# FCC Test Report

| | | |
|---|---|---|
| Client Name | : | JEICO |
| Address | : | 94-1, Choryang-ro, Dong-gu, Busan 48805, Korea |
| Product Name | : | Industrial wireless remote controller |
| Date | : | Feb. 17, 2020 |

## Shenzhen Anbotek Compliance Laboratory Limited

# Contents

1. General Information....4
1.1. Client Information....4
1.2. Description of Device (EUT)....4
1.3. Auxiliary Equipment Used During Test....4
1.4. Description of Test Modes....5
1.5. List of channels....6
1.6. Description Of Test Setup....7
1.7. Test Equipment List....8
1.8. Measurement Uncertainty....9
1.9. Description of Test Facility....9
2. Summary of Test Results....10
3. Conducted Emission Test....11
3.1. Test Standard and Limit....11
3.2. Test Setup....11
3.3. Test Procedure....11
3.4. Test Data....11
4. Radiation Spurious Emission and Band Edge....12
4.1. Test Standard and Limit....12
4.2. Test Setup....13
4.3. Test Procedure....14
4.4. Test Data....14
5. 20DB Occupy Bandwidth Test....26
5.1. Test Standard and Limit....26
5.2. Test Setup....26
5.3. Test Procedure....26
5.4. Test Data....26
6. Dwell Time Test....29
6.1. Test Standard and Limit....29
6.2. Test Setup....29
6.3. Test Procedure....29
6.4. Test Data....29
7. Antenna Requirement....32
7.1. Test Standard and Requirement....32
7.2. Antenna Connected Construction....32
APPENDIX I -- TEST SETUP PHOTOGRAPH....33
APPENDIX II -- EXTERNAL PHOTOGRAPH....34
APPENDIX III -- INTERNAL PHOTOGRAPH....37

# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | JEICO |
| Manufacturer | : | JEICO |
| Product Name | : | Industrial wireless remote controller |
| Model No. | : | JREMO 4L, JREMO 4LA, JREMO 4LB, JREMO 4LC, JREMO 4LM |
| Trade Mark | : | JECO |
| Rating(s) | : | Input: DC 3.0V, 25 mAh |

| | | |
|---|---|---|
| **Test Standard(s)** | : | **FCC Part15 Subpart C 2019, Section 15.231** |
| **Test Method(s)** | : | **ANSI C63.10: 2013** |

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

| | |
|---|---|
| Date of Receipt | Nov. 30, 2019 |
| Date of Test | Nov. 30~Dec. 28, 2019 |
| Prepared By | (Engineer / Dolly Mo) |
| Reviewer | (Supervisor / Bibo Zhang) |
| Approved & Authorized Signer | (Manager / Tom Chen) |

# 1. General Information

## 1.1. Client Information

| | | |
|---|---|---|
| Applicant | : | JEICO |
| Address | : | 94-1, Choryang-ro, Dong-gu, Busan 48805, Korea |
| Manufacturer | : | JEICO |
| Address | : | 94-1, Choryang-ro, Dong-gu, Busan 48805, Korea |
| Factory | : | JEICO |
| Address | : | 94-1, Choryang-ro, Dong-gu, Busan 48805, Korea |

## 1.2. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | Industrial wireless remote controller | |
| Model No. | : | JREMO 4L, JREMO 4LA, JREMO 4LB, JREMO 4LC, JREMO 4LM (Note: All samples are the same except the appearance color and buttons type, so we prepare "JREMO 4L" for test only.) | |
| Trade Mark | : | JECO | |
| Test Power Supply | : | DC 3.7V Battery inside | |
| Test Sample No. | : | 1-2-1(Normal Sample), 1-2-2(Engineering Sample) | |
| Product Description | : | Operation Frequency: | 433.05-434.775MHz |
| | | Number of Channel: | 70 Channels |
| | | Modulation Type: | GFSK |
| | | Antenna Type: | Monopole Antenna |
| | | Antenna Gain(Peak): | 1.5 dBi |
| **Remark:** 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. | | | |

## 1.3. Auxiliary Equipment Used During Test

| | | |
|---|---|---|
| N/A | | |

## 1.4. 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 | CH01 |
| Mode 2 | CH35 |
| Mode 3 | CH70 |

| For Radiated Emission | |
|---|---|
| Final Test Mode | Description |
| Mode 1 | CH01 |
| Mode 2 | CH35 |
| Mode 3 | CH70 |

Note: During the test, the EUT was keeping continuous transmission.

