

# TEST REPORT

**Reference No.**..... : WTD18S02102571-1W  
**FCC ID**..... : PAGTR-028S  
**Applicant**..... : KAB Enterprise Co., Ltd.  
**Address**..... : 21F, -1, No.33, Sec. 1, Minsheng Rd., Banqiao Dist., New Taipei City  
220, Taiwan (R.O.C)  
**Manufacturer**..... : Verdant Electronics(Dong Guan) Co., Ltd.  
**Address**..... : Langxie Administrative District, Qiaotou, Dongguan City, Guang Dong  
Sheng, China  
**Product**..... : Remote Controller  
**Model(s)**..... : TR-028S  
**Standards**..... : FCC CFR47 Part 15 Section 15.231:2017  
**Date of Receipt sample**.... : 2018-02-01  
**Date of Test**..... : 2018-02-02 to 2018-03-09  
**Date of Issue**..... : 2018-03-12  
**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 compiler and approver.

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## 1 Laboratories Introduction

**Waltek Services (Shenzhen) Co., Ltd** is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. Electro Magnetic Compatibility (EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

## 1.1 Test Facility

### A. Accreditations for Conformity Assessment (International)

| Country/Region   | Accreditation Body                               | Scope                         | Note |
|--|--|-------------------------------|------|
| USA  | <b>A2LA</b><br><b>(Certificate No.: 4243.01)</b> | FCC ID \ DOC \ VOC            | 1    |
| Canada   |  | IC ID \ VOC                   | 2    |
| Japan  |  | MIC-T \ MIC-R                 | -    |
| Europe   |  | EMCD \ RED                    | -    |
| Taiwan   |  | NCC                           | -    |
| Hong Kong  |  | OFCA                          | -    |
| Australia  |  | RCM                           | -    |
| India  |  | <b>International Services</b> | WPC  |
| Thailand   | NTC  |                               | -    |
| Singapore  | IDA  |                               | -    |
| Note:<br>1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.<br>2. IC Canada Registration No.: 7760A |  |                               |      |

### A. TCBs and Notify Bodies Recognized Testing Laboratory.

| Recognized Testing Laboratory of ...     | Notify body number |
|--|--------------------|
| TUV Rheinland                            | Optional.          |
| Intertek                                 |                    |
| TUV SUD                                  |                    |
| SGS                                      |                    |
| Phoenix Testlab GmbH                     | 0700               |
| Element Materials Technology Warwick Ltd | 0891               |
| Timco Engineering, Inc.                  | 1177               |
| Eurofins Product Service GmbH            | 0681               |

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### 3 Report Revision History

| Test report No.   | Date of Receipt sample | Date of Test             | Date of Issue | Purpose  | Comment | Approved |
|-------------------|------------------------|--------------------------|---------------|----------|---------|----------|
| WTD18S02102571-1W | 2018-02-01             | 2018-02-02 to 2018-03-09 | 2018-03-12    | original | -       | Valid    |

## 4 General Information

### 4.1 General Description of E.U.T.

|                      |                       |
|----------------------|-----------------------|
| Product              | : Remote Controller   |
| Model(s)             | : TR-028S             |
| Model Difference     | : N/A                 |
| Type of Modulation   | : ASK                 |
| Frequency Range      | : 433.92MHz           |
| Antenna installation | : PCB Printed Antenna |
| Antenna Gain         | : 0dBi                |
| Hardware Version     | : REV.0               |
| Software Version     | : REV.1               |

### 4.2 Details of E.U.T.

Ratings: DC 12V, 23A by ALKALINE BATTERY

### 4.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode    | Test channel |
|--------------|--------------|
| Transmitting | 433.92MHz    |

