Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 E-mail: ctl@ctl-lab.com

# TEST REPORT

## 47 CFR FCC Part 15 Subpart C 15.231

| | | |
|---|---|---|
| **Report Reference No**.....: | **CTL2206162072-WF** | |
| Compiled by:<br>( position+printed name+signature) | Happy Guo<br>(File administrators) | Happy Guo |
| Tested by:<br>( position+printed name+signature) | Gary Gao<br>(Test Engineer) | Gary Gao |
| Approved by:<br>( position+printed name+signature) | Ivan Xie<br>(Manager) | Ivan Xie |

| | |
|---|---|
| **Product Name**..... : | 433MHz Transceiver with USB interface |
| **Model/Type reference**.....: | KTX433 |
| **List Model(s)**.....: | KTX433-USB |
| **Trade Mark**..... : | KINGLORD |
| **FCC ID**..... : | **2AOW4-433USB** |
| **Applicant's name**..... : | **CM GLOBAL** |
| **Address of applicant**.....: | 1201 N. 4TH STREET, WATERTOWN, WI 53098, USA |
| **Test Firm**.....: | **Shenzhen CTL Testing Technology Co., Ltd.** |
| **Address of Test Firm**.....: | Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055 |
| **Test specification**.....: | |
| Standard.....: | **47 CFR FCC Part 15 Subpart C 15.231** |
| TRF Originator.....: | Shenzhen CTL Testing Technology Co., Ltd. |
| Master TRF.....: | Dated 2011-01 |
| **Date of receipt of test item**..... : | Jul. 01, 2022 |
| **Date of sampling**..... : | Jul. 01, 2022 |
| **Date of Test Date**..... : | Jul. 01, 2022- Jul. 27, 2022 |
| **Date of Issue**.....: | Jul. 27, 2022 |
| **Result**..... : | **Pass** |

# TEST REPORT

| Test Report No. : | CTL2206162072-WF | Jul. 27, 2022<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | 433MHz Transceiver with USB interface |
| Sample No. | : | CTL220616207-2-S001<br>CTL220616207-2-S002 |
| Model /Type | : | KTX433 |
| Listed Models | : | KTX433-USB |
| **Applicant** | : | **CM GLOBAL** |
| Address | : | 1201 N. 4TH STREET, WATERTOWN, WI 53098, USA |
| **Manufacturer** | : | **KINGLORD ELECTRONICS (HK) LTD.** |
| Address | : | FLAT 8, 14/F., WAH YIU INDUSTRIAL CENTRE, 30-32 AU PUI WAN STREET, HONG KONG |

| Test result | Pass * |
|---|---|

* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

# ** Modified History **

| Version | Description | Issued Data | Report No. | Remark |
|---|---|---|---|---|
| Version 1.0 | Initial Test Report Release | 2022-07-27 | CTL2206162072-WF | Tracy Qi |
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# 1. SUMMARY

## 1.1. Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.231:** Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

**ANSI C63.10:2013 :** American National Standard for Testing Unlicensed Wireless Devices

## 1.2. Test Description

| FCC and IC Requirements | | |
|---|---|---|
| FCC Part 15.207 | Conducted Emission | PASS |
| FCC Part 15.231(a)(1) | Automatically Deactivate | PASS |
| FCC Part 15.231(b) | Electric Field Strength of Fundamental Emission | PASS |
| FCC Part 15.205 &15.209& 15.231(b) | Electric Field Strength of Spurious Emission | PASS |
| FCC Part 15.231(c) | -20dB bandwidth | PASS |

Remark: The measurement uncertainty is not included in the test result.

## 1.3. Test Facility

### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

### 1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

**CNAS-Lab Code: L7497**

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No. 4343.01**

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**IC Registration No.: 9618B**

**CAB identifier: CN0041**

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

**FCC-Registration No.: 399832**

**Designation No.: CN1216**

Shenzhen CTL Testing Technology 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 399832, December 08, 2017.

## 1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

| Test | Measurement Uncertainty | Notes |
|---|---|---|
| Transmitter power conducted | ±0.57 dB | (1) |
| Transmitter power Radiated | ±2.20 dB | (1) |
| Conducted spurious emission 9KHz-40 GHz | ±2.20 dB | (1) |
| Occupied Bandwidth | ±0.01ppm | (1) |
| Radiated Emission 30~1000MHz | ±4.10dB | (1) |
| Radiated Emission Above 1GHz | ±4.32dB | (1) |

| | | |
|---|---|---|
| Conducted Disturbance0.15~30MHz | ±3.20dB | (1) |

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

# 2. GENERAL INFORMATION

## 2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Normal Temperature: | 25°C |
| Relative Humidity: | 55 % |
| Air Pressure: | 101 kPa |

## 2.2. General Description of EUT

| | |
|---|---|
| Product Name: | 433MHz Transceiver with USB interface |
| Model/Type reference: | KTX433 |
| Hardware version: | 01 |
| Software version: | 01 |
| Power supply: | DC 5V from USB |
| Modulation: | ASK |
| Operation frequency: | 432.700MHz~434.900MHz |
| Channel number: | 8 |
| Antenna type: | External Antenna |
| Antenna gain: | 2.5 dBi |

Note: For more details, please refer to the user's manual of the EUT.

## 2.3. Description of Test Modes and Test Frequency

**Operation Frequency**：

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| **1** | **432.700** | 5 | 434.000 |
| 2 | 433.100 | 6 | 434.300 |
| 3 | 433.500 | 7 | 434.600 |
| 4 | 433.600 | **8** | **434.900** |

Note1: In section 15.31(m), regards to the operating frequency range less than 10MHz, one near top and one near bottom point in the frequency range of operation should selected to measure.
Note2: The line display in grey was the channel selected for test.

