



# FCC Part 15C Test Report

## FCC ID: 2A003-0604

Applicant: Ningbo Aipulan Lighting Technology CO.,Ltd.

Address: No.2, Lane 282, Baishan, Road Wumei Village, Henghe Town, Zhejiang, China

Manufacturer: Ningbo Aipulan Lighting Technology CO.,Ltd.

Address: No.2, Lane 282, Baishan, Road Wumei Village, Henghe Town, Zhejiang, China

EUT: Wireless Remote Control Socket

Trade Mark: N/A

Model Number: ES1513U  
ES182U, ES9939U, ES9938U, ES186U

Date of Receipt: Mar. 27, 2023

Test Date: Mar. 27, 2023 – Mar. 31, 2023

Date of Report: Mar. 31, 2023

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Applicable Standards: FCC PART 15 C 15.231  
ANSI C63.10:2013

Test Result: Pass

Report Number: DL-20230331054E

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*This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.*



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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.231) , Subpart C |                                                     |          |        |
|---------------------------------|-----------------------------------------------------|----------|--------|
| Standard Section                | Test Item                                           | Judgment | Remark |
| 15.207                          | Conducted Emission                                  | N/A      |        |
| 15.209,15.231b                  | Fundamental &Radiated Spurious Emission Measurement | PASS     |        |
| 15.231a                         | Dwell time                                          | PASS     |        |
| 15.215                          | 20dB Bandwidth                                      | PASS     |        |
| 15.203                          | Antenna Requirement                                 | PASS     |        |

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

### 1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| No. | Item                         | Uncertainty               |
|-----|------------------------------|---------------------------|
| 1   | Conducted Emission Test      | $\pm 2.56\text{dB}$       |
| 2   | RF power,conducted           | $\pm 0.42\text{dB}$       |
| 3   | Spurious emissions,conducted | $\pm 2.76\text{dB}$       |
| 4   | All emissions,radiated(<1G)  | $\pm 3.65\text{dB}$       |
| 5   | All emissions,radiated(>1G)  | $\pm 4.89\text{dB}$       |
| 6   | Temperature                  | $\pm 0.5^{\circ}\text{C}$ |
| 7   | Humidity                     | $\pm 2\%$                 |



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |                                                                 |
|------------------------|-----------------------------------------------------------------|
| Product Name:          | Wireless Remote Control Socket                                  |
| Trademark              | N/A                                                             |
| Model No.:             | ES1513U<br>ES182U, ES9939U, ES9938U, ES186U                     |
| Model Difference       | The product's different for model number and Socket appearance. |
| Operation Frequency:   | 433.92MHz                                                       |
| Channel numbers:       | 1 Channels                                                      |
| Modulation technology: | FSK                                                             |
| Antenna Type:          | Internal Antenna                                                |
| Antenna gain:          | 0.53dBi                                                         |
| Power supply:          | TX: DC 12V from battery<br>RX: 120V~, 60Hz 10A                  |

Note:

- 1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.The EUT's all information provided by client.

### 2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode                                 | Description |
|----------------------------------------------|-------------|
| Mode 1                                       | TX Mode     |
| <b>For Conducted &amp; Radiated Emission</b> |             |
| Final Test Mode                              | Description |
| Mode 1                                       | TX Mode     |

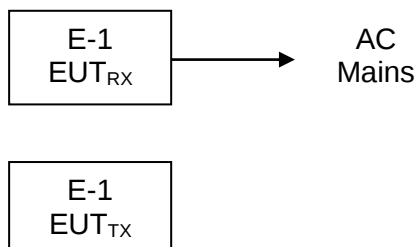
Note:

- (1) New battery is used during the test



### 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



### 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment                      | Model/Type No. | Series No. | Note |
|------|--------------------------------|----------------|------------|------|
| E-1  | Wireless Remote Control Socket | ES1513U        | N/A        | EUT  |
|      |                                |                |            |      |
|      |                                |                |            |      |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
|      |               |              |        |      |

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

### 2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

None.



## 2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

### Radiation test, Band-edge test and 20db bandwidth test equipment

| Item | Equipment                        | Manufacturer    | Type No.  | Serial No. | Last calibration | Calibrated until |
|------|----------------------------------|-----------------|-----------|------------|------------------|------------------|
| 1    | Spectrum Analyzer (9kHz-26.5GHz) | Agilent         | E4408B    | MY50140780 | Nov. 05, 2022    | Nov. 04, 2023    |
| 2    | Test Receiver (9kHz-7GHz)        | R&S             | ESRP7     | 101393     | Nov. 05, 2022    | Nov. 04, 2023    |
| 3    | Bilog Antenna (30MHz-1GHz)       | R&S             | VULB9162  | 00306      | Nov. 05, 2022    | Nov. 04, 2023    |
| 4    | Horn Antenna (1GHz-18GHz)        | Schwarzbeck     | BBHA9120D | 02139      | Nov. 05, 2022    | Nov. 04, 2023    |
| 5    | Horn Antenna (18GHz-40GHz)       | A.H. Systems    | SAS-574   | 588        | Nov. 05, 2022    | Nov. 04, 2023    |
| 6    | Amplifier (9KHz-6GHz)            | Schwarzbeck     | BBV9743B  | 00153      | Nov. 05, 2022    | Nov. 04, 2023    |
| 7    | Amplifier (1GHz-18GHz)           | EMEC            | EM01G8GA  | 00270      | Nov. 05, 2022    | Nov. 04, 2023    |
| 8    | Amplifier (18GHz-40GHz)          | Quanjuda        | DLE-161   | 97         | Nov. 05, 2022    | Nov. 04, 2023    |
| 9    | Loop Antenna (9KHz-30MHz)        | Schwarzbeck     | FMZB1519B | 00014      | Nov. 05, 2022    | Nov. 04, 2023    |
| 10   | RF cables1 (9kHz-1GHz)           | ChengYu         | 966       | 004        | Nov. 05, 2022    | Nov. 04, 2023    |
| 11   | RF cables2 (1GHz-40GHz)          | ChengYu         | 966       | 003        | Nov. 05, 2022    | Nov. 04, 2023    |
| 12   | Antenna connector                | Florida RF Labs | N/A       | RF 01#     | Nov. 05, 2022    | Nov. 04, 2023    |
| 13   | Power probe                      | KEYSIGHT        | U2021XA   | MY55210018 | Nov. 05, 2022    | Nov. 04, 2023    |
| 14   | Signal Analyzer 9kHz-26.5GHz     | Agilent         | N9020A    | MY55370280 | Nov. 05, 2022    | Nov. 04, 2023    |
| 15   | Test Receiver 20kHz-40GHz        | R&S             | ESU 40    | 100376     | Nov. 05, 2022    | Nov. 04, 2023    |
| 16   | D.C. Power Supply                | LongWei         | PS-305D   | 010964729  | Nov. 05, 2022    | Nov. 04, 2023    |

### Conduction Test equipment

| Item | Equipment         | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|------------------|
| 1    | 843 Shielded Room | ChengYu      | 843 Room | 843        | Sep. 20, 2022    | Sep. 19, 2025    |
| 2    | EMI Receiver      | R&S          | ESR      | 101421     | Nov. 05, 2022    | Nov. 04, 2023    |
| 3    | LISN              | R&S          | ENV216   | 102417     | Nov. 05, 2022    | Nov. 04, 2023    |
| 4    | 843 Cable 1#      | ChengYu      | CE Cable | 001        | Nov. 05, 2022    | Nov. 04, 2023    |