## 1.5. List of channels

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|---|---|---|
| 1 | 433.050 | 19 | 433.500 | 37 | 433.950 | 55 | 434.400 |
| 2 | 433.075 | 20 | 433.525 | 38 | 433.975 | 56 | 434.425 |
| 3 | 433.100 | 21 | 433.550 | 39 | 434.000 | 57 | 434.450 |
| 4 | 433.125 | 22 | 433.575 | 40 | 434.025 | 58 | 434.475 |
| 5 | 433.150 | 23 | 433.600 | 41 | 434.050 | 59 | 434.500 |
| 6 | 433.175 | 24 | 433.625 | 42 | 434.075 | 60 | 434.525 |
| 7 | 433.200 | 25 | 433.650 | 43 | 434.100 | 61 | 434.550 |
| 8 | 433.225 | 26 | 433.675 | 44 | 434.125 | 62 | 434.575 |
| 9 | 433.250 | 27 | 433.700 | 45 | 434.150 | 63 | 434.600 |
| 10 | 433.275 | 28 | 433.725 | 46 | 434.175 | 64 | 434.625 |
| 11 | 433.300 | 29 | 433.750 | 47 | 434.200 | 65 | 434.650 |
| 12 | 433.325 | 30 | 433.775 | 48 | 434.225 | 66 | 434.675 |
| 13 | 433.350 | 31 | 433.800 | 49 | 434.250 | 67 | 434.700 |
| 14 | 433.375 | 32 | 433.825 | 50 | 434.275 | 68 | 434.725 |
| 15 | 433.400 | 33 | 433.850 | 51 | 434.300 | 69 | 434.750 |
| 16 | 433.425 | 34 | 433.875 | 52 | 434.325 | 70 | 434.775 |
| 17 | 433.450 | 35 | 433.900 | 53 | 434.350 | | |
| 18 | 433.475 | 36 | 433.925 | 54 | 434.375 | | |


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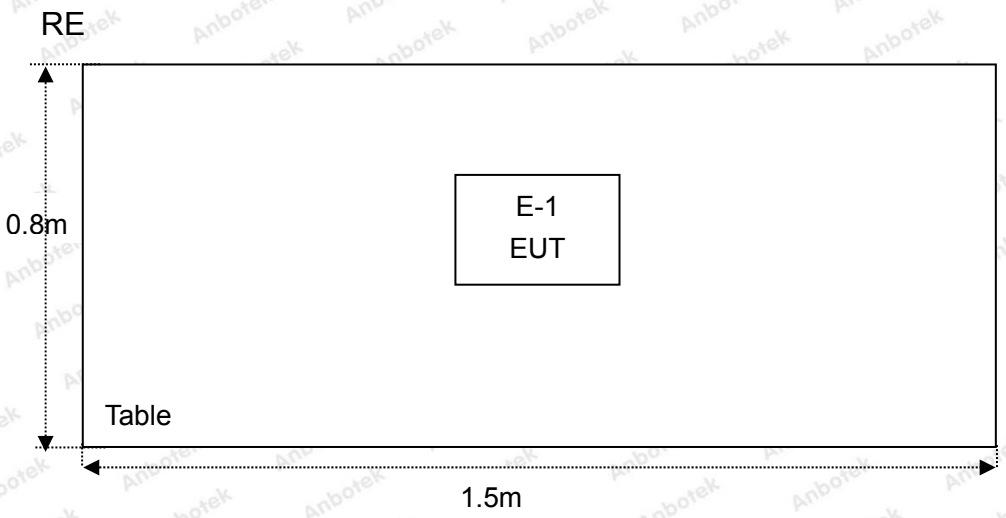
Hotline 400-003-0500
www.anbotek.com