## 5 Equipment Used during Test

### 5.1 Equipments List

| 3m Semi-anechoic Chamber for Radiation Emissions |   |                      |             |             |                       |                      |
|--|---|----------------------|-------------|-------------|-----------------------|----------------------|
| Item   | Equipment                                   | Manufacturer         | Model No.   | Serial No.  | Last Calibration Date | Calibration Due Date |
| 1  | Spectrum Analyzer                           | R&S                  | FSP30       | 100091      | 2017-04-29            | 2018-04-28           |
| 2  | Broad-band Horn Antenna(1-18GHz)            | SCHWARZBECK          | BBHA 9120 D | 667         | 2017-04-09            | 2018-04-08           |
| 3  | Broadband Preamplifier                      | COMPLIANCE DIRECTION | PAP-1G18    | 2004        | 2017-04-13            | 2018-04-12           |
| 4  | Coaxial Cable (above 1GHz)                  | Top                  | 1GHz-18GHz  | EW02014-7   | 2017-04-13            | 2018-04-12           |
| 5  | Spectrum Analyzer                           | R&S                  | FSP40       | 100501      | 2017-10-20            | 2018-10-19           |
| 6  | Broad-band Horn Antenna(18-40GHz)           | SCHWARZBECK          | BBHA 9170   | BBHA9170651 | 2017-10-25            | 2018-10-24           |
| 7  | Microwave Broadband Preamplifier (18-40GHz) | SCHWARZBECK          | BBV 9721    | 100472      | 2017-10-25            | 2018-10-24           |
| 8  | Cable                                       | Top                  | 18-40GHz    | -           | 2017-10-25            | 2018-10-24           |
| 3m Semi-anechoic Chamber for Radiation Emissions |   |                      |             |             |                       |                      |
| Item   | Equipment                                   | Manufacturer         | Model No.   | Serial No   | Last Calibration Date | Calibration Due Date |
| 1  | Test Receiver                               | R&S                  | ESCI        | 101296      | 2017-04-13            | 2018-04-12           |
| 2  | Trilog Broadband Antenna                    | SCHWARZBECK          | VULB9160    | 9160-3325   | 2017-04-13            | 2018-04-12           |
| 3  | Active Loop Antenna                         | Beijing Dazhi        | ZN30900A    | -           | 2017-04-09            | 2018-04-08           |
| 4  | Amplifier                                   | ANRITSU              | MH648A      | M43381      | 2017-04-13            | 2018-04-12           |
| 5  | Cable                                       | HUBER+SUHNER         | CBL2        | 525178      | 2017-04-13            | 2018-04-12           |
| 6  | Coaxial Cable (below 1GHz)                  | Top                  | TYPE16(13M) | -           | 2017-09-12            | 2018-09-11           |
| RF Conducted Testing                             |   |                      |             |             |                       |                      |
| Item   | Equipment                                   | Manufacturer         | Model No.   | Serial No.  | Last Calibration Date | Calibration Due Date |
| 1  | Spectrum Analyzer                           | R&S                  | FSP30       | 100091      | 2017-04-29            | 2018-04-28           |

### 5.2 Measurement Uncertainty

| Test Item                   | Frequency Range | Uncertainty | Note |
|-----------------------------|-----------------|-------------|------|
| Radiated Spurious Emissions | 30MHz~1000MHz   | ±5.03dB     | (1)  |
|                             | 1000M~6000MHz   | ± 5.47 dB   | (1)  |

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

## 6 Test Summary

| Test Items   | Test Requirement                 | Result |
|--|----------------------------------|--------|
| Conducted Emissions  | 15.207                           | N/A*   |
| Radiated Spurious Emissions  | 15.205(a)<br>15.209<br>15.231(a) | Pass   |
| Periodic Operation   | 15.231(a)                        | Pass   |
| Emission Bandwidth   | 15.231(c)                        | Pass   |
| Antenna Requirement  | 15.203                           | Pass   |
| RF Exposure  | 1.1307(b)(1)                     | Pass   |
| Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable<br>*: The EUT is only powered by battery, no need to evaluate AC Power Conducted Emission. |                                  |        |



## 7 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.231(a), 15.209, 15.205

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (uV/m) | Field Strength of Fundamental (dBUV/m) | Field Strength of Spurious Emission (uV/m) | Field Strength of Spurious Emission (dBUV/m) |
|-----------------------------|--------------------------------------|--|--|--|
| 44.66-40.70                 | 2250                                 | 67                                     | 225  | 47   |
| 70-130                      | 1250                                 | 62                                     | 125  | 42   |
| 130-174                     | 1250 to 3750*                        | 62 to 71.48*                           | 125 to 375*                                | 42 to 51.48*                                 |
| 174-260                     | 3750                                 | 71.48                                  | 375  | 51.48  |
| 260-470                     | 3750 to 12500*                       | 71.48 to 81.94*                        | 375 to 1250*                               | 51.48 to 61.94*                              |
| Above 470                   | 12500                                | 81.94                                  | 1250                                       | 61.94  |
| * linear interpolations     |                                      |  |  |  |