### Other

| Item | Name                         | Manufacturer | Model   | Software version |
|------|------------------------------|--------------|---------|------------------|
| 1    | EMC Conduction Test System   | FALA         | EZ_EMCC | EMC-CON 3A1.1    |
| 2    | EMC radiation test system    | FALA         | EZ_EMCC | FA-03A2          |
| 3    | RF test system               | MAIWEI       | MTS8310 | 2.0.0.0          |
| 4    | RF communication test system | MAIWEI       | MTS8200 | 2.0.0.0          |



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | Limit (dBuV) |           | Standard |
|-----------------|--------------|-----------|----------|
|                 | Quasi-peak   | Average   |          |
| 0.15 -0.5       | 66 - 56 *    | 56 - 46 * | FCC      |
| 0.50 -5.0       | 56.00        | 46.00     | FCC      |
| 5.0 -30.0       | 60.00        | 50.00     | FCC      |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

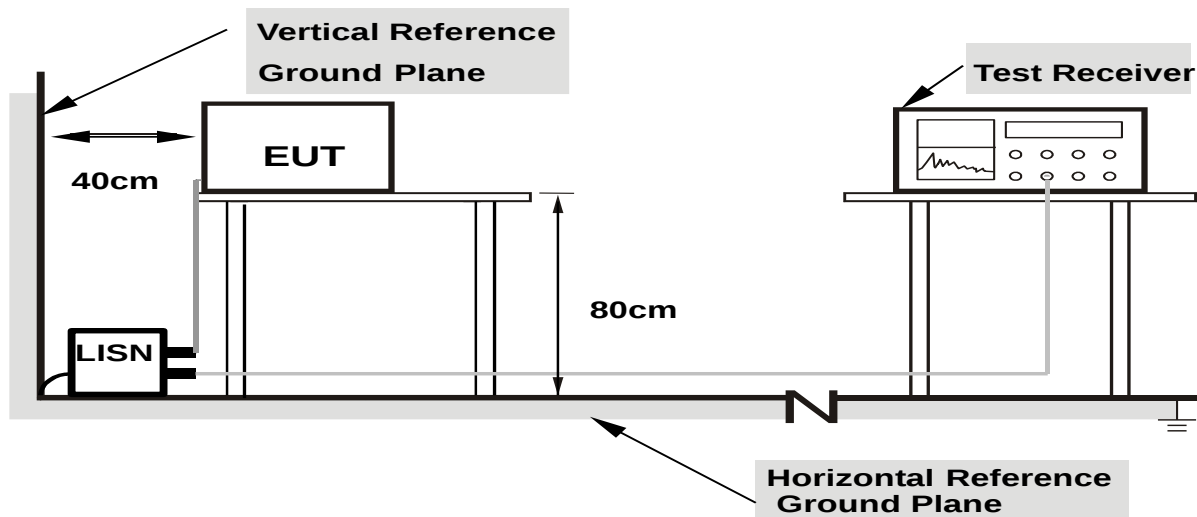
##### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



- Note:**
- 1.Support units were connected to second LISN.
  - 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

### 3.1.6 TEST RESULTS

The EUT is powered by DC, no requirements for this item.

**3.2 RADIATED EMISSION MEASUREMENT****3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)**

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009~0.490     | 2400/F(KHz)                       | 300                           |
| 0.490~1.705     | 24000/F(KHz)                      | 30                            |
| 1.705~30.0      | 30                                | 30                            |
| 30~88           | 100                               | 3                             |
| 88~216          | 150                               | 3                             |
| 216~960         | 200                               | 3                             |
| Above 960       | 500                               | 3                             |

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental Frequency | Field Strength of Fundamental (millivolts/meter) | Field Strength of Harmonics (microvolts/meter) |
|-----------------------|--------------------------------------------------|------------------------------------------------|
| 40.66-40.70 MHz       | 2250                                             | 225                                            |
| 70-130 MHz            | 1250                                             | 125                                            |
| 130-174 MHz           | 1250-3750**                                      | 1250-375**                                     |
| 174-260 MHz           | 3750                                             | 375                                            |
| 260-470 MHz           | 3750-12500**                                     | 3750-1250**                                    |
| Above 470 MHz         | 12500                                            | 1250                                           |

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

**LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)**

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).



Receiver setup:

| Frequency    | Detector   | RBW    | VBW    | Value      |
|--------------|------------|--------|--------|------------|
| 9KHz-150KHz  | Quasi-peak | 200Hz  | 600Hz  | Quasi-peak |
| 150KHz-30MHz | Quasi-peak | 9KHz   | 30KHz  | Quasi-peak |
| 30MHz-1GHz   | Quasi-peak | 100KHz | 300KHz | Quasi-peak |
| Above 1GHz   | Peak       | 1MHz   | 3MHz   | Peak       |
|              | Peak       | 1MHz   | 10Hz   | Average    |

### 3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre( Above 18GHz the distance is 1 meter and table is 1.5 metre).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

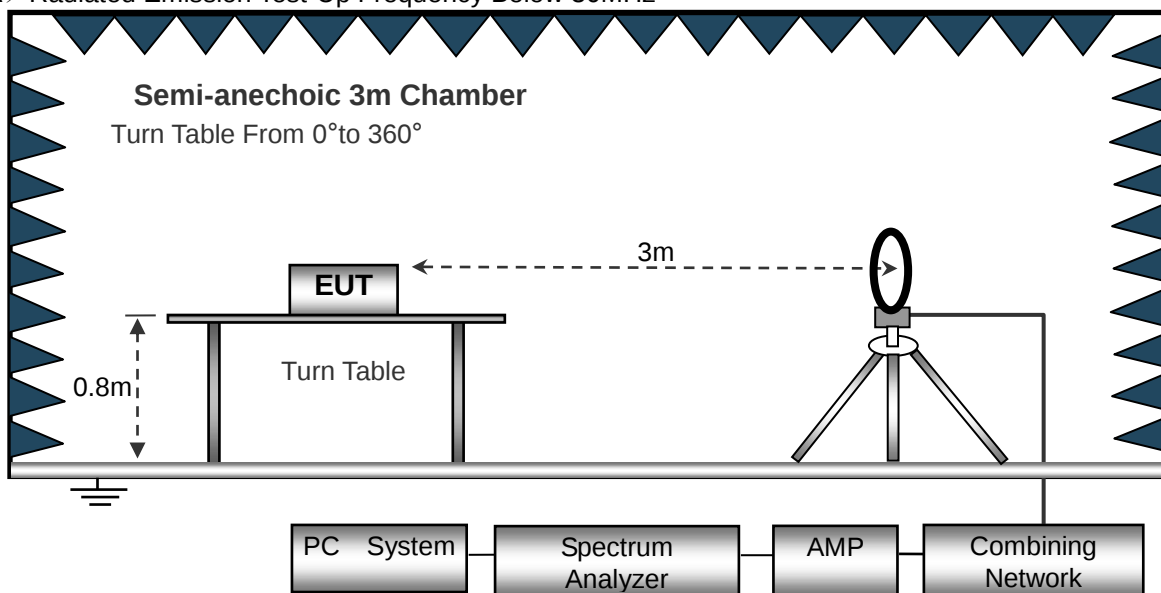
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

