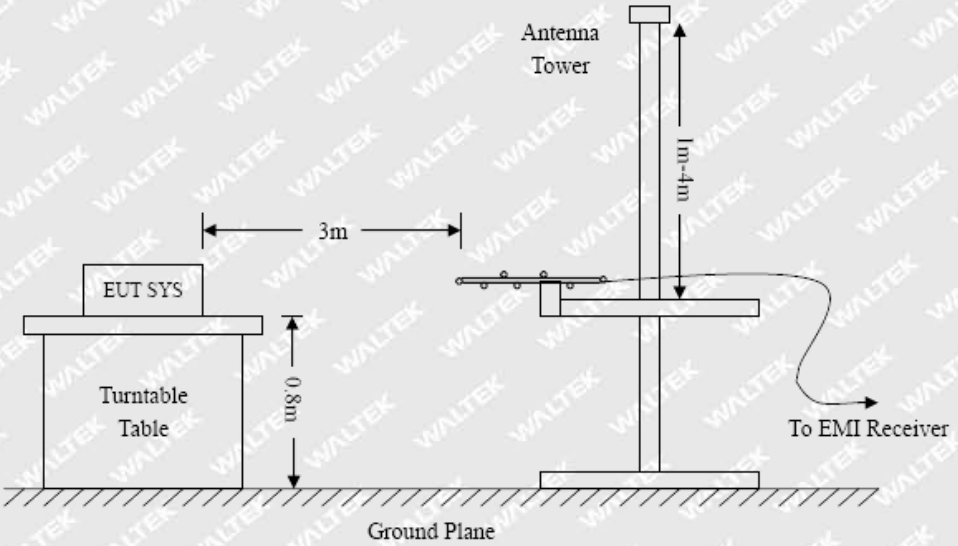
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

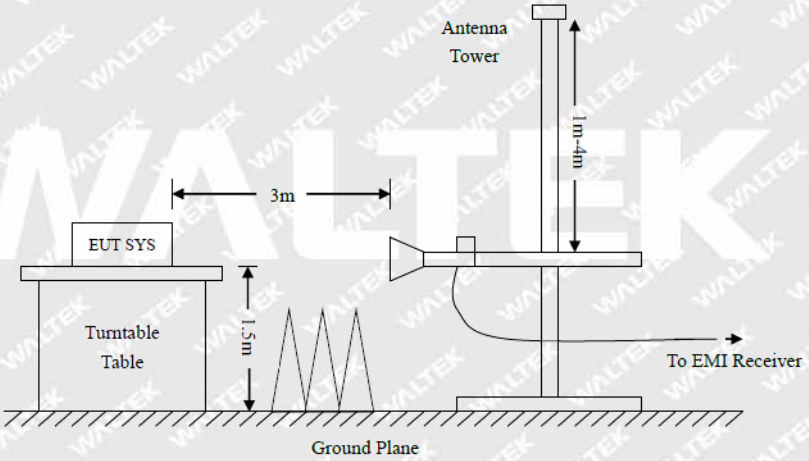
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

### 6.2.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.




### 6.2.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading +Ant.Loss +Cab. Loss – Ampl.Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB V means the emission is 6dB V below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15C Limit

### 6.2.4 Test Results

**Test Frequency : 30MHz ~ 5GHz**

| Frequency | Receiver Reading (PK) | Turn table Angle | RX Antenna | | Corrected Factor | Corrected Amplitude (PK) | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | | | Height | Polar | | | | |
| (MHz) | (dBμV) | Degree | (m) | (H/V) | (dB/m) | (dBμV/m) | (dBμV/m) | (dB) |
| 433.91 | 59.75 | 235 | 1.1 | H | 19.02 | 78.77 | 100.83 | -22.06 |
| 433.91 | 56.12 | 163 | 1.4 | V | 19.02 | 75.14 | 100.83 | -25.69 |
| 867.91 | 14.35 | 102 | 1.8 | H | 26.29 | 40.64 | 80.83 | -40.19 |
| 867.91 | 10.13 | 240 | 1.5 | V | 26.29 | 36.42 | 80.83 | -44.41 |
| 1300.00 | 60.76 | 118 | 1.8 | H | -12.90 | 47.86 | 74 | -26.14 |
| 1300.00 | 60.95 | 141 | 1.5 | V | -12.90 | 48.05 | 74 | -25.95 |
| 4915.00 | 51.98 | 178 | 1.6 | H | -1.53 | 50.45 | 74 | -23.55 |
| 4915.00 | 44.82 | 268 | 2.0 | V | -1.53 | 43.29 | 74 | -30.71 |