### 7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

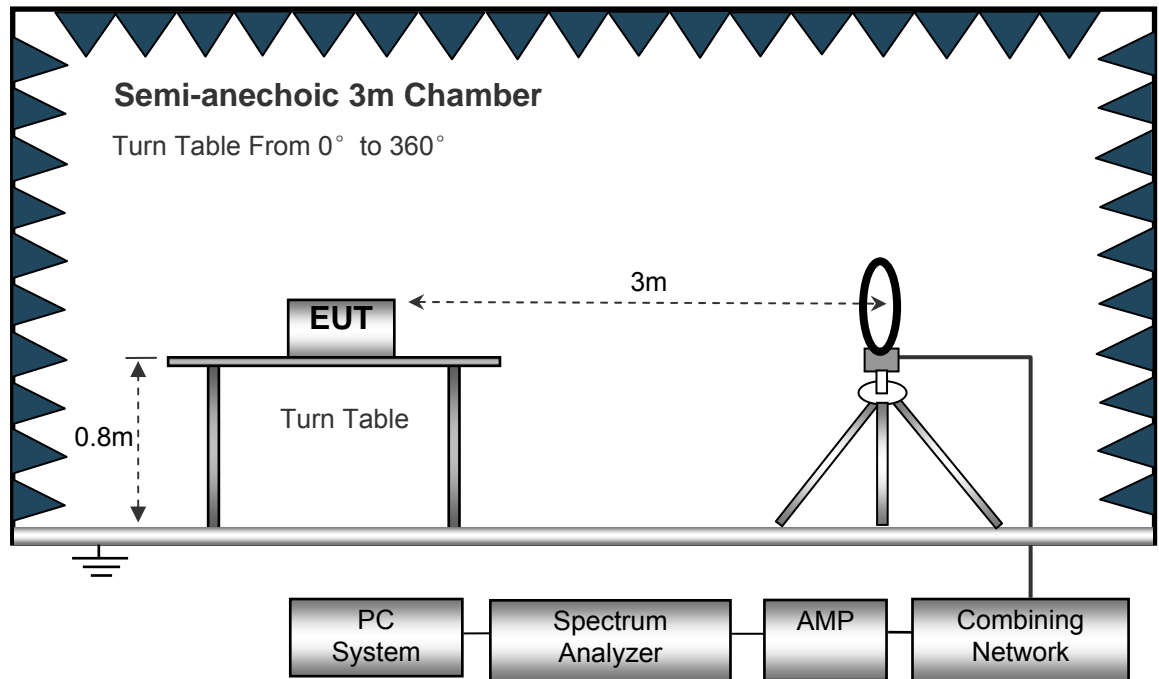
EUT Operation :

The test was performed in Transmitting mode, the test data were shown in the report.

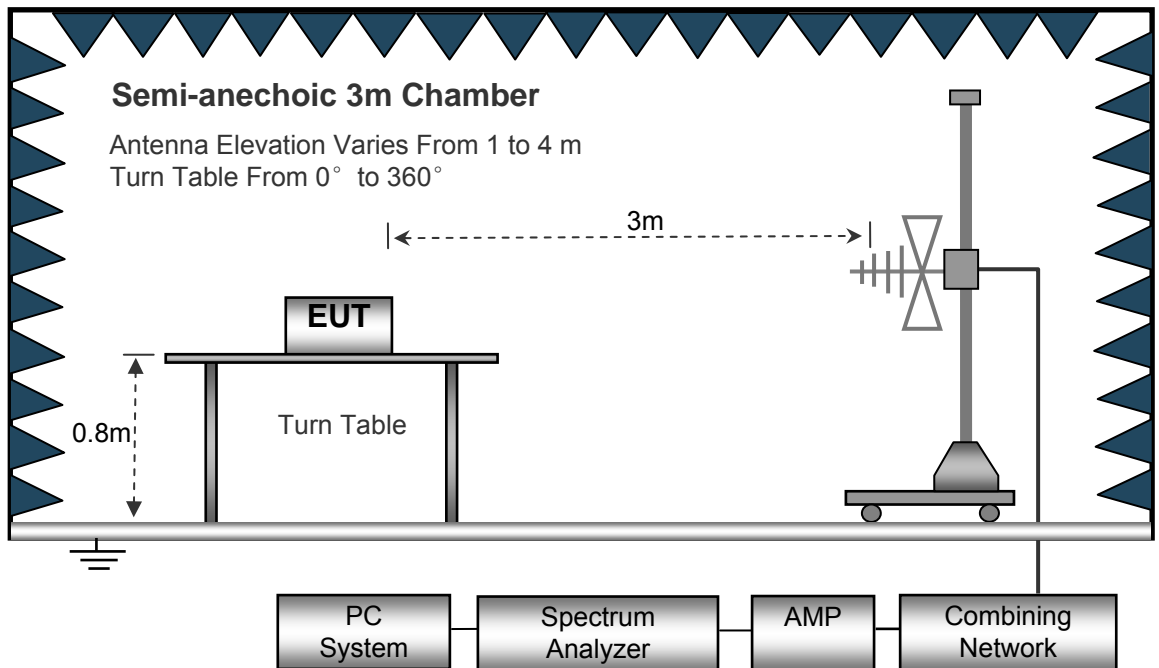
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