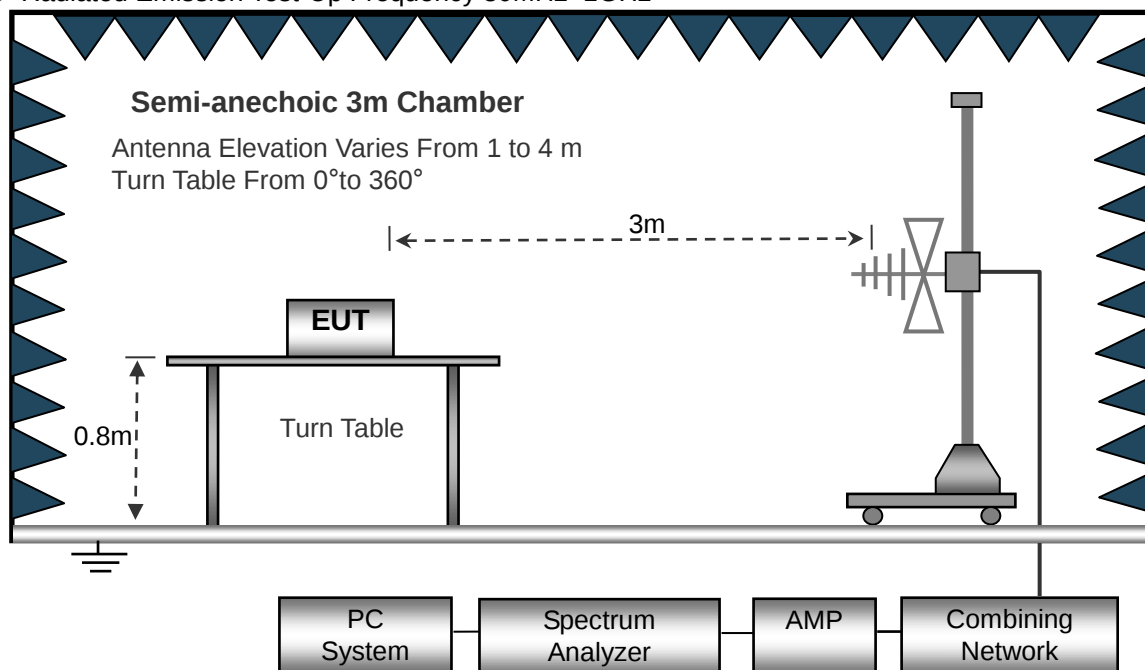
No deviation

### 3.2.4 TEST SETUP

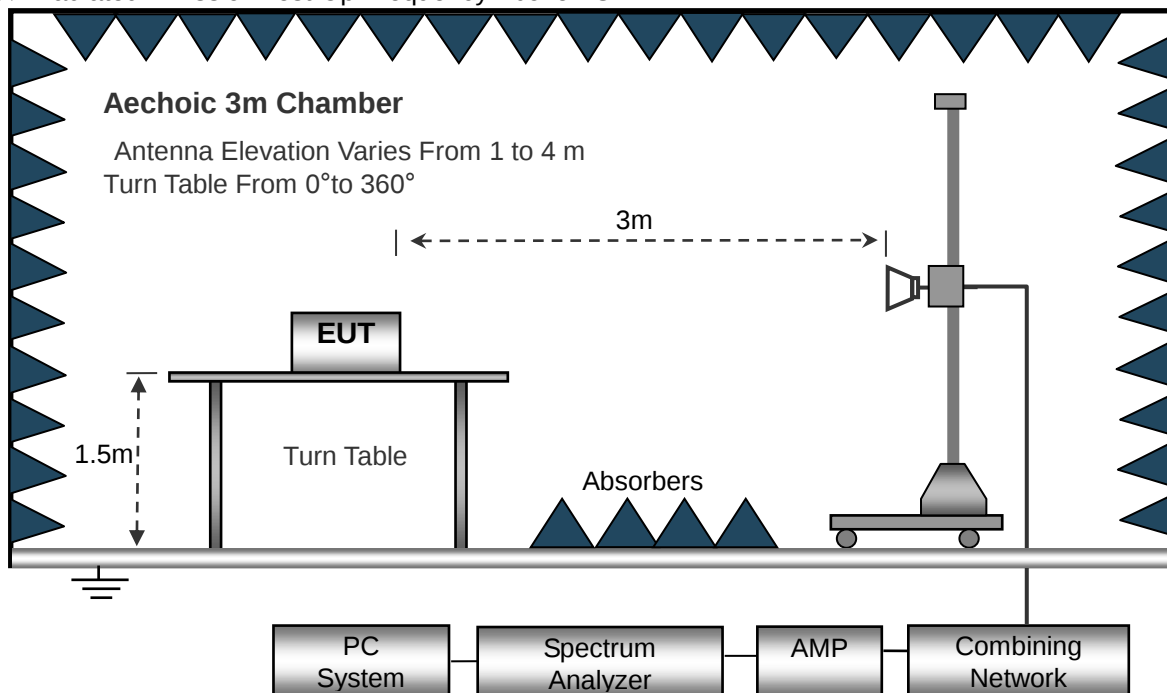
#### (A) Radiated Emission Test-Up Frequency Below 30MHz



#### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



## (C) Radiated Emission Test-Up Frequency Above 1GHz

**3.2.5 EUT OPERATING CONDITIONS**

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

**3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)**

|              |          |                    |        |
|--------------|----------|--------------------|--------|
| Temperature: | 20℃      | Relative Humidity: | 48%    |
| Pressure:    | 1010 hPa | Test Voltage :     | DC 12V |
| Test Mode :  | Mode 1   | Polarization :     | --     |

| Freq. | Reading  | Limit    | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |
| --    | --       | --       | --     | PASS  |
| --    | --       | --       | --     | PASS  |

**NOTE:**

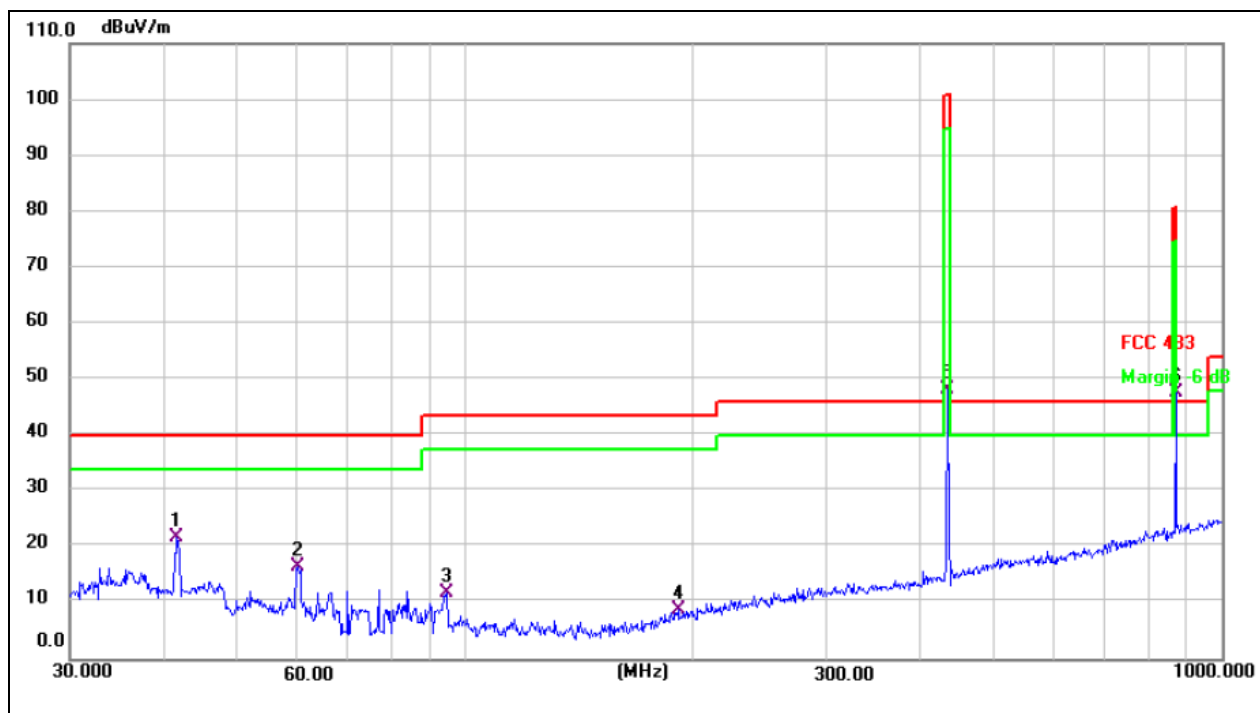
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