## 2.4. Equipments Used during the Test

| Test Equipment | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| LISN | R&S | ENV216 | 3560.6550.12 | 2022/05/06 | 2023/05/05 |
| LISN | R&S | ESH2-Z5 | 860014/010 | 2022/05/06 | 2023/05/05 |
| Double Cone logarithmic antenna | Schwarzbeck | VULB 9168 | 824 | 2020/04/07 | 2023/04/06 |

| | | | | | |
|---|---|---|---|---|---|
| Active Loop Antenna | Da Ze | ZN30900A | / | 2021/05/13 | 2024/05/12 |
| Horn Antenna | Sunol Sciences Corp. | DRH-118 | A062013 | 2021/12/23 | 2024/12/22 |
| Horn Antenna | Ocean Microwave | OBH100400 | 26999002 | 2019/11/28 | 2022/11/27 |
| EMI Test Receiver | R&S | ESCI | 1166.5950.03 | 2022/05/06 | 2023/05/05 |
| Spectrum Analyzer | Agilent | N9020 | US46220290 | 2022/05/07 | 2023/05/06 |
| Spectrum Analyzer | RS | FSP | 1164.4391.38 | 2022/05/07 | 2023/05/06 |
| Controller | EM Electronics | EM 1000 | 060859 | 2022/05/20 | 2023/05/19 |
| Amplifier | Agilent | 8449B | 3008A02306 | 2022/05/07 | 2023/05/06 |
| Amplifier | Agilent | 8447D | 2944A10176 | 2022/05/06 | 2023/05/05 |
| Amplifier | Brief&Smart | LNA-4018 | 2104197 | 2022/05/07 | 2023/05/06 |
| Temperature/Humidity Meter | Ji Yu | MC501 | / | 2022/05/07 | 2023/05/06 |
| Power Sensor | Agilent | U2021XA | MY55130004 | 2022/05/07 | 2023/05/06 |
| Power Sensor | Agilent | U2021XA | MY55130006 | 2022/05/07 | 2023/05/06 |
| Power Sensor | Agilent | U2021XA | MY54510008 | 2022/05/07 | 2023/05/06 |
| Power Sensor | Agilent | U2021XA | MY55060003 | 2022/05/07 | 2023/05/06 |
| High-Pass Filter | micro-tranics | HPM50108 | G174 | 2022/05/07 | 2023/05/06 |
| High-Pass Filter | micro-tranics | HPM50111 | G142 | 2022/05/07 | 2023/05/06 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-10M | 10m | 2022/05/07 | 2023/05/06 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-3M | 3m | 2022/05/07 | 2023/05/06 |
| Coaxial Cables | HUBER+SUHNER | SUCOFLEX 104PEA-3M | 3m | 2022/05/07 | 2023/05/06 |
| RF Cable | Megalon | RF-A303 | N/A | 2022/05/07 | 2023/05/06 |
| RF Control Unit | Tonsecnd | JS0806-2 | 20J8060323 | 2022/05/07 | 2023/05/06 |
| Test Software | Tonsecnd | JS1120-3 | 2.6.880341 | N/A | N/A |
| Test software | EZ | EZ_EMC | 1.1.4.2 | N/A | N/A |

The calibration interval was one year

## 2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

# 3. TEST CONDITIONS AND RESULTS

## 3.1. Conducted Emission (AC Main)

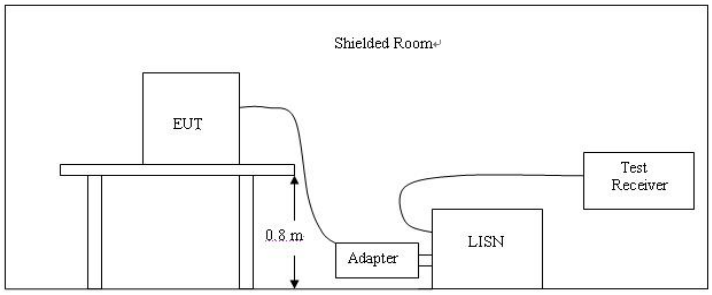
**LIMIT**

FCC CFR Title 47 Part 15 Subpart C Section 15.207

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

**TEST CONFIGURATION**



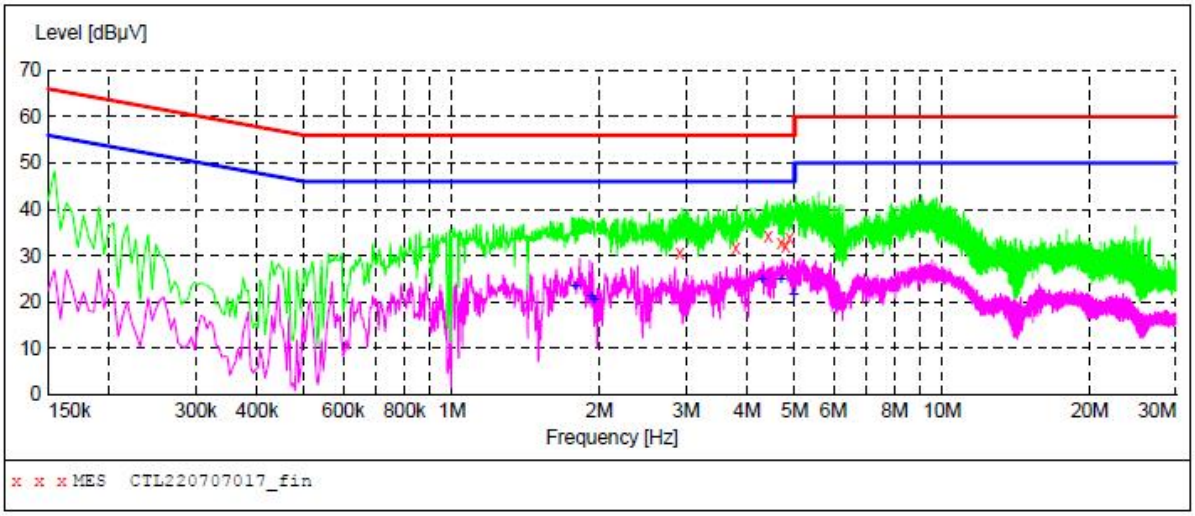

**TEST PROCEDURE**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a flood stand system; a wooden table with a height of 0.1 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2. Support equipment, if needed, was placed as per ANSI C63.10-2013
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4. If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