**AV = Peak +20Log$_{10}$(duty cycle) =PK+(–9.86)** [refer to section 6.5 for more detail]

| Frequency | PK | RX Antenna Polar | Duty cycle Factor | Calculated AV | Limit | Margin |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV/m) | (H/V) | (dB) | (dBμV/m) | (dBμV/m) | (dB) |
| 433.91 | 78.77 | H | -9.86 | 68.91 | 80.83 | -11.92 |
| 433.91 | 75.14 | V | -9.86 | 65.28 | 80.83 | -15.55 |
| 867.91 | 40.64 | H | -9.86 | 30.78 | 60.83 | -30.05 |
| 867.91 | 36.42 | V | -9.86 | 26.56 | 60.83 | -34.27 |
| 1300.00 | 47.86 | H | -9.86 | 38.00 | 54 | -16.00 |
| 1300.00 | 48.05 | V | -9.86 | 38.19 | 54 | -15.81 |
| 4915.00 | 50.45 | H | -9.86 | 40.59 | 54 | -13.41 |
| 4915.00 | 43.29 | V | -9.86 | 33.43 | 54 | -20.57 |

*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 6th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.92MHz.*

## 6.3 20dB Bandwidth

### 6.3.1 Standard Applicable

According to FCC Part 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### 6.3.2 Test Procedure

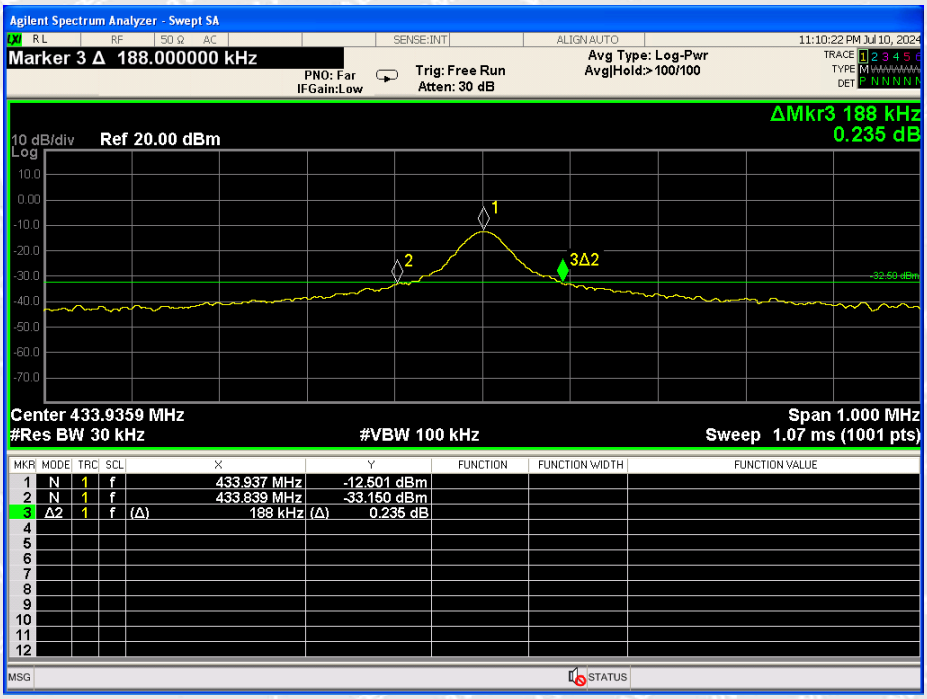
With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

### 6.3.3 Test Result

| Test Frequency (MHz) | 20dB Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|
| 433.92 | 188 | 1084.8 | Pass |