**3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)**

|                |          |                    |            |
|----------------|----------|--------------------|------------|
| Temperature:   | 26℃      | Relative Humidity: | 54%        |
| Pressure:      | 1010 hPa | Polarization :     | Horizontal |
| Test Voltage : | DC 12V   |                    |            |
| Test Mode :    | Mode 1   |                    |            |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Margin |          |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dB/m   | dB     | Detector |
| 1   | *   | 41.5670  | 39.47         | -17.70         | 21.77        | 40.00  | -18.23 | QP       |
| 2   |     | 60.0690  | 33.63         | -17.05         | 16.58        | 40.00  | -23.42 | QP       |
| 3   |     | 94.4282  | 33.06         | -21.23         | 11.83        | 43.50  | -31.67 | QP       |
| 4   |     | 191.0738 | 29.18         | -20.11         | 9.07         | 43.50  | -34.43 | QP       |
| 5   |     | 433.9200 | 62.43         | -14.11         | 48.32        | 100.80 | -52.48 | Peak     |
| 6   |     | 867.8400 | 54.46         | -6.85          | 47.61        | 80.80  | -33.19 | Peak     |

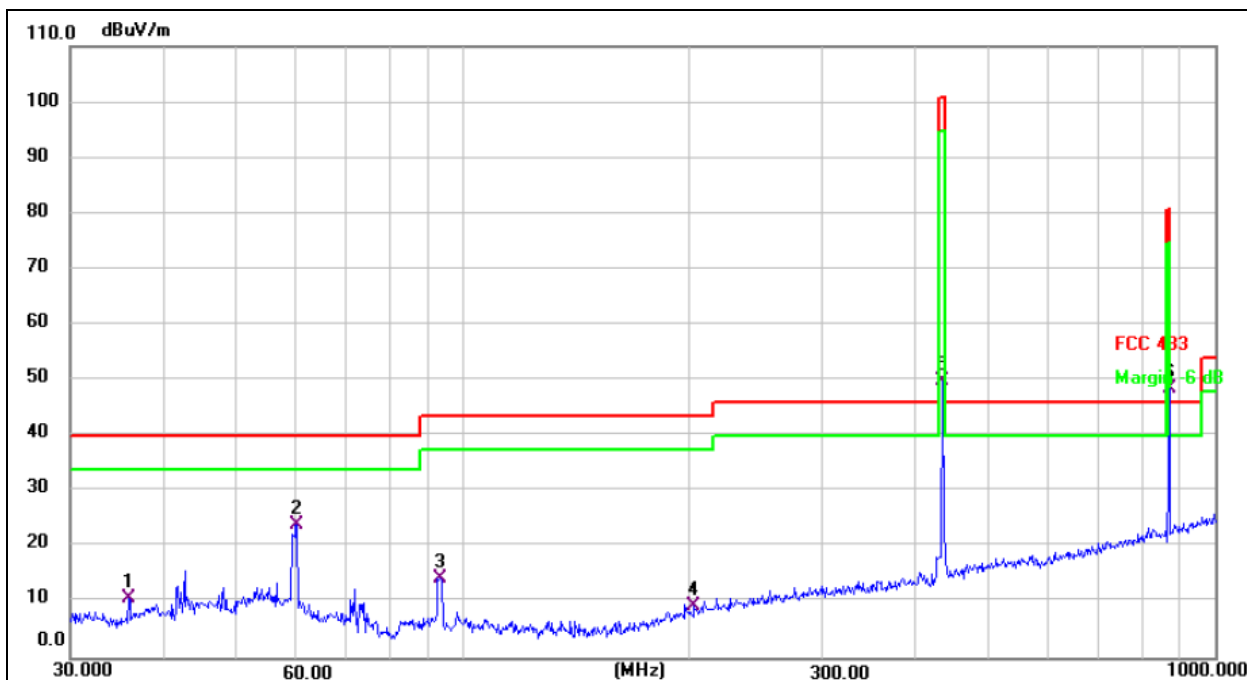
Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Level - Limit;



|                |          |                    |          |
|----------------|----------|--------------------|----------|
| Temperature:   | 26℃      | Relative Humidity: | 54%      |
| Pressure:      | 1010 hPa | Polarization :     | Vertical |
| Test Voltage : | DC 12V   |                    |          |
| Test Mode :    | Mode 1   |                    |          |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measure-ment | Limit  | Margin | Detector |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dB             | dBuV/m       | dB/m   | dB     |          |
| 1   |     | 35.8746  | 30.03         | -19.10         | 10.93        | 40.00  | -29.07 | QP       |
| 2   | *   | 60.0690  | 42.04         | -17.85         | 24.19        | 40.00  | -15.81 | QP       |
| 3   |     | 93.1131  | 35.27         | -20.88         | 14.39        | 43.50  | -29.11 | QP       |
| 4   |     | 202.8103 | 28.68         | -19.16         | 9.52         | 43.50  | -33.98 | QP       |
| 5   |     | 433.9200 | 63.05         | -13.15         | 49.90        | 100.80 | -50.90 | Peak     |
| 6   |     | 867.8400 | 54.24         | -5.67          | 48.57        | 80.80  | -32.23 | Peak     |

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Level - Limit;



## For average Emission

| Frequency<br>MHz | Peak<br>Level<br>dBuV/m | Duty cycle<br>factor | AverageLevel<br>dBuV/m | Polarization | Limit<br>AV | Margin |
|------------------|-------------------------|----------------------|------------------------|--------------|-------------|--------|
| 433.9200         | 48.32                   | -13.98               | 34.25                  | Horizontal   | 80.8        | -46.55 |
| 867.8400         | 47.61                   | -13.98               | 33.63                  | Horizontal   | 60.8        | -27.17 |

Notes: 1. Average emission Level = Peak Level + Duty cycle factor  
2. Duty cycle level please see clause 5.

| Frequency<br>MHz | Peak<br>Level<br>dBuV/m | Duty cycle<br>factor | AverageLevel<br>dBuV/m | Polarization | Limit<br>AV | Margin |
|------------------|-------------------------|----------------------|------------------------|--------------|-------------|--------|
| 433.9200         | 49.90                   | -13.98               | 35.92                  | Vertical     | 80.8        | -44.88 |
| 867.8400         | 48.57                   | -13.98               | 34.59                  | Vertical     | 60.8        | -26.21 |

Notes: 1. Average emission Level = Peak Level + Duty cycle factor  
2. Duty cycle level please see clause 5.