## TEST RESULTS

| Test Mode | TX | Line: | L |
|---|---|---|---|

***SCAN TABLE: "Voltage (9K-30M)FIN"***
Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL220707017_fin"***

7/7/2022 10:03AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 2.913000 | 30.60 | 10.3 | 56 | 25.4 | QP | L1 | GND |
| 3.790500 | 31.80 | 10.3 | 56 | 24.2 | QP | L1 | GND |
| 4.420500 | 34.00 | 10.3 | 56 | 22.0 | QP | L1 | GND |
| 4.690500 | 32.60 | 10.3 | 56 | 23.4 | QP | L1 | GND |
| 4.785000 | 32.20 | 10.4 | 56 | 23.8 | QP | L1 | GND |
| 4.875000 | 33.70 | 10.4 | 56 | 22.3 | QP | L1 | GND |

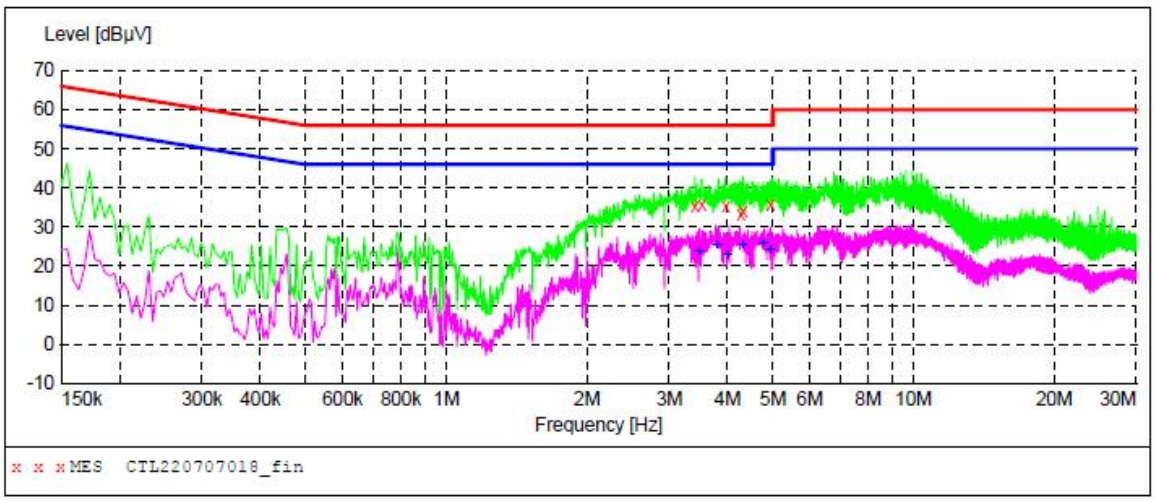
***MEASUREMENT RESULT: "CTL220707017_fin2"***

7/7/2022 10:03AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 1.788000 | 23.40 | 10.2 | 46 | 22.6 | AV | L1 | GND |
| 1.923000 | 21.20 | 10.2 | 46 | 24.8 | AV | L1 | GND |
| 1.945500 | 20.30 | 10.2 | 46 | 25.7 | AV | L1 | GND |
| 4.290000 | 24.80 | 10.3 | 46 | 21.2 | AV | L1 | GND |
| 4.681500 | 24.60 | 10.3 | 46 | 21.4 | AV | L1 | GND |
| 4.983000 | 21.60 | 10.4 | 46 | 24.4 | AV | L1 | GND |

| Test Mode | TX | Line: | N |
|---|---|---|---|

***SCAN TABLE: "Voltage (9K-30M)FIN"***
Short Description: 150K-30M Voltage




***MEASUREMENT RESULT: "CTL220707018_fin"***

7/7/2022 10:01AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 3.412500 | 35.30 | 10.3 | 56 | 20.7 | QP | N | GND |
| 3.525000 | 35.70 | 10.3 | 56 | 20.3 | QP | N | GND |
| 3.970500 | 35.40 | 10.3 | 56 | 20.6 | QP | N | GND |
| 4.276500 | 33.30 | 10.3 | 56 | 22.7 | QP | N | GND |
| 4.317000 | 33.90 | 10.3 | 56 | 22.1 | QP | N | GND |
| 4.951500 | 35.60 | 10.4 | 56 | 20.4 | QP | N | GND |

***MEASUREMENT RESULT: "CTL220707018_fin2"***

7/7/2022 10:01AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Detector | Line | PE |
|---|---|---|---|---|---|---|---|
| 3.475500 | 23.50 | 10.3 | 46 | 22.5 | AV | N | GND |
| 3.799500 | 25.50 | 10.3 | 46 | 20.5 | AV | N | GND |
| 3.988500 | 22.90 | 10.3 | 46 | 23.1 | AV | N | GND |
| 4.299000 | 25.20 | 10.3 | 46 | 20.8 | AV | N | GND |
| 4.767000 | 25.70 | 10.4 | 46 | 20.3 | AV | N | GND |
| 4.933500 | 24.00 | 10.4 | 46 | 22.0 | AV | N | GND |

Remark: Level(dBuV)=Reading(dBuV)+Factor(dB)
Margin=Limit(dBuV)-Level(dBuV)

## 3.2. Radiated Emission

**Limit**

For intentional device, according to 15.209(a) the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table.