Limit = Fundamental Frequency x 0.25% = 433.92 MHz x 0.25% = 1084.8 kHz

**Test Plots:**



## 6.4 Transmission Time

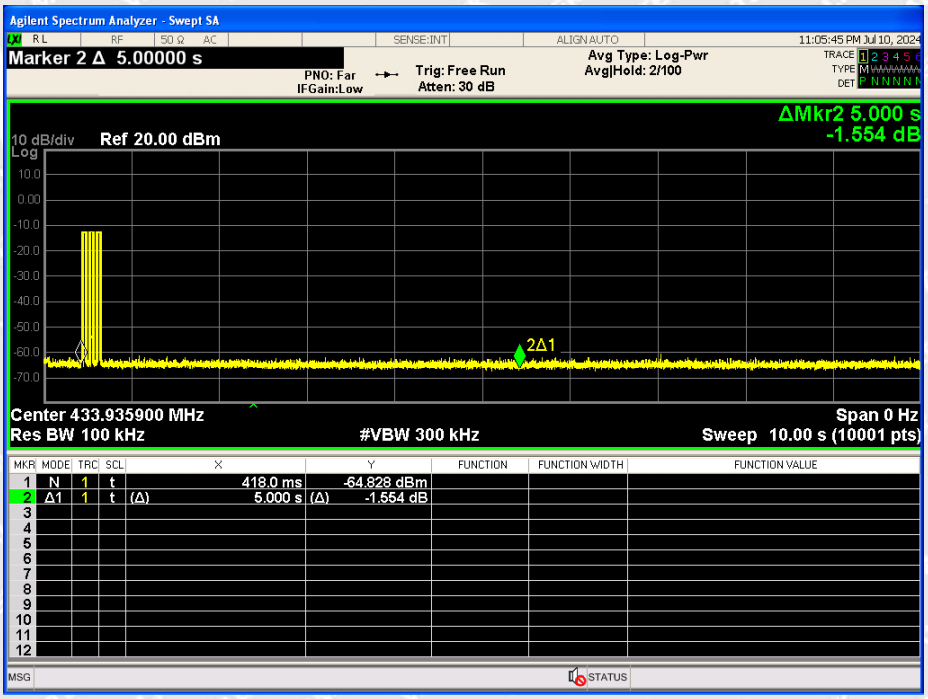
### 6.4.1 Standard Applicable

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:
1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

### 6.4.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

### 6.4.3 Test Result



## 6.5 Duty Cycle

### 6.5.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

### 6.5.2 Test Procedure

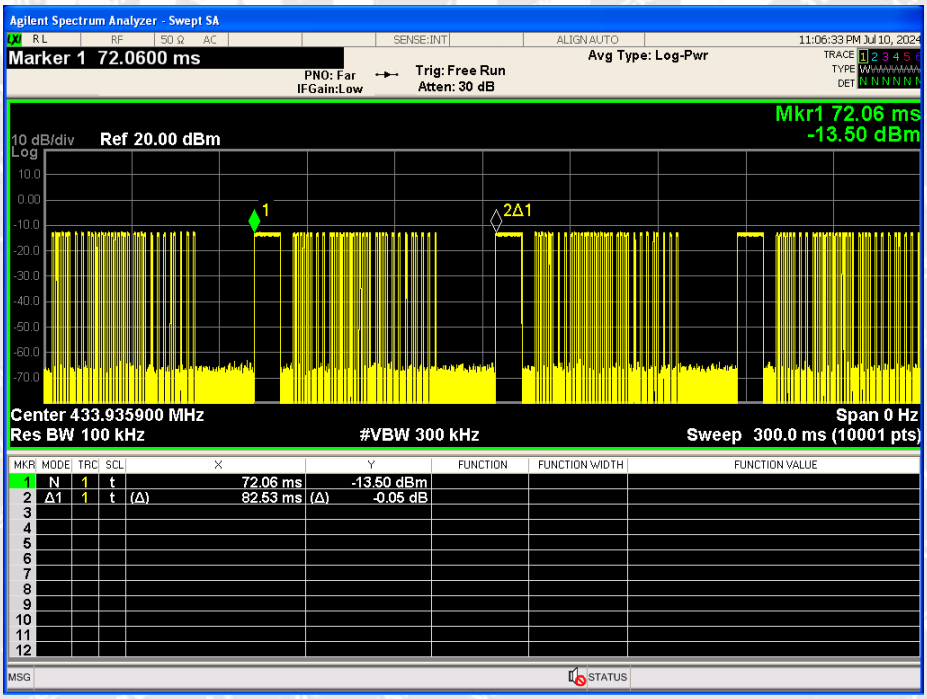
With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