## 1.6. Description Of Test Setup



## 1.7. Test Equipment List

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | L.I.S.N. Artificial Mains Network | Rohde & Schwarz | ENV216 | 100055 | Nov. 04, 2019 | 1 Year |
| 2. | EMI Test Receiver | Rohde & Schwarz | ESPI3 | 101604 | Nov. 04, 2019 | 1 Year |
| 3. | RF Switching Unit | Compliance Direction | RSU-M2 | 38303 | Nov. 04, 2019 | 1 Year |
| 4. | MAX Spectrum Analysis | Agilent | N9020A | MY51170037 | Nov. 04, 2019 | 1 Year |
| 5. | Preamplifier | SKET Electronic | BK1G18G30D | KD17503 | Nov. 04, 2019 | 1 Year |
| 6. | Double Ridged Horn Antenna | Instruments corporation | GTH-0118 | 351600 | Nov. 01, 2019 | 1 Year |
| 7. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | VULB 9163-289 | Nov. 01, 2019 | 1 Year |
| 8. | Loop Antenna | Schwarzbeck | FMZB1519B | 00053 | Nov. 01, 2019 | 1 Year |
| 9. | Horn Antenna | A-INFO | LB-180400-KF | J211060628 | Nov. 01, 2019 | 1 Year |
| 10. | Pre-amplifier | SONOMA | 310N | 186860 | Nov. 04, 2019 | 1 Year |
| 11. | EMI Test Software EZ-EMC | SHURPLE | N/A | N/A | N/A | N/A |
| 12. | RF Test Control System | YIHENG | YH3000 | 2017430 | Nov. 04, 2019 | 1 Year |
| 13. | Power Sensor | DAER | RPR3006W | 15I00041SN045 | Nov. 04, 2019 | 1 Year |
| 14. | Power Sensor | DAER | RPR3006W | 15I00041SN046 | Nov. 04, 2019 | 1 Year |
| 15. | MXA Spectrum Analysis | Agilent | N9020A | MY51170037 | Nov. 04, 2019 | 1 Year |
| 16. | MXG RF Vector Signal Generator | Agilent | N5182A | MY48180656 | Nov. 04, 2019 | 1 Year |
| 17. | Signal Generator | Agilent | E4421B | MY41000743 | Nov. 04, 2019 | 1 Year |
| 18. | DC Power Supply | LW | TPR-6420D | 374470 | Nov. 04, 2019 | 1 Year |
| 19. | Constant Temperature Humidity Chamber | ZHONGJIAN | ZJ-KHWS80B | N/A | Nov. 04, 2019 | 1 Year |

## 1.8. Measurement Uncertainty

| | | |
|---|---|---|
| Radiation Uncertainty | : | Ur = 3.9 dB (Horizontal) |
| | | Ur = 3.8 dB (Vertical) |
| | | |
| Conduction Uncertainty | : | Uc = 3.4 dB |

## 1.9. Description of Test Facility

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

**FCC-Registration No.: 184111**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed 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 No. 184111, September 27, 2019.

**ISED-Registration No.: 8058A**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A, March 07, 2019.

**Test Location**

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

# 2. Summary of Test Results

| Standard Section | Test Item | Result |
|---|---|---|
| 15.203 | Antenna Requirement | PASS |
| 15.207 | Conducted Emission | N/A |
| 15.205/15.209/15.231(b) | Spurious Emission | PASS |
| 15.231(c) | 20dB Occupied Bandwidth | PASS |
| 15.231(a) | Dwell time | PASS |
| **Remark:** "N/A" is an abbreviation for Not Applicable. | | |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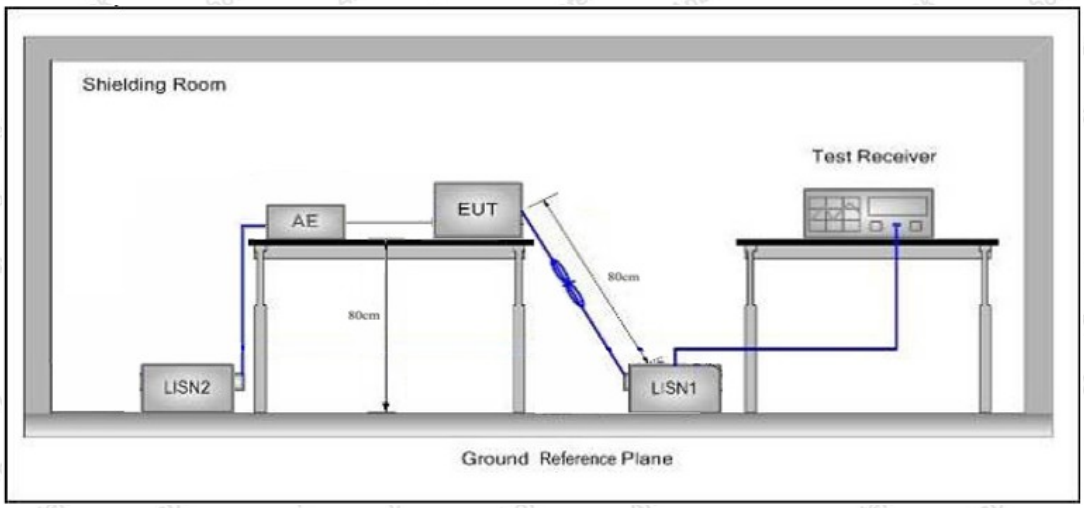
# 3. Conducted Emission Test

## 3.1. Test Standard and Limit

| Test Standard | FCC Part15 Section 15.207 | | |
|---|---|---|---|
| Test Limit | Frequency | Maximum RF Line Voltage (dBuV) | |
| | | Quasi-peak Level | Average Level |
| | 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| | 500kHz~5MHz | 56 | 46 |
| | 5MHz~30MHz | 60 | 50 |
| **Remark:** (1) *Decreasing linearly with logarithm of the frequency.<br>(2) The lower limit shall apply at the transition frequency. | | | |

## 3.2. Test Setup




## 3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

## 3.4. Test Data

The EUT is powered by DC 3.7V Battery inside, so there is no need to conduct this test.