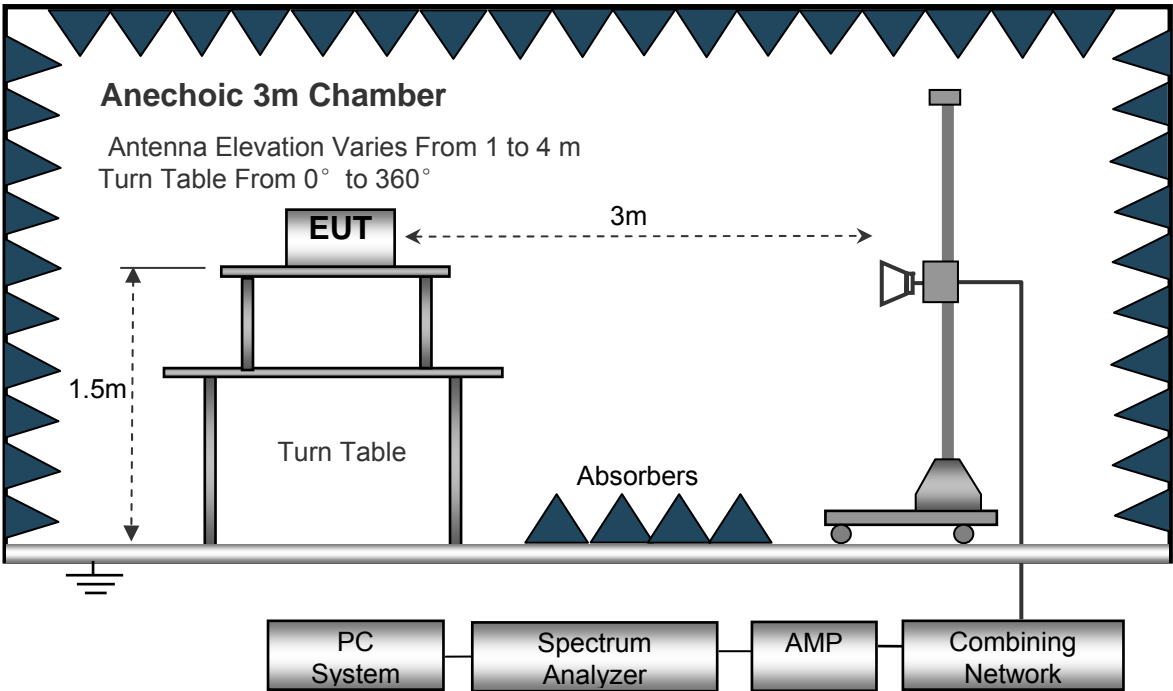
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



**7.3 Spectrum Analyzer Setup**

Below 30MHz

- Sweep Speed .....Auto
- IF Bandwidth.....10kHz
- Video Bandwidth.....10kHz
- Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

- Sweep Speed .....Auto
- Detector .....PK
- Resolution Bandwidth.....100kHz
- Video Bandwidth.....300kHz

Above 1GHz

- Sweep Speed .....Auto
- Detector .....PK
- Resolution Bandwidth.....1MHz
- Video Bandwidth.....3MHz

## 7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 7.5 Summary of Test Results

### Test Frequency: 9 kHz~30 MHz

The measurements were more than 20 dB below the limit and not reported.