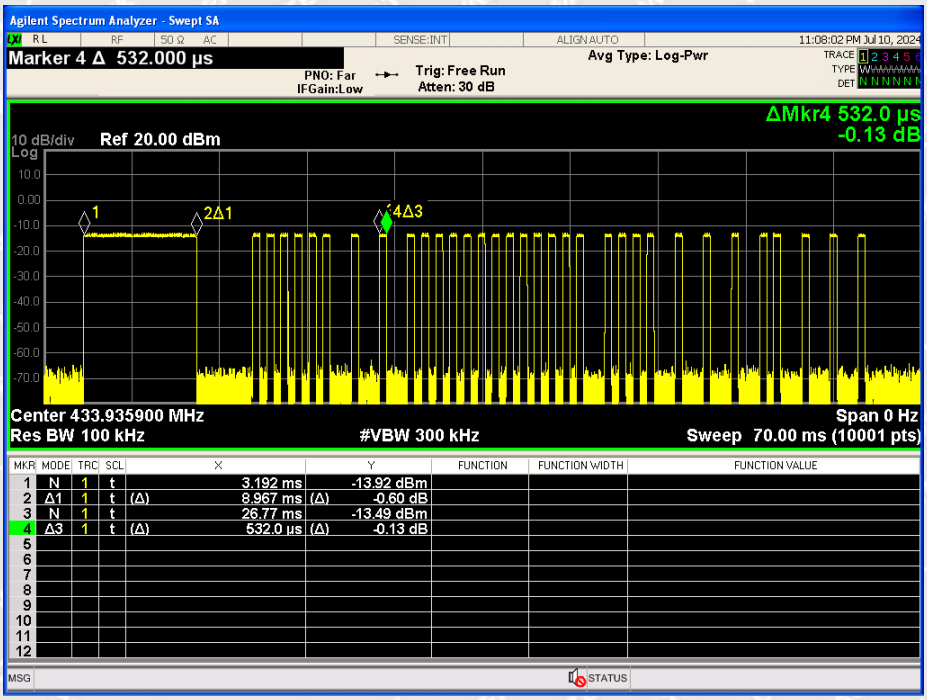
### 6.5.3 Test Result

| | |
|---|---|
| Total transmission time(ms) | 8.967*1+0.532*33=26.523 |
| Length of a complete transmission period(ms) | 82.53 |
| Duty Cycle(%) | 32.13 |
| Duty Cycle Correction Factor(dB) | –9.86 |

Remark: Duty Cycle Factor=20*log(Duty Cycle)

**Test Plots:**




Agilent Spectrum Analyzer - Swept SA
Marker 4 Δ 532.000 µs
Avg Type: Log-Pwr
Trig: Free Run
Atten: 30 dB
PNO: Far
IFGain:Low
ΔMkr4 532.0 µs
-0.13 dB
10 dB/div Ref 20.00 dBm
Log
Center 433.935900 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 70.00 ms (10001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 t 3.192 ms -13.92 dBm
2 Δ1 1 t (Δ) 8.967 ms (Δ) -0.60 dB
3 N 1 t 26.77 ms -13.49 dBm
4 Δ3 1 t (Δ) 532.0 µs (Δ) -0.13 dB
MSG
STATUS