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

In addition to the provisions of 15.231(b) and RSS 210-A1.1.2, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

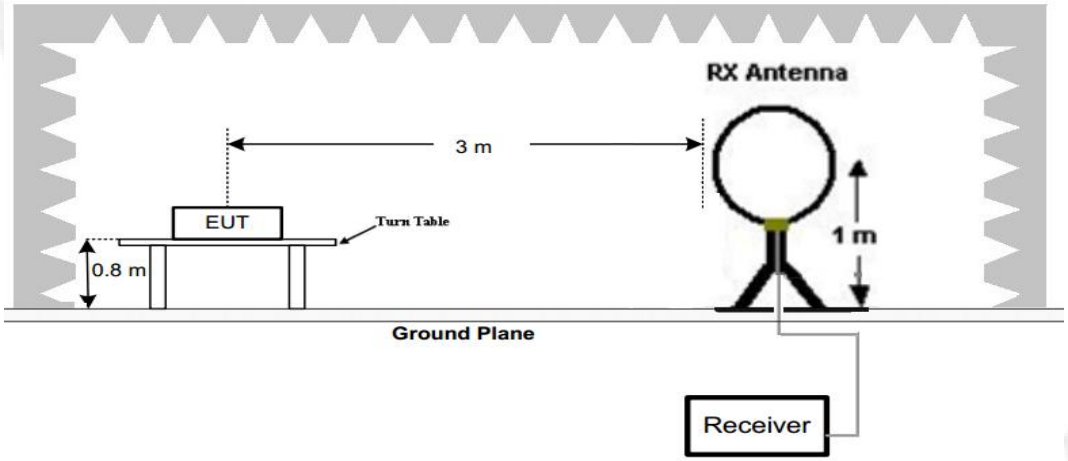
| Fundamental frequency (MHz) | Field strength of fundamental (microvolts/meter) | Field strength of spurious emissions (microvolts/meter) |
|---|---|---|
| 40.66–40.70. | 2,250 | 225 |
| 70–130 | 1,250 | 125 |
| 130–174 | [1] 1,250 to 3,750 | [1] 125 to 375 |
| 174–260 | 3,750 | 375 |
| 260–470 | [1] 3,750 to 12,500 | [1] 375 to 1,250 |
| Above 470 | 12,500 | 1,250 |

[1] Linear interpolations.

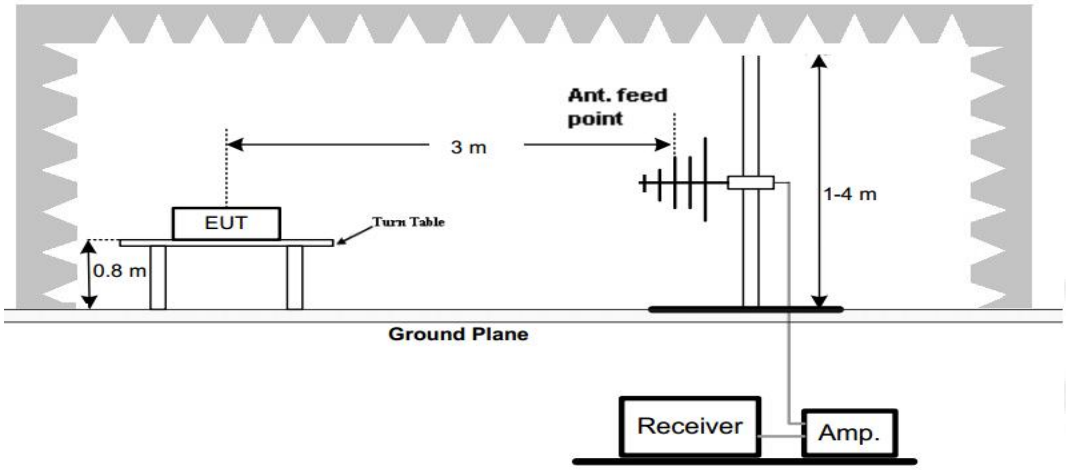
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 260-470 MHz, μV/m at 3 meters =41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

**TEST CONFIGURATION**

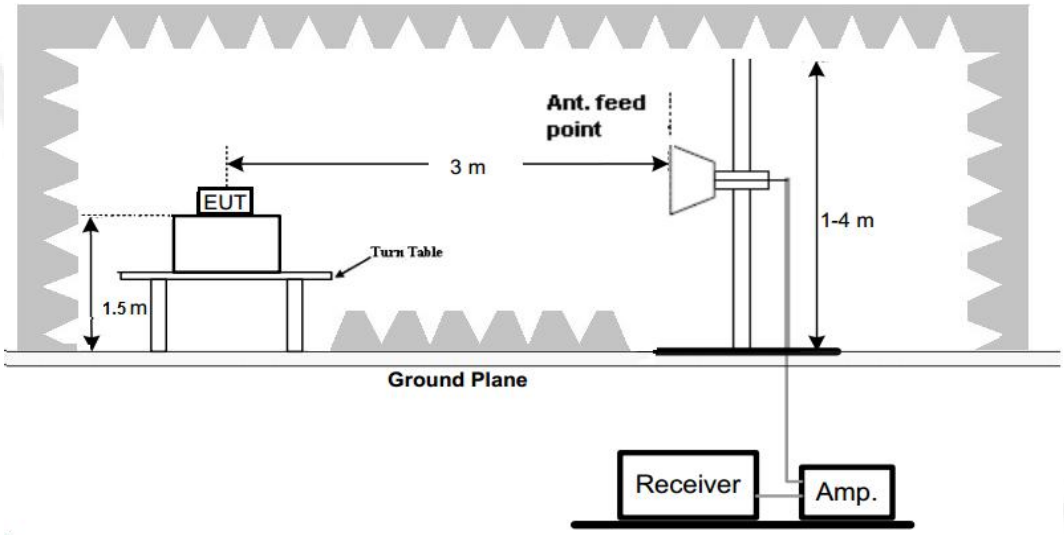
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz




(C) Radiated Emission Test Set-Up, Frequency above 1000MHz




**Test Procedure**

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

**TEST RESULTS**

The emissions from 30MHz to 5GHz are measured with PEAK detector; and average level calculated with Duty cycle correction according 15.35(c), detailed test data please see below. Besides, we tested 3 directions and recorded the worst data

**Test frequency:432.700MHz**

| Emission Styles | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Direction (H/V) |
|---|---|---|---|---|---|---|
| Fundamental | 432.70 | 84.20 | 100.78 | 16.58 | PK | H |
| Spurious | 851.03 | 33.19 | 46.00 | 12.81 | PK | H |
| Harmonics | 865.40 | 62.59 | 80.78 | 18.19 | PK | H |
| Harmonics | 1298.10 | 60.27 | 74.00 | 13.73 | PK | H |
| -- | -- | -- | -- | -- | -- | -- |
| Fundamental | 432.70 | 83.75 | 100.78 | 17.03 | PK | V |
| Spurious | 744.86 | 31.48 | 46.00 | 14.52 | PK | V |
| Harmonics | 865.40 | 61.73 | 80.78 | 19.05 | PK | V |
| Harmonics | 1298.10 | 58.68 | 74.00 | 15.32 | PK | V |
| -- | -- | -- | -- | -- | -- | -- |