**3.2.8 TEST RESULTS (1GHZ TO 10<sup>TH</sup> HARMONICS)**

| Polar<br>(H/V)             | Frequency | Peak<br>Reading<br>Level | Correct<br>Factor | Peak<br>Level | Duty<br>cycle<br>factor | Average<br>Level | Limits<br>PK | Limits<br>AV | Margin<br>PK | Margin<br>AV |
|----------------------------|-----------|--------------------------|-------------------|---------------|-------------------------|------------------|--------------|--------------|--------------|--------------|
|                            | (MHz)     | (dBuV)                   | (dB)              | (dB)          | (dB/m)                  | (dBuV/m)         | (dB)         | (dB)         |              |              |
| operation frequency:433.92 |           |                          |                   |               |                         |                  |              |              |              |              |
| V                          | 1301.76   | 31.26                    | -9.37             | 21.89         | -13.98                  | 7.91             | 74           | 54           | -52.11       | -46.09       |
| V                          | 1735.68   | 33.51                    | -9.37             | 24.14         | -13.98                  | 10.16            | 80.8         | 60.8         | -56.66       | -50.64       |
| V                          | 2169.6    | 27.19                    | -5.34             | 21.85         | -13.98                  | 7.87             | 80.8         | 60.8         | -58.95       | -52.93       |
| V                          | 2603.52   | 25.33                    | -5.34             | 19.99         | -13.98                  | 6.01             | 80.8         | 60.8         | -60.81       | -54.79       |
| V                          | 3037.44   | 25.25                    | -1.79             | 23.46         | -13.98                  | 9.48             | 80.8         | 60.8         | -57.34       | -51.32       |
| V                          | 3471.36   | 24.24                    | -1.79             | 22.45         | -13.98                  | 8.47             | 80.8         | 60.8         | -58.35       | -52.33       |
| H                          | 1301.76   | 32.13                    | -9.37             | 22.76         | -13.98                  | 8.78             | 74           | 54           | -51.24       | -45.22       |
| H                          | 1735.68   | 32.37                    | -9.37             | 23            | -13.98                  | 9.02             | 80.8         | 60.8         | -57.80       | -51.78       |
| H                          | 2169.6    | 28.16                    | -5.34             | 22.82         | -13.98                  | 8.84             | 80.8         | 60.8         | -57.98       | -51.96       |
| H                          | 2603.52   | 27.11                    | -5.34             | 21.77         | -13.98                  | 7.79             | 80.8         | 60.8         | -59.03       | -53.01       |
| H                          | 3037.44   | 24.78                    | -1.79             | 22.99         | -13.98                  | 9.01             | 80.8         | 60.8         | -57.81       | -51.79       |
| H                          | 3471.36   | 24.56                    | -1.79             | 22.77         | -13.98                  | 8.79             | 80.8         | 60.8         | -58.03       | -52.01       |

**Remark:**

1. PK Emission Level = Peak Reading Level + Correct Factor
2. Correct Factor= Antenna Factor + Cable Loss – Pre-amplifier,  
Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Notes: 1. Average emission Level = Peak Level + Duty cycle factor

2. Duty cycle level please see clause 5.

3. Pulse Desensitization Correction Factor

Pulse Width (PW) = 77ms

$2/PW = 2/77\text{ms} = 0.03\text{kHz}$

RBW (100 kHz) > 2/PW (0.03kHz)

Therefore PDCF is not needed



#### 4. BANDWIDTH TEST

##### 4.1 APPLIED PROCEDURES / LIMIT

| FCC PART 15 C 15.215 |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 15.231C              | <p>The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.</p> <p>B.W (20dBc) Limit = <math>0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1.0848\text{MHz}</math></p> |

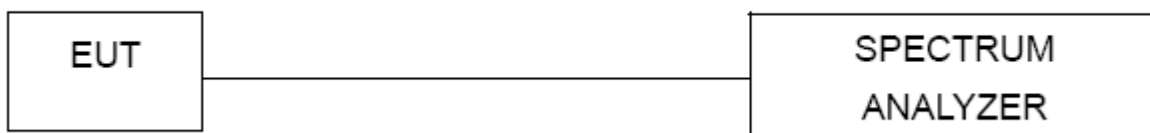
##### 4.1.1 TEST PROCEDURE

1. Set RBW = 30 kHz.
2. Set VBW = 100 kHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

##### 4.1.2 DEVIATION FROM STANDARD

No deviation.

##### 4.1.3 TEST SETUP



##### 4.1.4 EUT OPERATION CONDITIONS

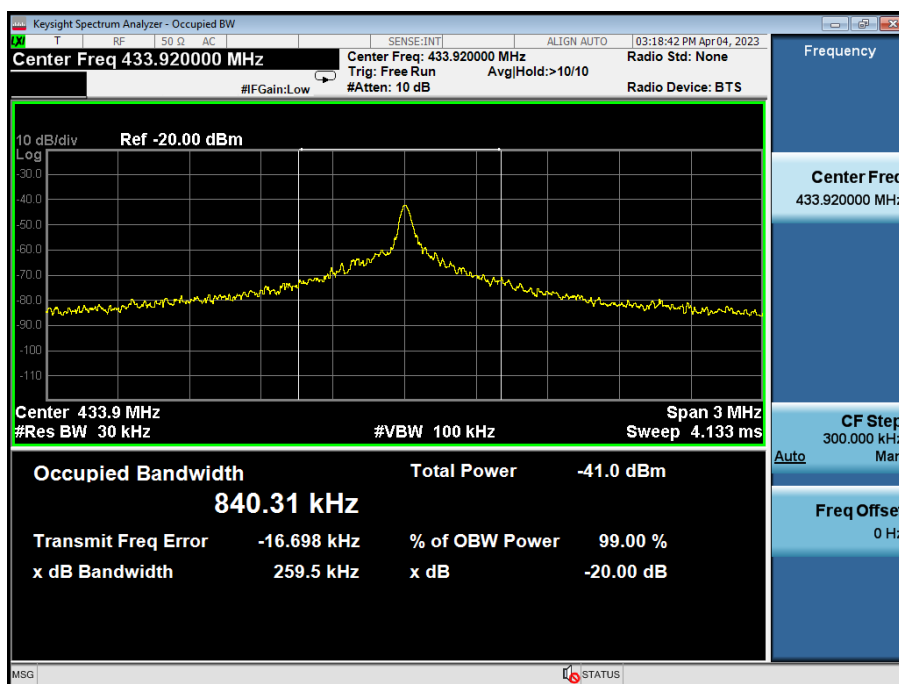
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



## 4.1.5 TEST RESULTS

| Frequency (MHz) | 20dB Bandwidth (MHz) | Result |
|-----------------|----------------------|--------|
| 433.92          | 0.2595               | Pass   |

## FSK





## 5. CALCULATION OF AVERAGE FACTOR

### 5.1 APPLIED PROCEDURES / LIMIT

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

#### 5.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz.
3. Detector = Peak.
4. Sweep = auto couple.
5. Allow the trace to stabilize.