### Test Frequency: 30MHz ~ 5GHz

#### Test Channel: 433.92MHz

| Frequency | Receiver Reading (PK) | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude (PK) | FCC Part 15.231/15.209/205 |        |
|-----------|-----------------------|------------------|------------|-------|------------------|--------------------------|----------------------------|--------|
|           |                       |                  | Height     | Polar |                  |                          | Limit                      | Margin |
| (MHz)     | (dBμV)                | Degree           | (m)        | (H/V) | (dB/m)           | (dBμV/m)                 | (dBμV/m)                   | (dB)   |
| 433.92    | 95.70                 | 321              | 1.9        | H     | -7.47            | 88.23                    | 100.83                     | -12.60 |
| 433.92    | 73.81                 | 270              | 1.5        | V     | -7.47            | 66.34                    | 100.83                     | -34.49 |
| 867.84    | 62.33                 | 226              | 1.2        | H     | 1.57             | 63.90                    | 80.83                      | -16.93 |
| 867.84    | 51.16                 | 278              | 1.9        | V     | 1.57             | 52.73                    | 80.83                      | -28.10 |
| 1300.13   | 78.22                 | 239              | 1.8        | H     | -17.29           | 60.93                    | 74.00                      | -13.07 |
| 1300.13   | 67.85                 | 312              | 1.0        | V     | -17.29           | 50.56                    | 74.00                      | -23.44 |
| 3040.23   | 58.95                 | 85               | 1.1        | H     | -12.73           | 46.22                    | 74.00                      | -27.78 |
| 3040.23   | 57.40                 | 268              | 1.8        | V     | -12.73           | 44.67                    | 74.00                      | -29.33 |

**AV = Peak +20Log<sub>10</sub> (duty cycle) =PK+ (-13.76)** [refer to section 8 for more detail]

| Frequency | PK       | RX Antenna Polar | Duty cycle Factor | Calculated AV | FCC Part 15.231/209/205 |        |
|-----------|----------|------------------|-------------------|---------------|-------------------------|--------|
|           |          |                  |                   |               | Limit                   | Margin |
| (MHz)     | (dBμV/m) | (H/V)            | (dB)              | (dBμV/m)      | (dBμV/m)                | (dB)   |
| 433.92    | 83.23    | H                | -13.76            | 74.47         | 80.83                   | -6.36  |
| 433.92    | 66.34    | V                | -13.76            | 52.58         | 80.83                   | -28.25 |
| 867.84    | 63.90    | H                | -13.76            | 50.14         | 60.83                   | -10.69 |
| 867.84    | 52.73    | V                | -13.76            | 38.97         | 60.83                   | -21.86 |
| 1816.80   | 50.56    | H                | -13.76            | 47.17         | 54.00                   | -6.83  |
| 1816.80   | 55.39    | V                | -13.76            | 36.80         | 54.00                   | -17.20 |
| 2725.20   | 50.15    | H                | -13.76            | 32.46         | 54.00                   | -21.54 |
| 2725.20   | 46.22    | V                | -13.76            | 30.91         | 54.00                   | -23.09 |

## 8 Periodic Operation

The duty cycle was determined by the following equation:

To calculate the actual field intensity, The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

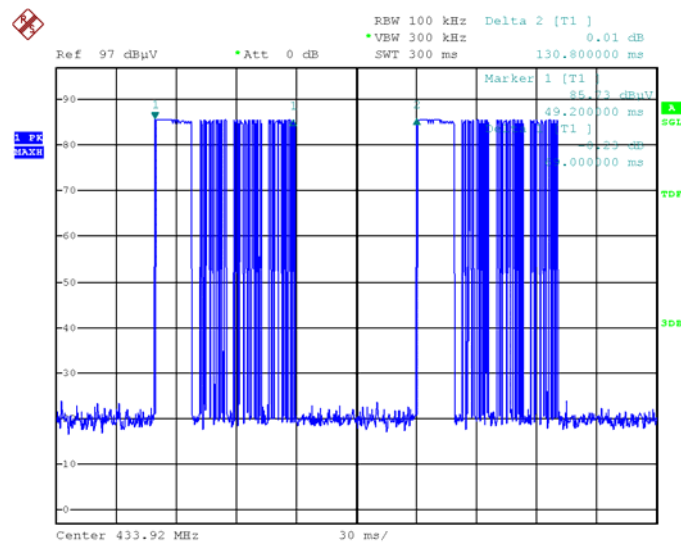
Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train \* %