# 7 Photographs Test Setup

## 7.1 Photographs - Radiated Emission Test Setup

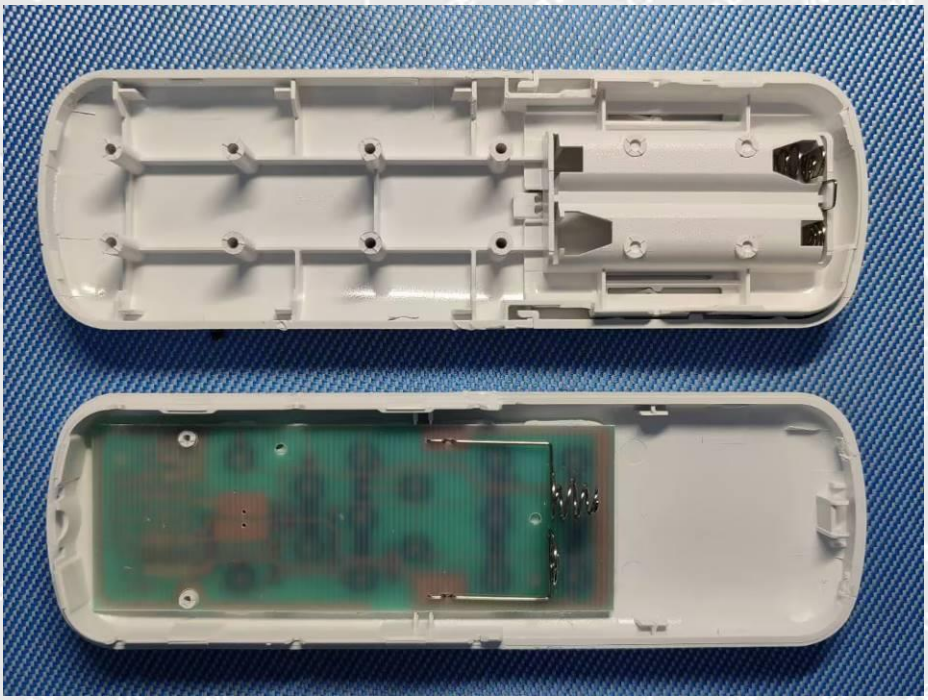
**30MHz-1GHz**

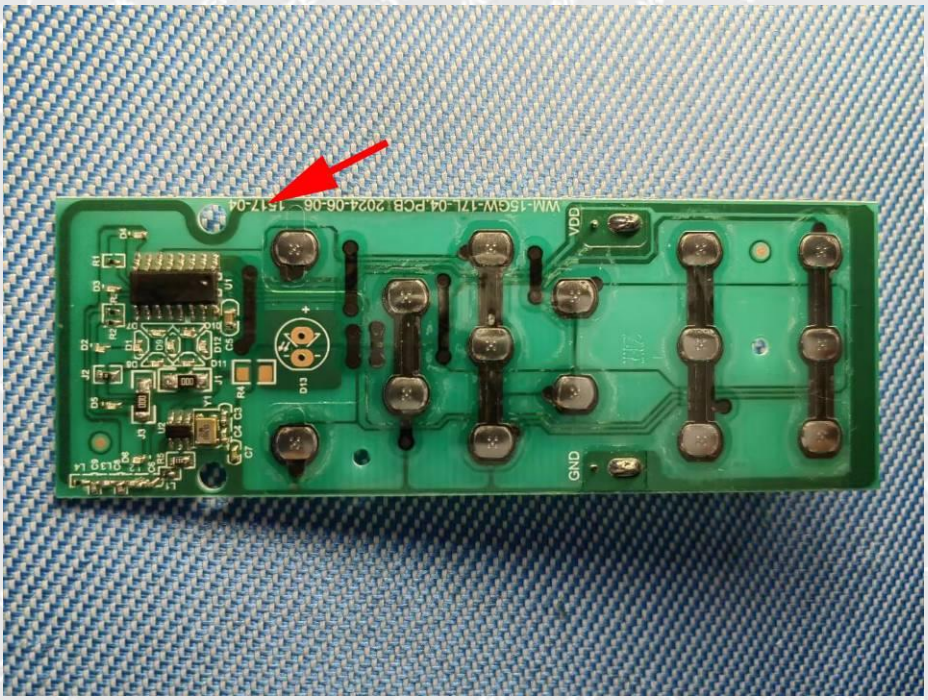
**Above 1GHz**

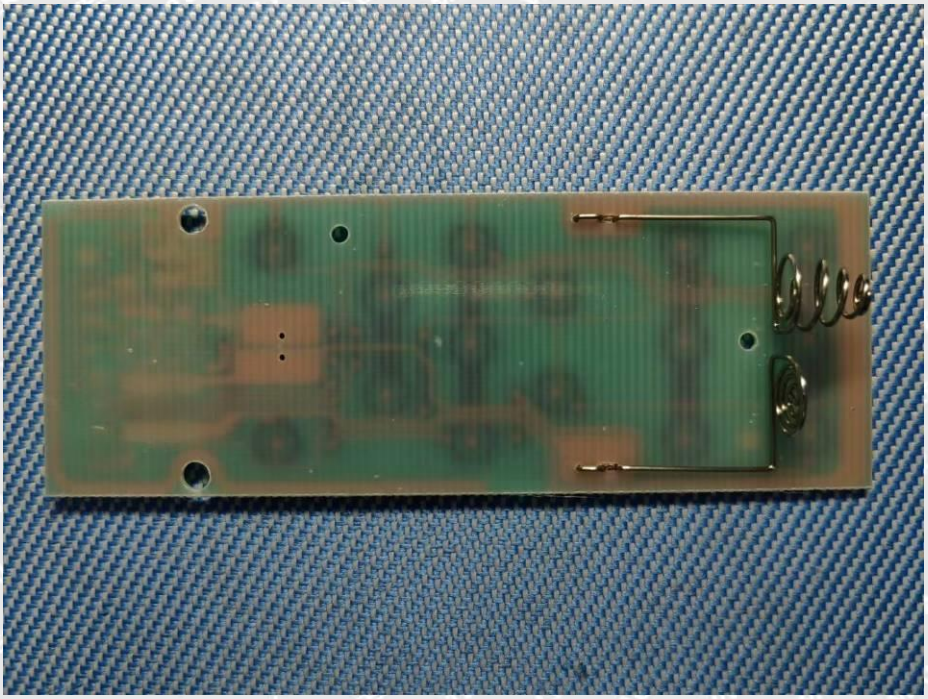