Note: Margin= Limit-Emission level

| Emission Styles | Frequency (MHz) | PK Emission Level (dBuV/m) | AV Factor (dB/m) | AV Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Direction (H/V) |
|---|---|---|---|---|---|---|---|
| Fundamental | 432.70 | 84.20 | -8.80 | 75.40 | 80.78 | 5.38 | H |
| Harmonics | 865.40 | 62.59 | -8.80 | 53.79 | 60.78 | 6.99 | H |
| Harmonics | 1298.10 | 60.27 | -8.80 | 51.47 | 54.00 | 2.53 | H |
| -- | -- | -- | -- | -- | -- | -- | -- |
| Fundamental | 432.70 | 83.75 | -8.80 | 74.95 | 80.78 | 5.83 | V |
| Harmonics | 865.40 | 61.73 | -8.80 | 52.93 | 60.78 | 7.85 | V |
| Harmonics | 1298.10 | 58.68 | -8.80 | 49.88 | 54.00 | 4.12 | V |
| -- | -- | -- | -- | -- | -- | -- | -- |

**Test frequency:434.900MHz**

| Emission Styles | Frequency (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Direction (H/V) |
|---|---|---|---|---|---|---|
| Fundamental | 434.90 | 83.31 | 100.86 | 17.55 | PK | H |
| Spurious | 793.39 | 32.84 | 46.00 | 13.16 | PK | H |
| Harmonics | 869.80 | 62.09 | 80.86 | 18.77 | PK | H |
| Harmonics | 1304.70 | 60.78 | 74.00 | 13.22 | PK | H |
| -- | -- | -- | -- | -- | -- | -- |
| Fundamental | 434.90 | 82.57 | 100.86 | 18.29 | PK | V |
| Spurious | 659.41 | 30.93 | 46.00 | 15.07 | PK | V |

| | | | | | | |
|---|---|---|---|---|---|---|
| Harmonics | 869.80 | 61.79 | 80.86 | 19.07 | PK | V |
| Harmonics | 1304.70 | 58.66 | 74.00 | 15.34 | PK | V |
| -- | -- | -- | -- | -- | -- | -- |

Note: Margin= Limit-Emission level

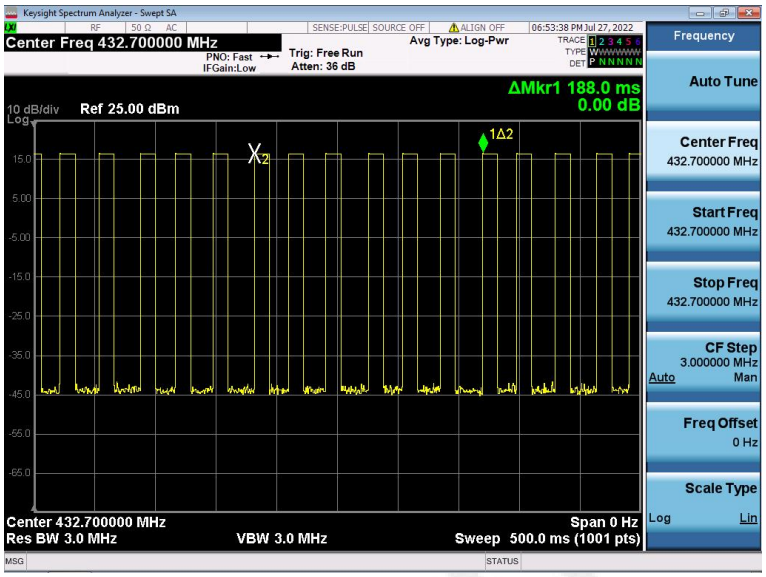
| Emission Styles | Frequency (MHz) | PK Emission Level (dBuV/m) | AV Factor (dB/m) | AV Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Direction (H/V) |
|---|---|---|---|---|---|---|---|
| Fundamental | 434.90 | 83.31 | -8.80 | 74.51 | 80.86 | 6.35 | H |
| Harmonics | 869.80 | 62.09 | -8.80 | 53.29 | 60.86 | 7.57 | H |
| Harmonics | 1304.70 | 60.78 | -8.80 | 51.98 | 54.00 | 2.02 | H |
| -- | -- | -- | -- | -- | -- | -- | -- |
| Fundamental | 434.90 | 82.57 | -8.80 | 73.77 | 80.86 | 7.09 | V |
| Harmonics | 869.80 | 61.79 | -8.80 | 52.99 | 60.86 | 7.87 | V |
| Harmonics | 1304.70 | 58.66 | -8.80 | 49.86 | 54.00 | 4.14 | V |
| -- | -- | -- | -- | -- | -- | -- | -- |

Note:

1. AV Level (dBuV/m)= PK Emission Level (dBuV/m)+ AV Factor(dB)
2. Duty Cycle= (12.1 *3)/100.0=0.363 (Note: According to C63.10 if the transmit cycle period longer than 100ms, then 100ms is used calculation.)
3. AV Factor=20*log(Duty Cycle)=20*log(0.363)=-8.80