#### 5.1.2 TEST SETUP



#### 5.1.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



### 5.1.4 TEST RESULTS

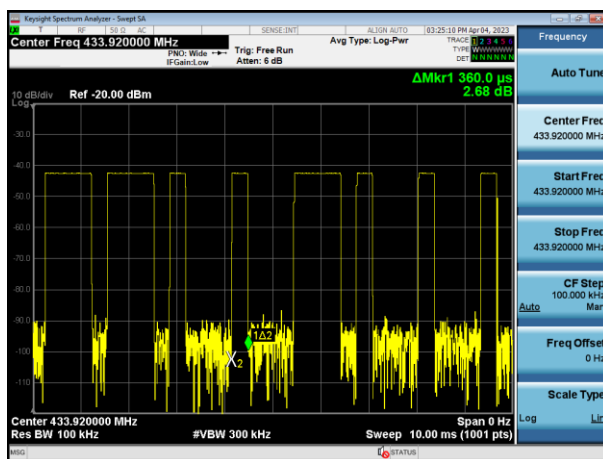
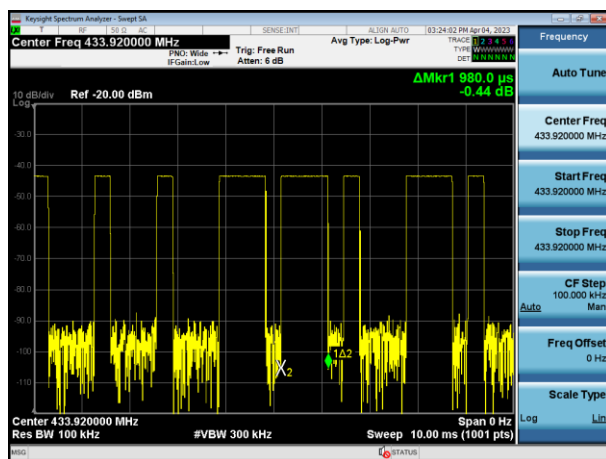
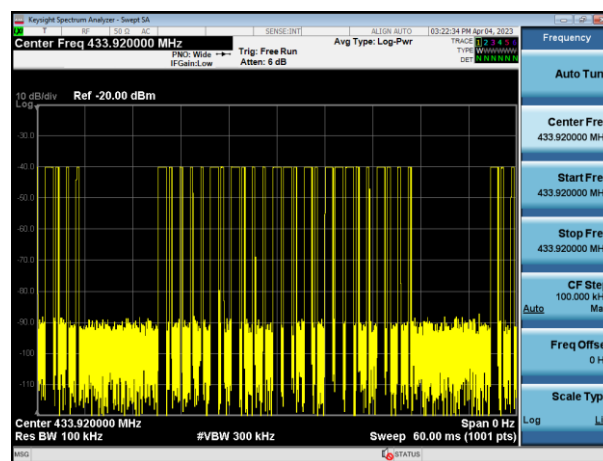
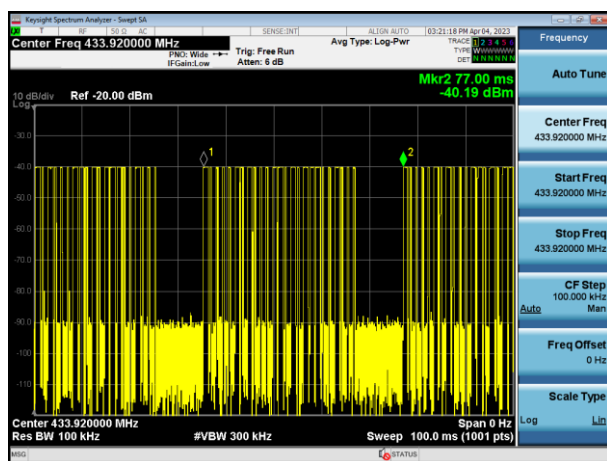
Duty Cycle= Effective time one cycle/ Total time one cycle

Averaging factor in dB =20log (duty cycle)

Duty Cycle = (0.98ms\*10+0.36ms\*15)/77

Therefore, the averaging factor is found by 20log0.20=-13.98dB

Test plot as follows:





## 6. DWELL TIME

### 6.1 APPLIED PROCEDURES / LIMIT

| FCC PART 15 C 15.231 |                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section              | Description                                                                                                                                                |
| 15.231a              | A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. |

#### 6.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Allow the trace to stabilize.

#### 6.1.2 DEVIATION FROM STANDARD

No deviation.

#### 6.1.3 TEST SETUP



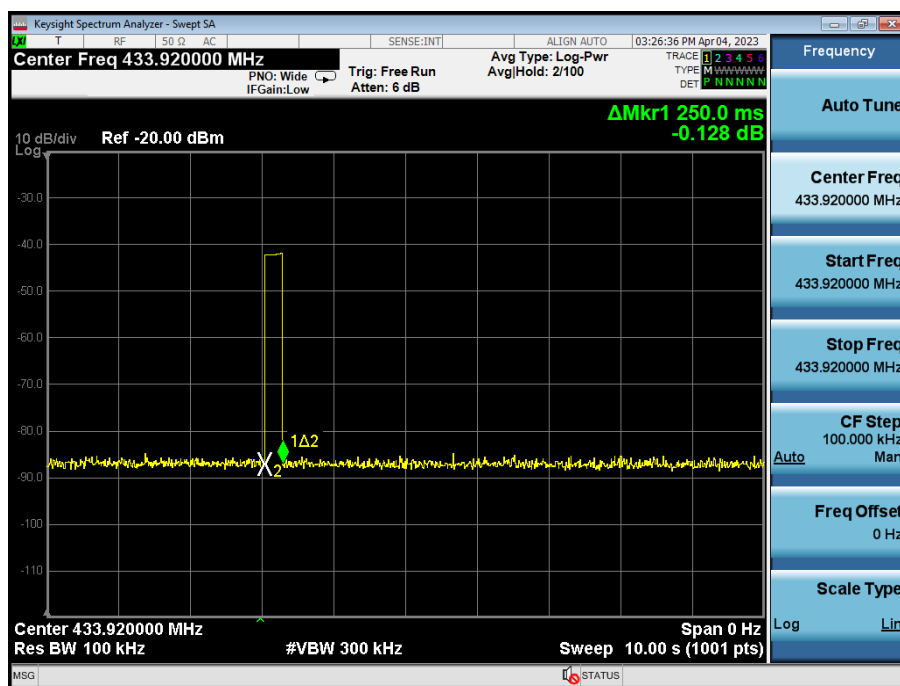
#### 6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



## 6.1.5 TEST RESULTS

|        | Dwell time (second) | Limit (second) | Result |
|--------|---------------------|----------------|--------|
| Normal | 0.250               | <5s            | Pass   |





## **7. ANTENNA REQUIREMENT**

### **7.1 STANDARD REQUIREMENT**

15.203 requirement: For intentional device, according to 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.