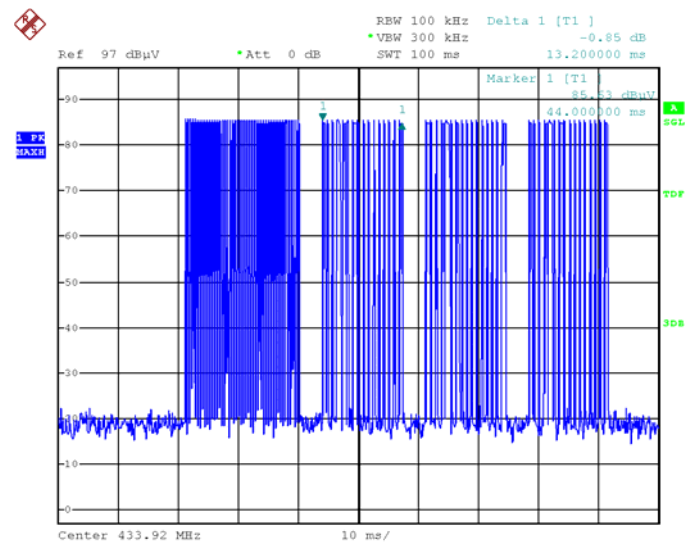
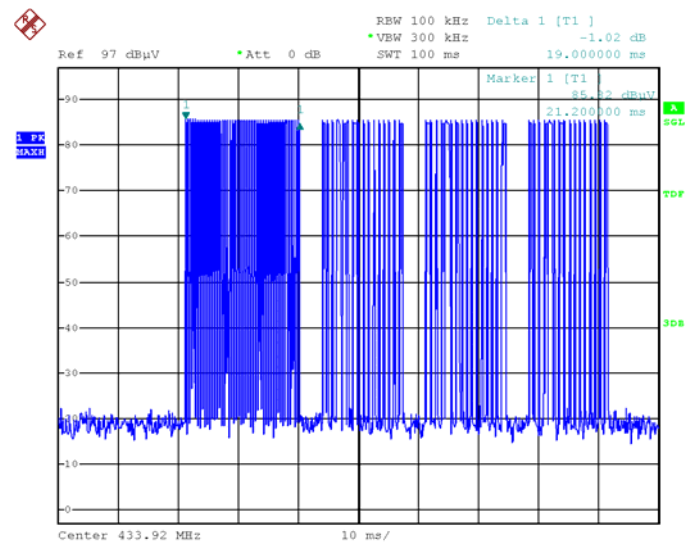
Duty Cycle Correction Factor(dB)=20 \* Log<sub>10</sub>(Duty Cycle(%))

|  |                                  |
|--|----------------------------------|
| Total transmission time(ms)                  | 0.18*47+0.12*11*3+0.54*5*3=20.52 |
| Length of a complete transmission period(ms) | 100.00*                          |
| Duty Cycle(%)                                | 20.52                            |
| Duty Cycle Correction Factor(dB)             | -13.76                           |

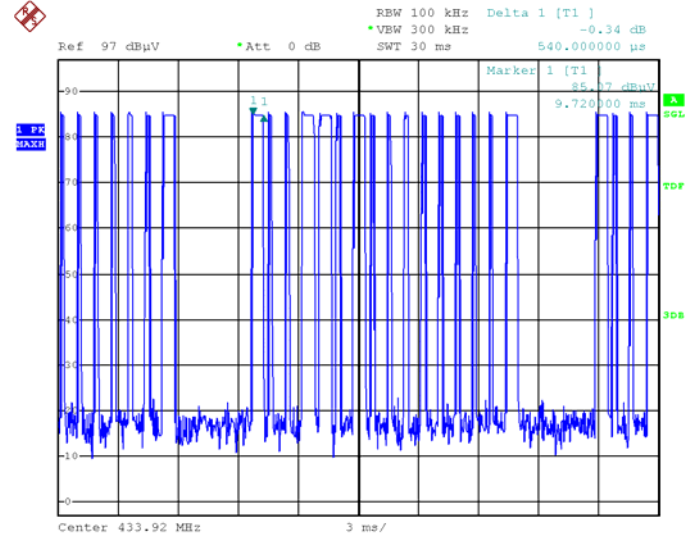
(\* Note: the transmitter operates for longer than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. So the Length of a complete transmission period=100ms)

Refer to the duty cycle plot (as below)