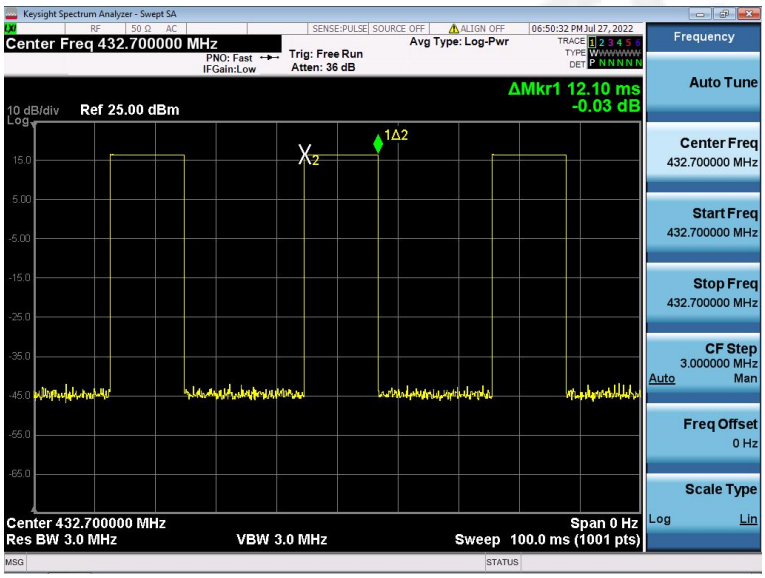
(The plot of Duty Cycle See the follow page)

Duty cycle plots




(Transmit cycle 188.0ms)

(Total Bursts in a transmit cycle 6pcs)



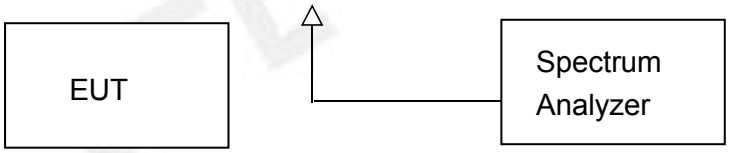

(12.10ms per burst)

## 3.3. 20dB Bandwidth

### Limit

According to 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

### Test Configuration




### Test Procedure

The 20dB bandwidth and 99% bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

### Test Results

| Modulation | Channel Frequency (MHz) | 99% OBW (KHz) | 20dB bandwidth (KHz) | Limit (KHz) | Result |
|---|---|---|---|---|---|
| ASK | 432.700 | 210.83 | 221.5 | 0.25%*432.700=1081.75 | Pass |
| | 434.900 | 213.62 | 222.7 | 0.25%*434.900=1087.25 | Pass |

**Test plot as follows:**

*432.70MHz*

| 434.90MHz |
| --- |
|  |

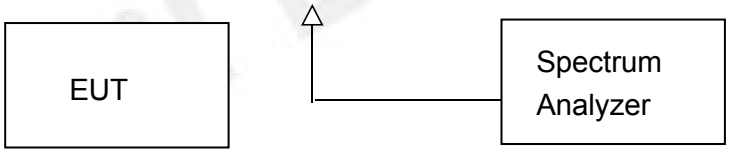
Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:PULSE SOURCE OFF ALIGN OFF 08:52:52 PM Jul 14, 2022
Center Freq 434.900000 MHz
Center Freq: 434.900000 MHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 30 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Frequency
15 dB/div Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center 434.9 MHz
#Res BW 10 kHz
#VBW 30 kHz
Span 500 kHz
Sweep 6.2 ms
Occupied Bandwidth
213.62 kHz
Total Power 17.3 dBm
Transmit Freq Error -710 Hz
% of OBW Power 99.00 %
x dB Bandwidth 222.7 kHz
x dB -20.00 dB
Center Freq
434.900000 MHz
CF Step
50.000 kHz
Auto Man
Freq Offset
0 Hz
MSG
STATUS

## 3.4. Deactivation Time

### Limit

According to FCC §15.231(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.

### Test Configuration



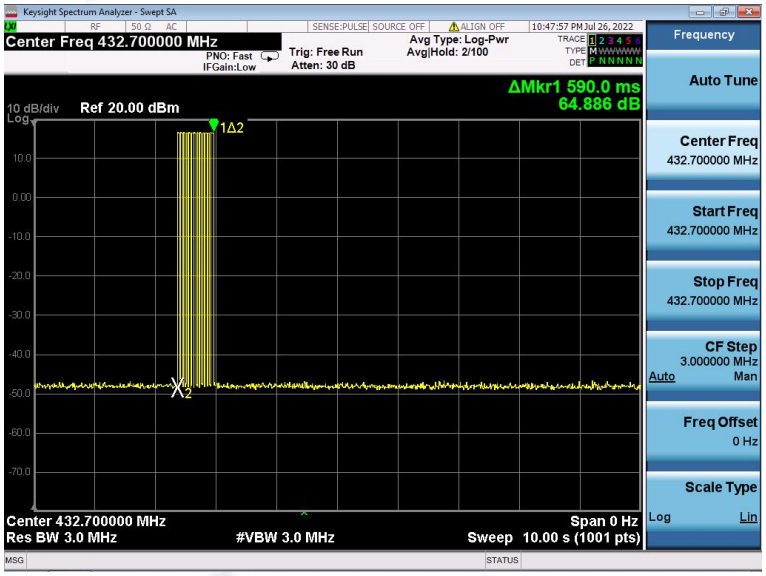

### Test Procedure

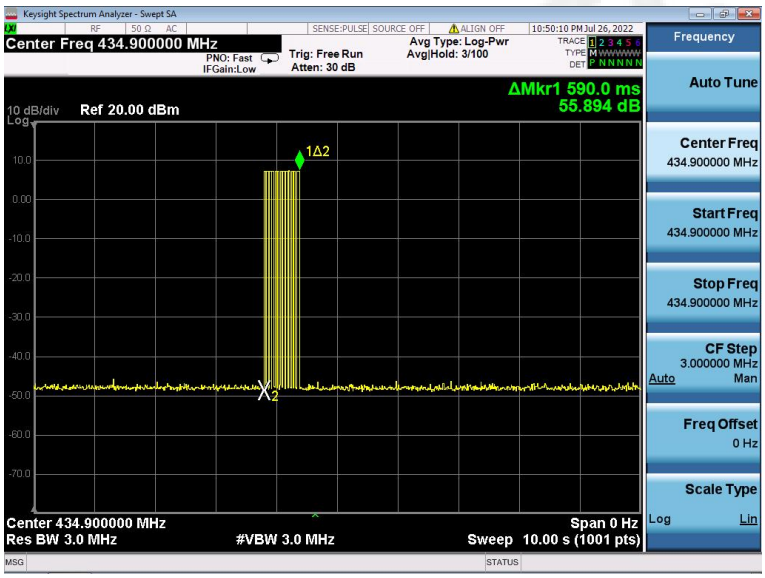
1. The EUT was placed on a wooded table which is 0.8m height and close to receiver antenna of spectrum analyzer.
2. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was set to 1 MHz to encompass all significant spectral components during the test. The spectrum analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