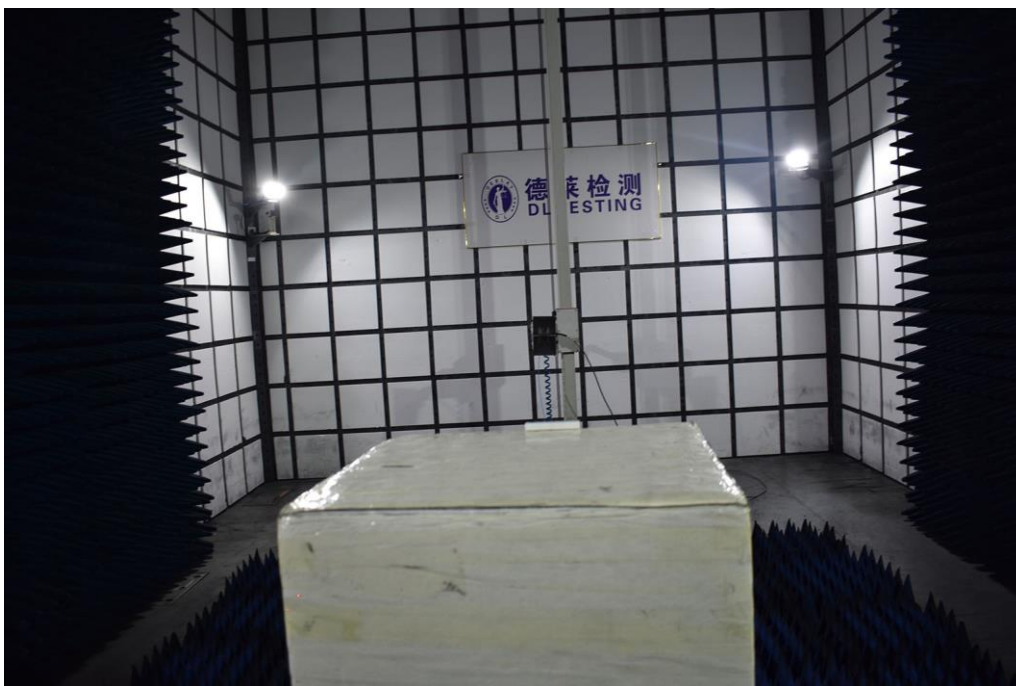
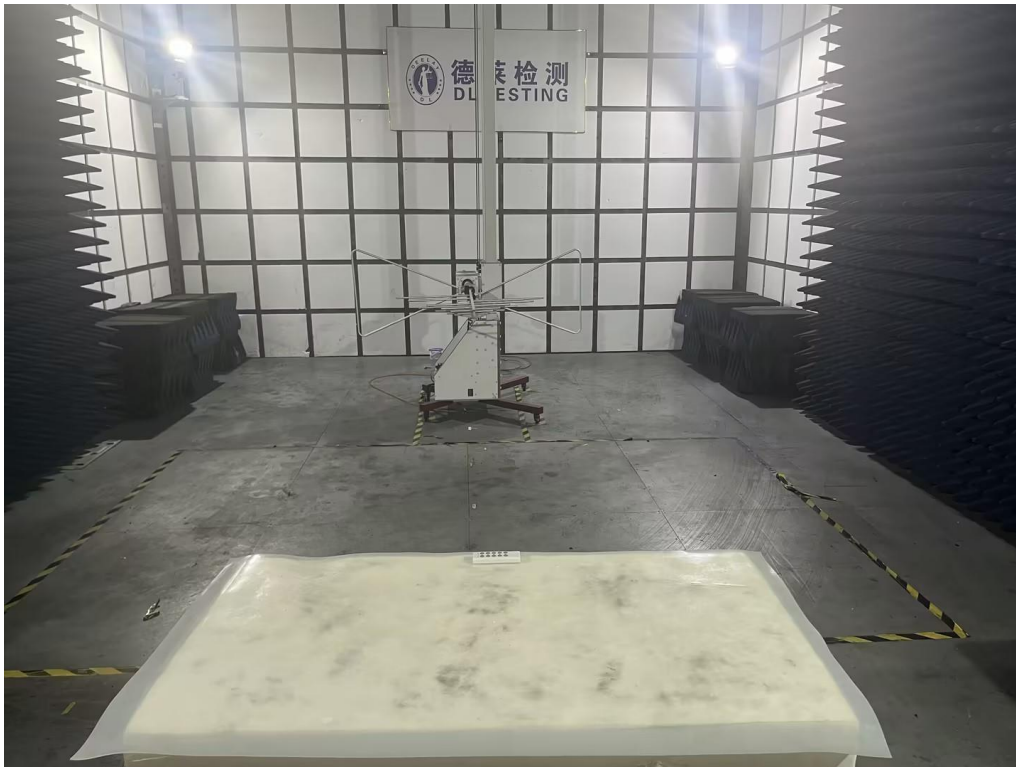
### **7.2 EUT ANTENNA**

The EUT antenna is Internal antenna, It comply with the standard requirement.