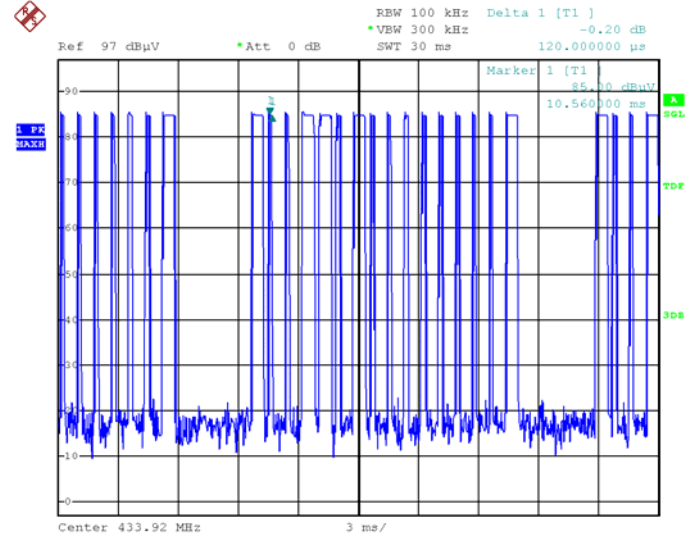




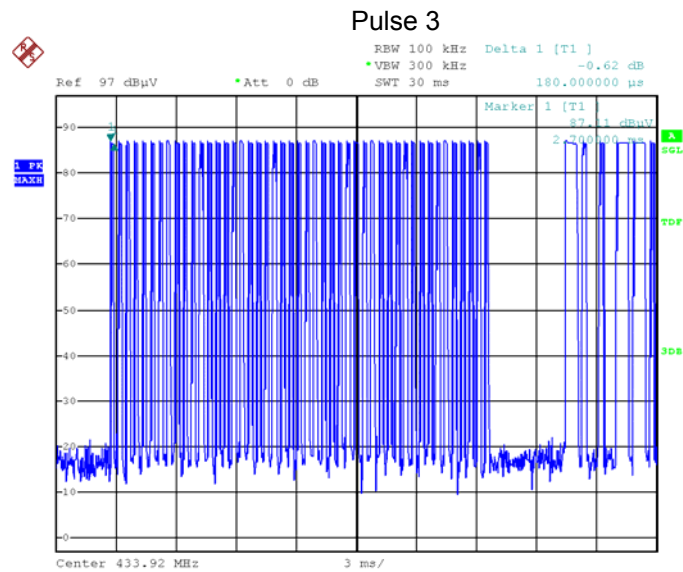
Pulse 1



Pulse 2

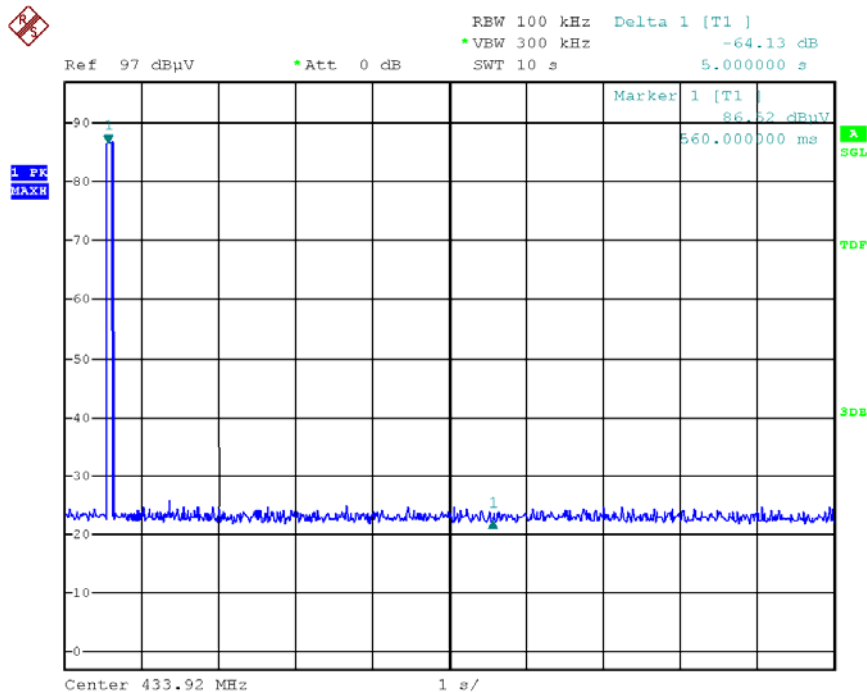






FCC Part15.231 (a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2)A transmitter activated automatically shall cease transmission within 5 seconds after activation.