# 8 Photographs - Constructional Details

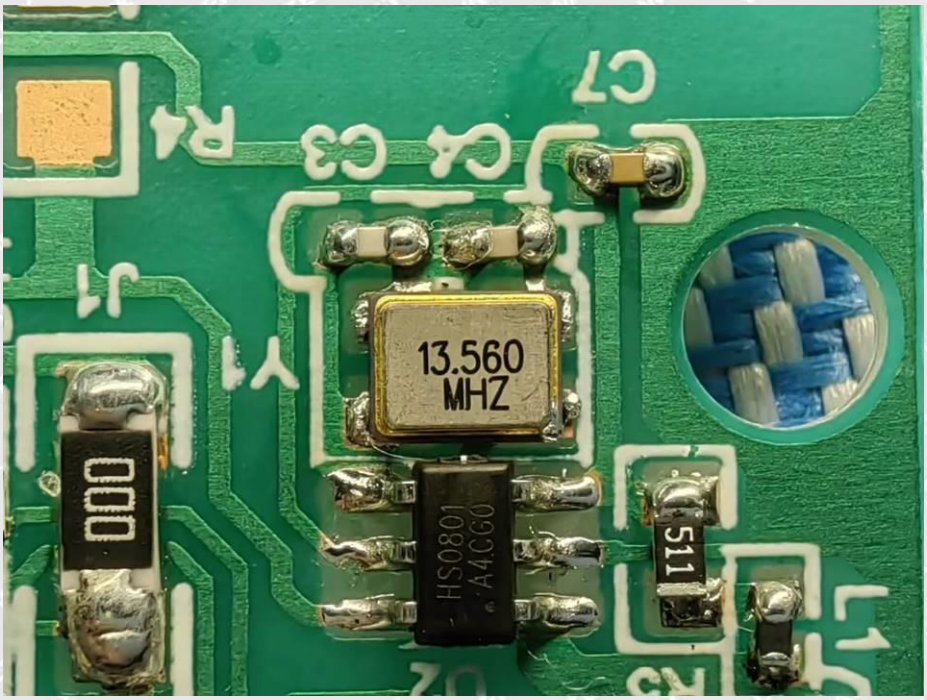
## 8.1 EUT - External Photos

## 8.2 EUT - Internal Photos




GND
VDD






======End of Report======