## 8. TEST SEUUP PHOTO

### Radiated Measurement Photos



## 9. EUT PHOTO

Model Number: ES1513U

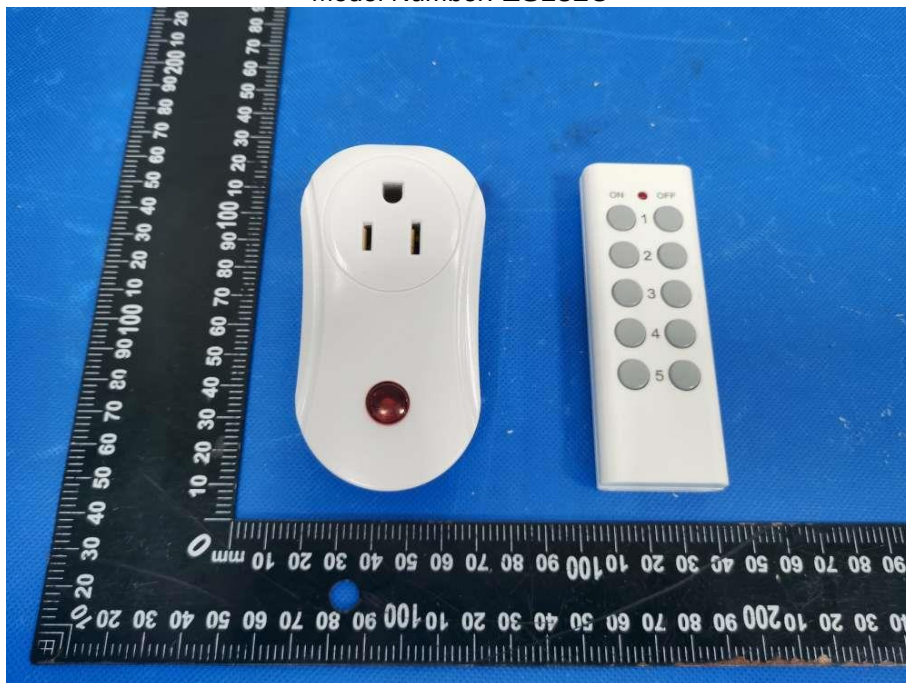


Model Number: ES9939U





Model Number: ES182U



Model Number: ES9938U

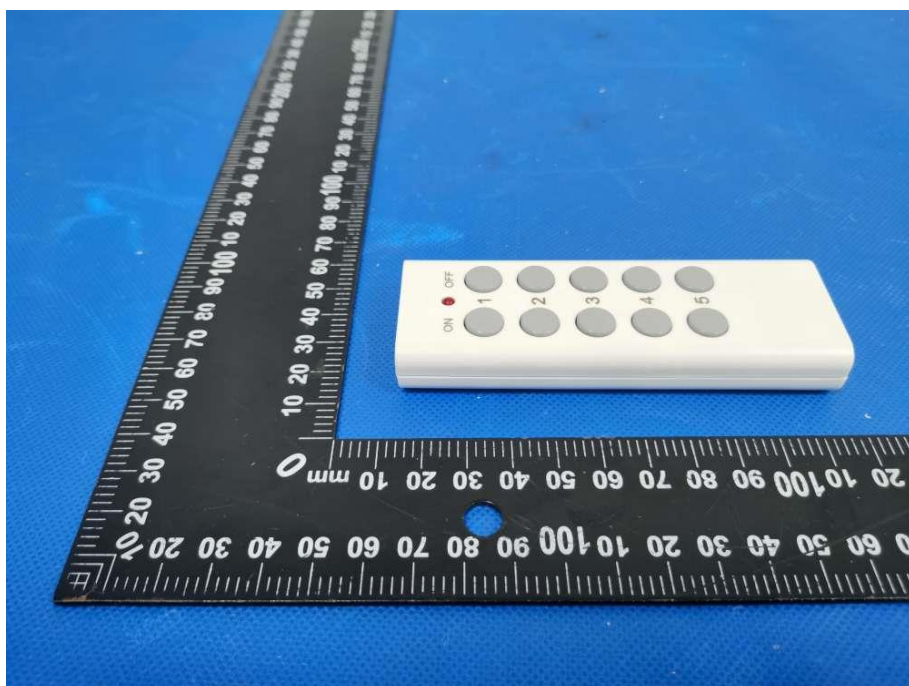




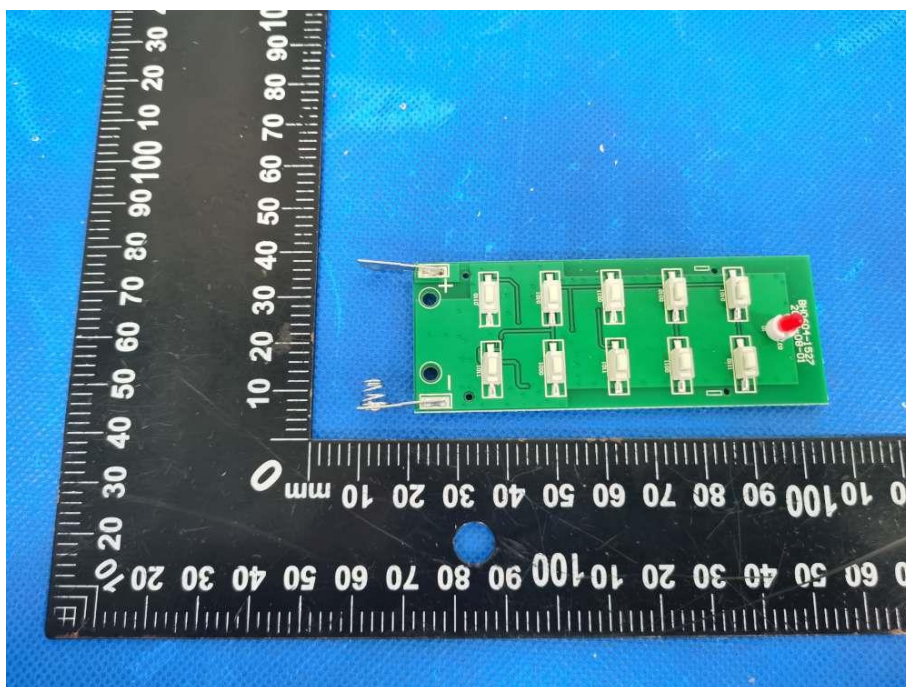
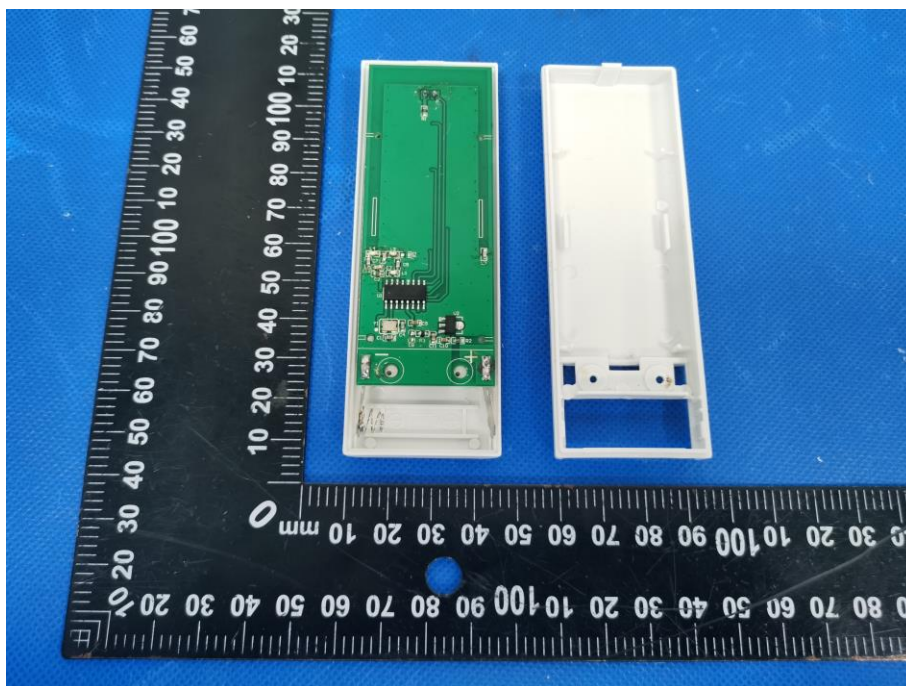
Model Number: ES186U

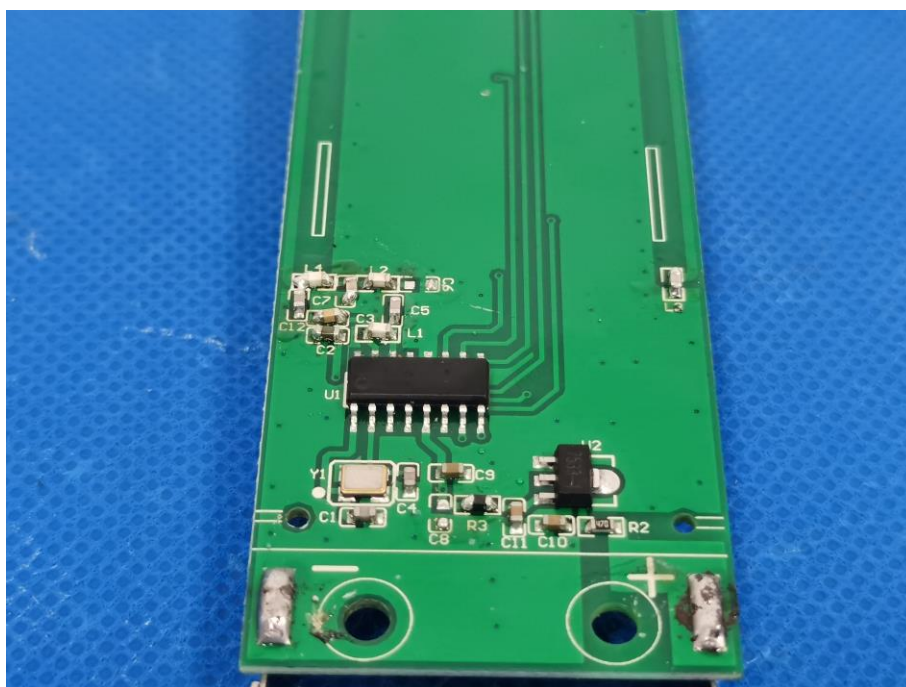
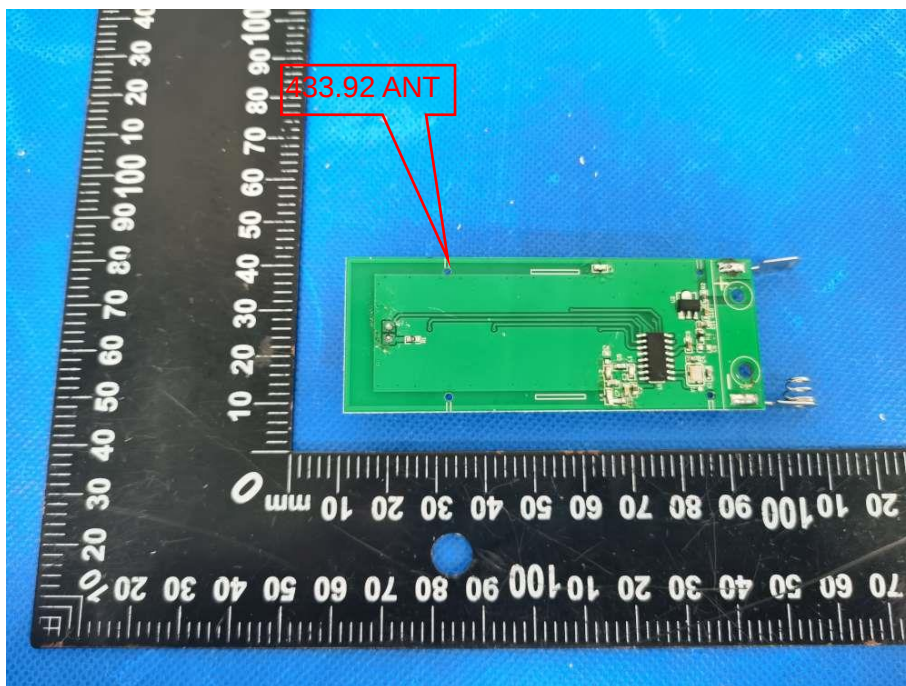












\*\*\*\*\* END OF REPORT \*\*\*\*\*