### TEST RESULTS

Note : Multiple groups of channels are tested, only the poor frequencies are recorded, other frequencies meet the requirements.

| Frequency (MHz) | One transmission time (S) | Limit(S) | Result |
|---|---|---|---|
| 432.70 | 0.5900 | 5 | Pass |
| 434.90 | 0.5900 | 5 | Pass |




Keysight Spectrum Analyzer - Swept SA
Center Freq 434.900000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
10:50:10 PM Jul 26, 2022
ΔMkr1 590.0 ms
55.894 dB
10 dB/div
Log
Ref 20.00 dBm
1Δ2
Center 434.900000 MHz
Res BW 3.0 MHz
#VBW 3.0 MHz
Span 0 Hz
Sweep 10.00 s (1001 pts)
Frequency
Auto Tune
Center Freq
434.900000 MHz
Start Freq
434.900000 MHz
Stop Freq
434.900000 MHz
CF Step
3.000000 MHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

## 3.5. Antenna Requirement

**Standard Applicable**

According to FCC Part 15C 15.203

a) An intentional radiator shall be de-signed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

b) 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.

**Refer to statement below for compliance.**

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

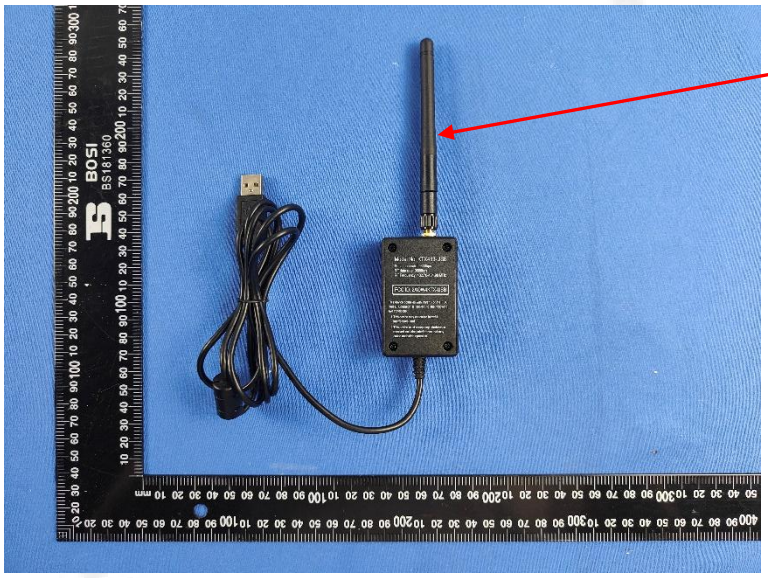
**Antenna Connected Construction**

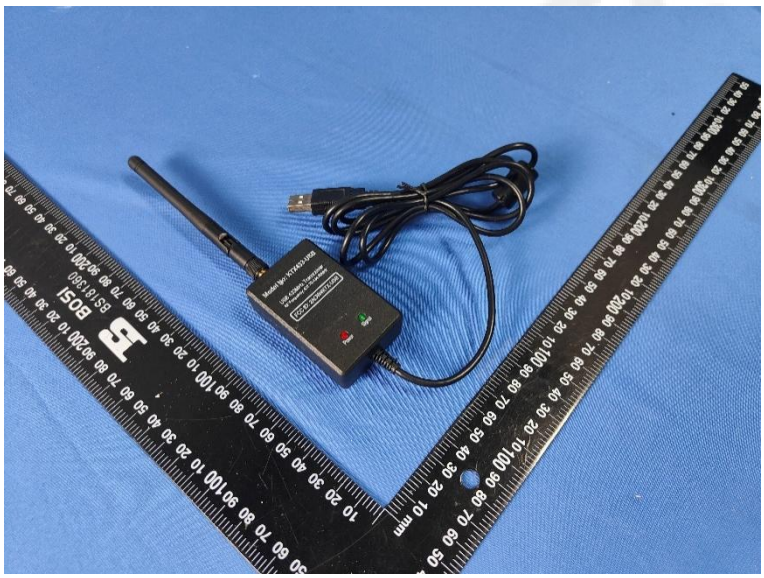
The antenna used in this product is an external antenna, The directional gains of antenna used for transmitting is 2.5dBi.