## 9 Emission Bandwidth

Test Requirement: FCC Part15.231(c)

Test Method: FCC Part15.231(c)

Limit 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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

### 9.1 Test Procedure

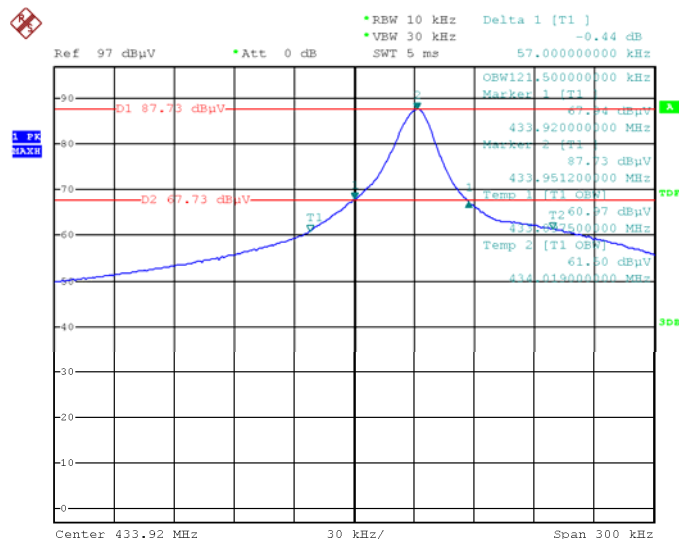
1. The transmitter output (antenna port) was connected to the spectrum analyzer. EUT and its simulators are placed on a table, let EUT working in test mode, then test it.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 10 kHz RBW and 30 kHz VBW. The 20 dB bandwidth was recorded.

### 9.2 Test Result

| Frequency (MHz) | 20dB Bandwidth Emission(kHz) | Limit (kHz) | Result     |
|-----------------|------------------------------|-------------|------------|
| 433.92          | 57.00                        | 1084.80     | Compliance |

Limit=Center Frequency\*0.25%

Test Plot



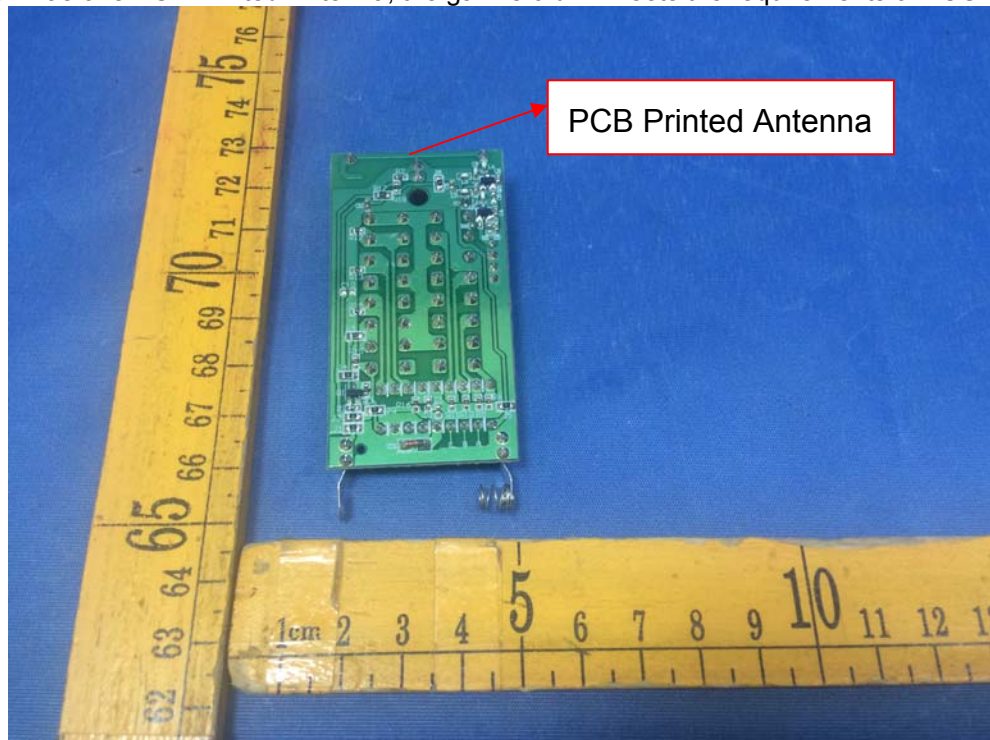
## 10 Antenna Requirement

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 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.

Result:

The EUT has one PCB Printed Antenna, the gain is 0 dBi. meets the requirements of FCC 15.203.



## **11 FCC ID: PAG-TR028S RF Exposure Report**

Note: Please refer to RF Exposure report: WTD18S02102571-2W.

## **12 Photographs – Model TR-028S Test Setup Photos**

Note: Please refer to Photos: WTD18S02102571-3W.

## **13 Photographs - Constructional Details**

### **13.1 Model TR-028S - External Photos**

Note: Please refer to Photos: WTD18S02102571-3W.

### **13.2 Model TR-028S - Internal Photos**

Note: Please refer to Photos: WTD18S02102571-3W.

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