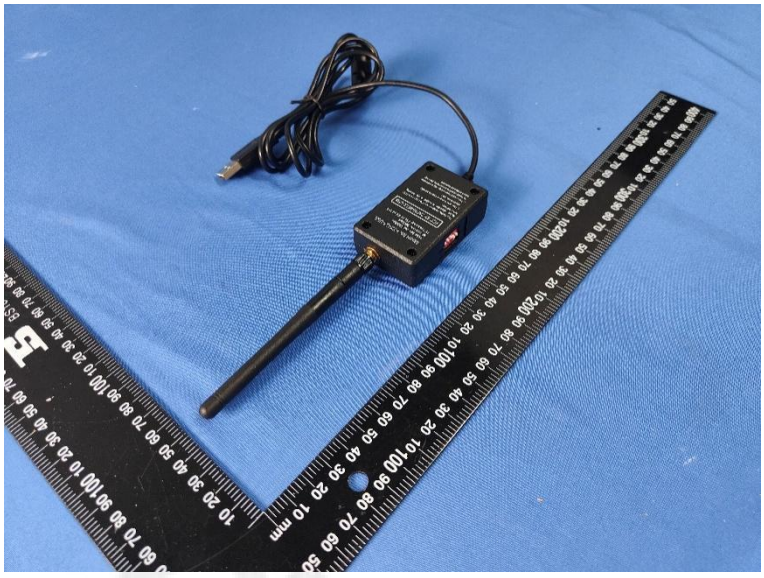
# 4. Test Setup Photos of the EUT

# 5. External and Internal Photos of the EUT

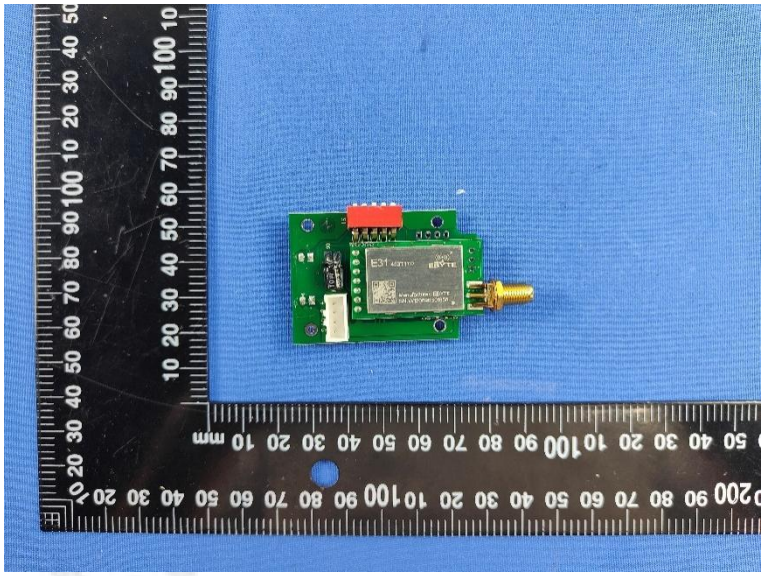
## External Photos of EUT

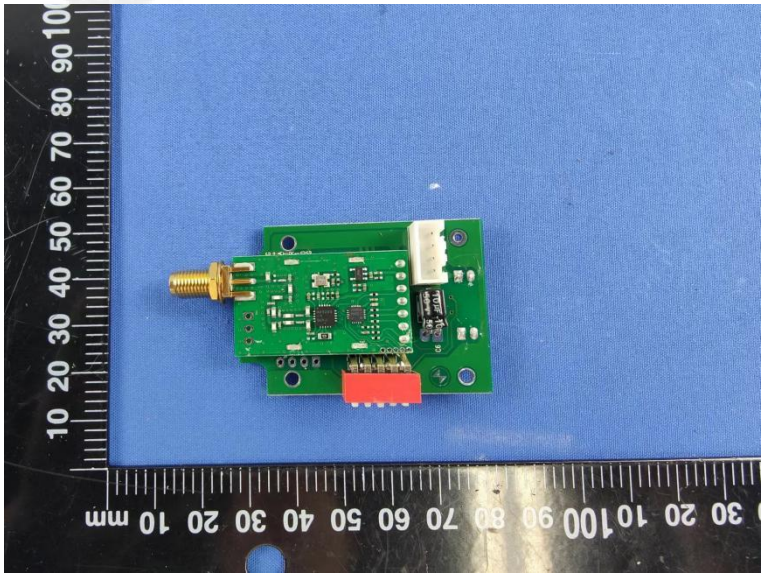


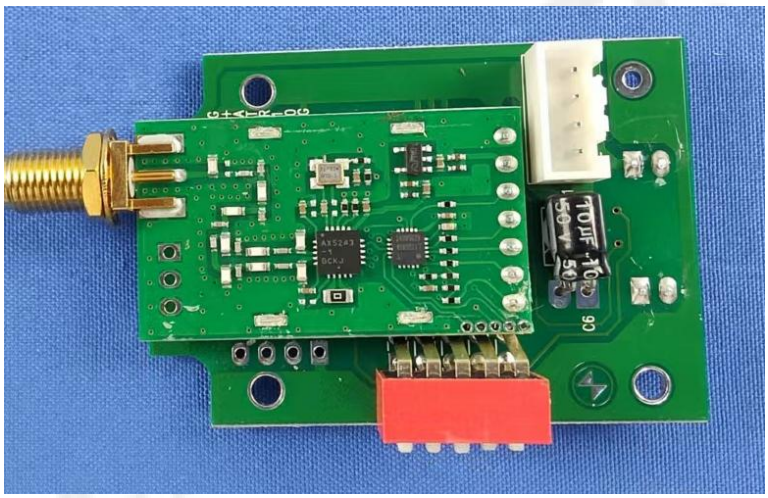



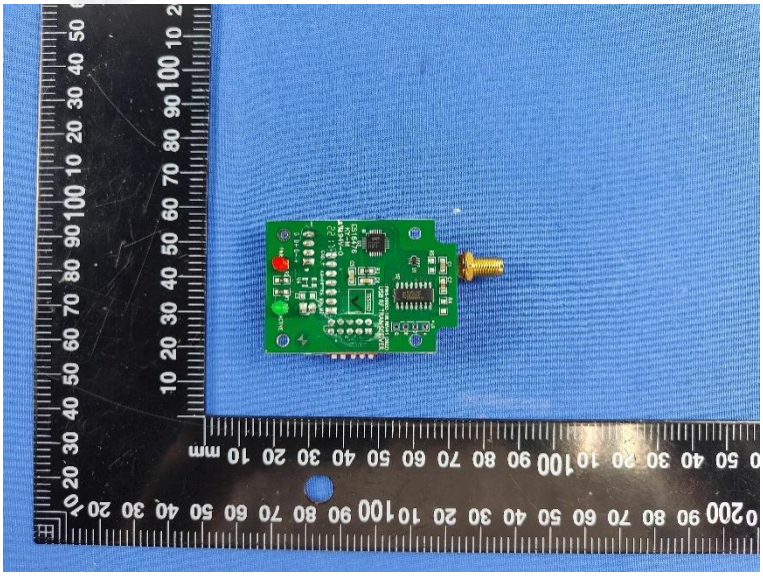


## Internal Photos of EUT









********** End of Report **********