# 4. Radiation Spurious Emission and Band Edge

## 4.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.209, 15.205 and 15.231(b) | | | | |
|---|---|---|---|---|---|
| Test Limit | Frequency (MHz) | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
| | 0.009MHz~0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz~88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz~216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz~960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz~1000MHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1000MHz | 500 | 54.0 | Average | 3 |
| | | - | 74.0 | Peak | 3 |

**Remark:**

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

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

Emission Level (dBuV/m)=20log Emission Level(uV/m)

The field strength of emission limits have been calculated in below table:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (dBuV/m)@3m |
|---|---|
| 433.05 | 80.80 (AVG) |
| 433.05 | 100.80 (Peak) |

| Fundamental Frequency (MHz) | Field Strength of Fundamental (dBuV/m)@3m |
|---|---|
| 433.90 | 80.82 (AVG) |
| 433.90 | 100.82 (Peak) |

| Fundamental Frequency (MHz) | Field Strength of Fundamental (dBuV/m)@3m |
|---|---|
| 434.775 | 80.85 (AVG) |
| 434.775 | 100.85 (Peak) |

## 4.2. Test Setup

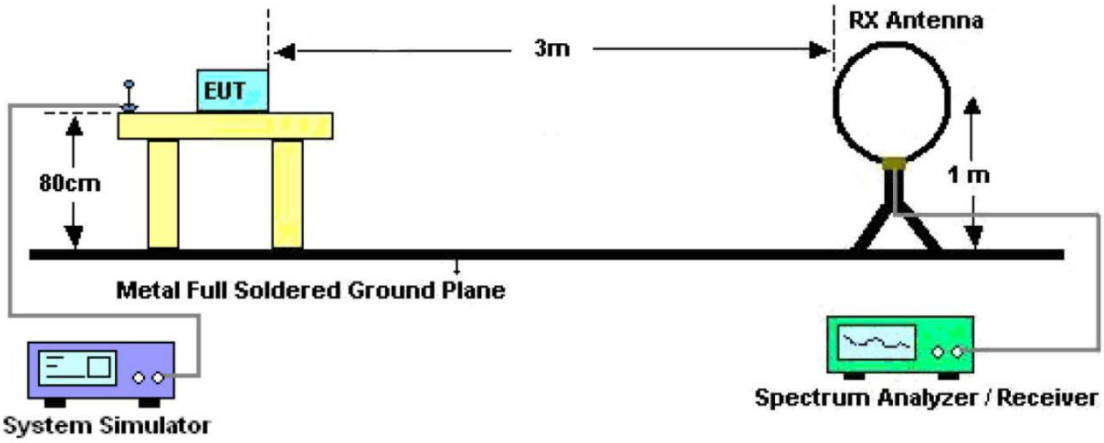



Figure 1. Below 30MHz

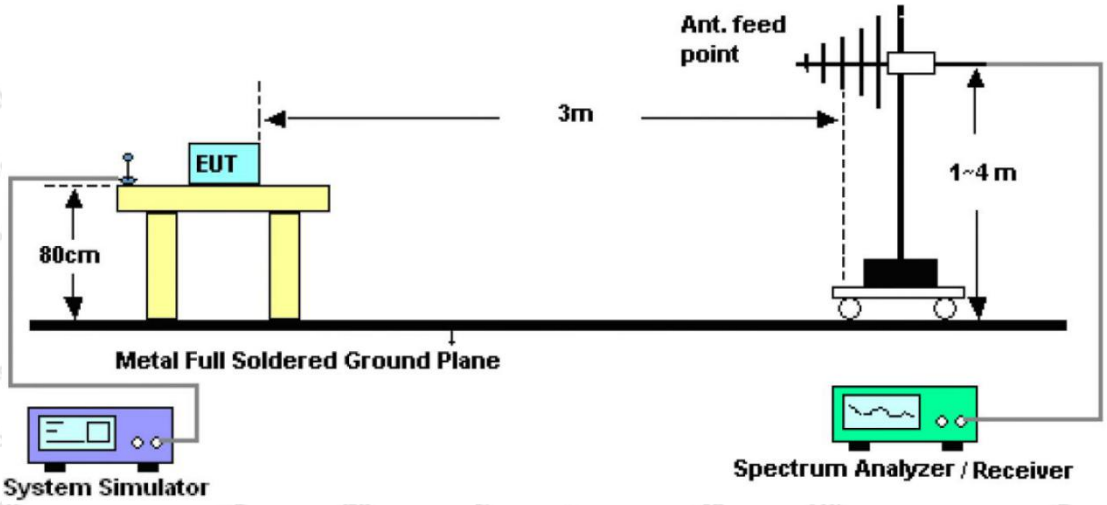



Figure 2. 30MHz to 1GHz

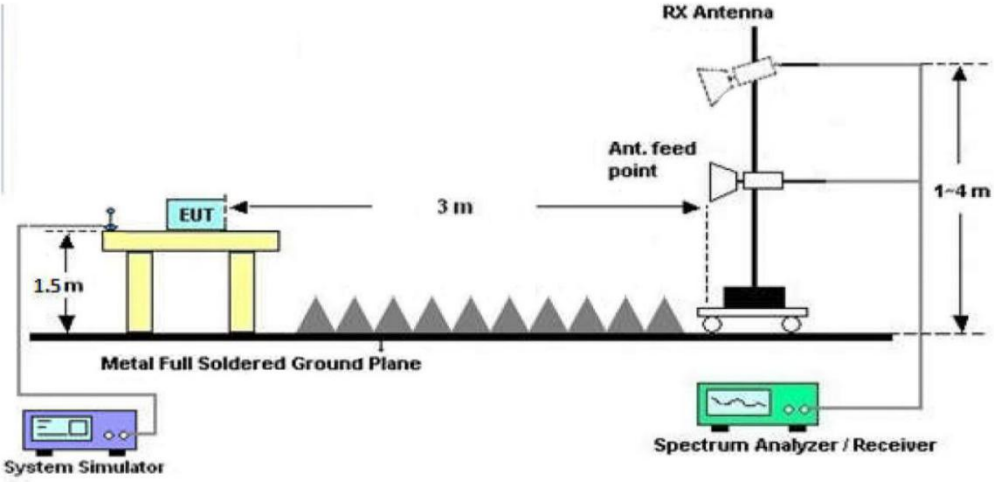



Figure 3. Above 1 GHz

## 4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz,Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

## 4.4. Test Data

**PASS**

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz and above 18000MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

**Test Results (Fundamental 433.05MHz)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det. |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 433.05 | H | 94.82 | 1.52 | 12.64 | 31.45 | - | 77.53 | 100.80 | PK |
| 433.05 | H | 94.82 | 1.52 | 12.64 | 31.45 | -8.87 | 68.66 | 80.80 | AV |
| 433.05 | V | 97.45 | 1.52 | 12.64 | 31.45 | - | 80.16 | 100.80 | PK |
| 433.05 | V | 97.45 | 1.52 | 12.64 | 31.45 | -8.87 | 71.29 | 80.80 | AV |

Remark:

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor
2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 0.278ms

2/PW=2/0.278=7.17kHz

RBW(1000kHz)＞ 2/PW (7.17KHz)

Therefore PDCF is not needed.

3. Duty Cycle Factor

Calculate Formula:

AV=PEAK +Duty Cycle Factor

Duty Cycle Factor=20log(Duty Cycle)

Duty Cycle= on time/ period

Test Data:

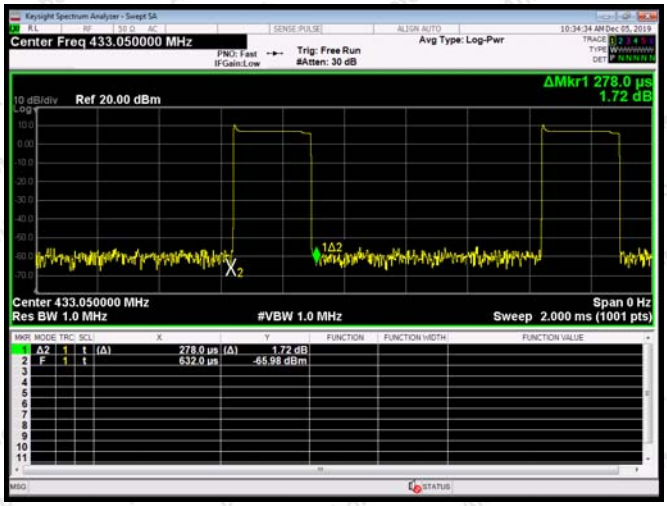
T on time=0.772ms*6+0.278ms*11=7.690 ms

T period=21.35ms

Duty Cycle=36.02%

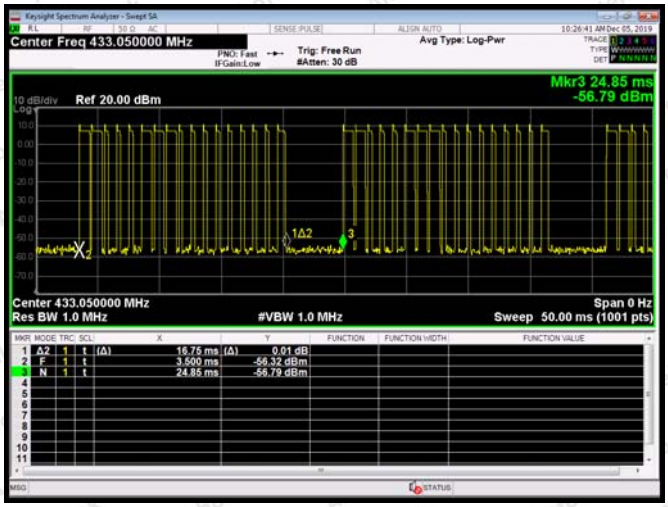
Duty Cycle Factor =20log(Duty Cycle)=-8.87

T on time slot-1




T on time slot-2

T period



**Test Results (Harmonics Emissions)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 866.10 | H | 74.61 | 1.92 | 12.71 | 31.72 | - | 57.52 | 80.80 | PK |
| 866.10 | H | 74.61 | 1.92 | 12.71 | 31.72 | -8.87 | 48.65 | 60.80 | AV |
| 866.10 | V | 76.73 | 1.92 | 12.71 | 31.72 | - | 59.64 | 80.80 | PK |
| 866.10 | V | 76.73 | 1.92 | 12.71 | 31.72 | -8.87 | 50.77 | 60.80 | AV |
| 1299.15 | H | 63.92 | 2.38 | 21.43 | 32.45 | - | 55.28 | 74.00 | PK |
| 1299.15 | H | 63.92 | 2.38 | 21.43 | 32.45 | -8.87 | 46.41 | 54.00 | AV |
| 1299.15 | V | 65.09 | 2.38 | 18.56 | 32.45 | - | 53.58 | 74.00 | PK |
| 1299.15 | V | 65.09 | 2.38 | 18.56 | 32.45 | -8.87 | 44.71 | 54.00 | AV |

Remark :

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor

2. Pulse Desensitization Correction Factor

   Pulse Width (PW)= 0.278ms

   2/PW=2/0.278=7.19kHz

   RBW(1000kHz)＞ 2/PW (7.75KHz)

   Therefore PDCF is not needed.

3. Duty Cycle Factor=-8.87

**Test Results (Fundamental 433.90MHz)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det. |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 433.90 | H | 94.07 | 1.52 | 12.64 | 31.45 | - | 76.78 | 100.82 | PK |
| 433.90 | H | 94.07 | 1.52 | 12.64 | 31.45 | -8.84 | 67.94 | 80.82 | AV |
| 433.90 | V | 97.91 | 1.52 | 12.64 | 31.45 | - | 80.62 | 100.82 | PK |
| 433.90 | V | 97.91 | 1.52 | 12.64 | 31.45 | -8.84 | 71.78 | 80.82 | AV |

Remark:

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor
2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 0.270ms

2/PW=2/0.270=7.41kHz

RBW(1000kHz)＞ 2/PW (7.41KHz)

Therefore PDCF is not needed.

3. Duty Cycle Factor

Calculate Formula:

AV=PEAK +Duty Cycle Factor

Duty Cycle Factor=20log(Duty Cycle)

Duty Cycle= on time/ period

Test Data:

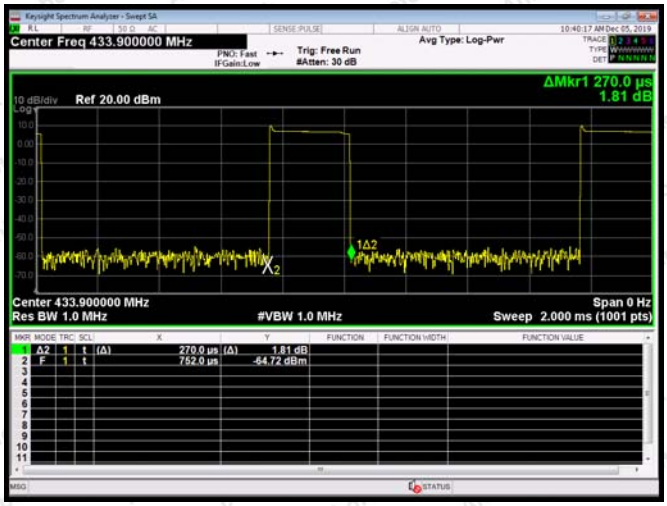
T on time=0.794ms*6+0.270ms*11=7.734 ms

T period=21.40ms

Duty Cycle=36.14%

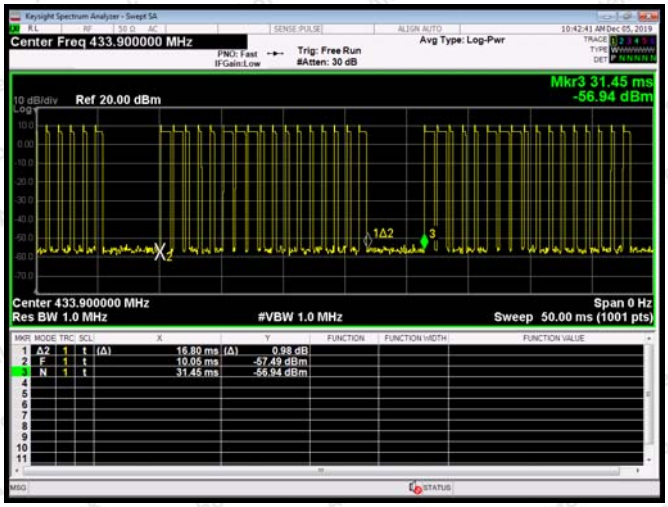
Duty Cycle Factor =20log(Duty Cycle)=-8.84

T on time slot-1




T on time slot-2

T period



**Test Results (Harmonics Emissions)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 867.80 | H | 74.59 | 1.92 | 12.71 | 31.72 | - | 57.50 | 80.82 | PK |
| 867.80 | H | 74.59 | 1.92 | 12.71 | 31.72 | -8.84 | 48.66 | 60.82 | AV |
| 867.80 | V | 76.85 | 1.92 | 12.71 | 31.72 | - | 59.76 | 80.82 | PK |
| 867.80 | V | 76.85 | 1.92 | 12.71 | 31.72 | -8.84 | 50.92 | 60.82 | AV |
| 1301.70 | H | 63.91 | 2.38 | 21.43 | 32.45 | - | 55.27 | 74.00 | PK |
| 1301.70 | H | 63.91 | 2.38 | 21.43 | 32.45 | -8.84 | 46.43 | 54.00 | AV |
| 1301.70 | V | 65.24 | 2.38 | 18.56 | 32.45 | - | 53.73 | 74.00 | PK |
| 1301.70 | V | 65.24 | 2.38 | 18.56 | 32.45 | -8.84 | 44.89 | 54.00 | AV |

Remark :

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor

2. Pulse Desensitization Correction Factor

   Pulse Width (PW)= 0.270ms

   2/PW=2/0.270=7.41kHz

   RBW(1000kHz)＞ 2/PW (7.41KHz)

   Therefore PDCF is not needed.

3. Duty Cycle Factor=-8.84


Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500
www.anbotek.com

**Test Results (Fundamental 434.775MHz)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det. |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 434.775 | H | 94.79 | 1.52 | 12.64 | 31.45 | - | 77.50 | 100.85 | PK |
| 434.775 | H | 94.79 | 1.52 | 12.64 | 31.45 | -8.91 | 68.59 | 80.85 | AV |
| 434.775 | V | 97.35 | 1.52 | 12.64 | 31.45 | - | 80.06 | 100.85 | PK |
| 434.775 | V | 97.35 | 1.52 | 12.64 | 31.45 | -8.91 | 71.15 | 80.85 | AV |

Remark:

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor
2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 0.272ms

2/PW=2/0.272=7.35kHz

RBW(1000kHz)＞ 2/PW (7.35KHz)

Therefore PDCF is not needed.

3. Duty Cycle Factor

Calculate Formula:

AV=PEAK +Duty Cycle Factor

Duty Cycle Factor=20log(Duty Cycle)

Duty Cycle= on time/ period

Test Data:

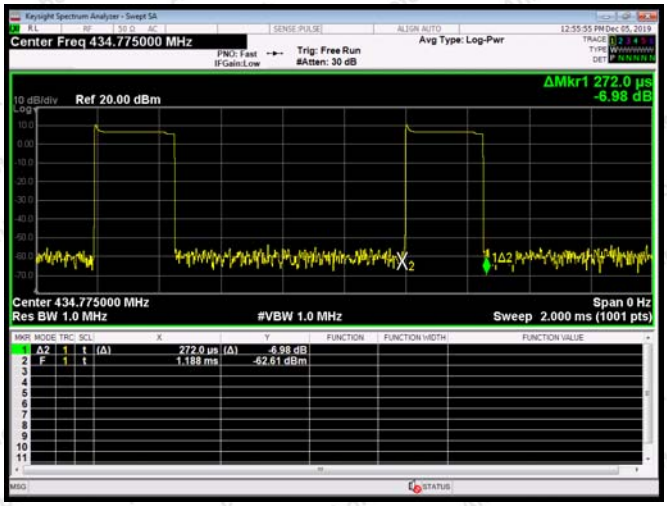
T on time=0.768ms*6+0.266ms*11=7.636 ms

T period=21.30ms

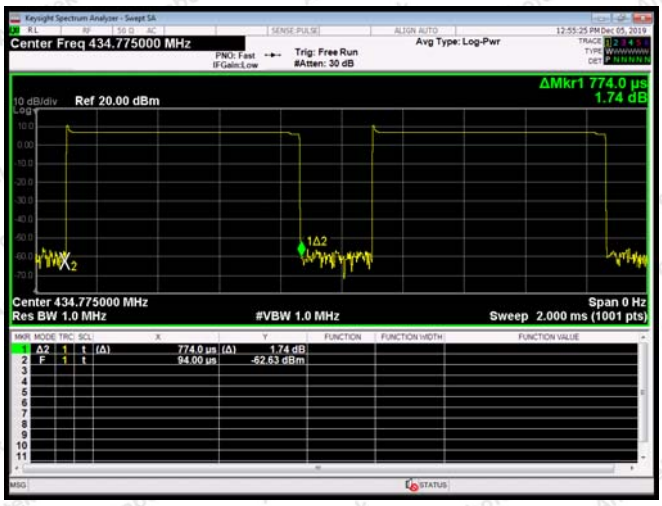
Duty Cycle=35.85%

Duty Cycle Factor =20log(Duty Cycle)=-8.91

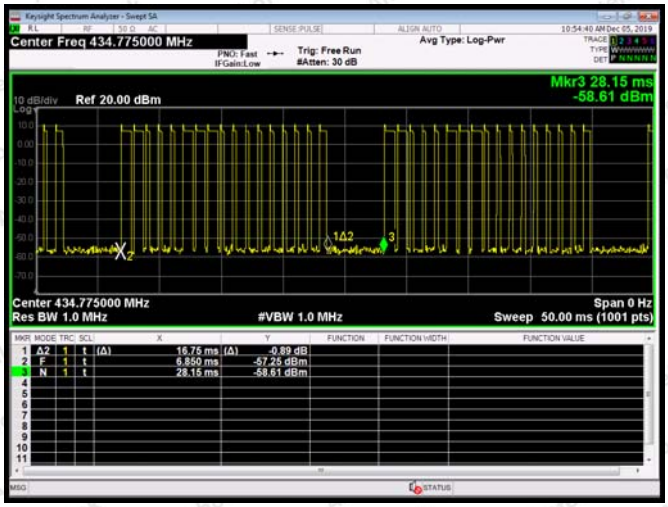
T on time slot-1




T on time slot-2




T period



**Test Results (Harmonics Emissions)**

| Frequency | Antenna | Reading | Cable Loss | Ant Factor | Amplifier | Duty cycle Factor | Results | Limits | Det |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | Pol. | (dBuV/m) | (dB) | (dB) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | Mode |
| 869.55 | H | 74.95 | 1.92 | 12.71 | 31.72 | - | 57.86 | 80.85 | PK |
| 869.55 | H | 74.95 | 1.92 | 12.71 | 31.72 | -8.91 | 48.95 | 60.85 | AV |
| 869.55 | V | 76.40 | 1.92 | 12.71 | 31.72 | - | 59.31 | 80.85 | PK |
| 869.55 | V | 76.40 | 1.92 | 12.71 | 31.72 | -8.91 | 50.40 | 60.85 | AV |
| 1304.325 | H | 63.60 | 2.38 | 21.43 | 32.45 | - | 54.96 | 74.00 | PK |
| 1304.325 | H | 63.60 | 2.38 | 21.43 | 32.45 | -8.91 | 46.05 | 54.00 | AV |
| 1304.325 | V | 66.00 | 2.38 | 18.56 | 32.45 | - | 54.49 | 74.00 | PK |
| 1304.325 | V | 66.00 | 2.38 | 18.56 | 32.45 | -8.91 | 45.58 | 54.00 | AV |

Remark :

1. Result = Reading + Cable Loss +Ant Factor –Amplifier + Duty cycle Factor

2. Pulse Desensitization Correction Factor

   Pulse Width (PW)= 0.272ms

   2/PW=2/0.272=7.35kHz

   RBW(1000kHz)＞ 2/PW (7.35KHz)

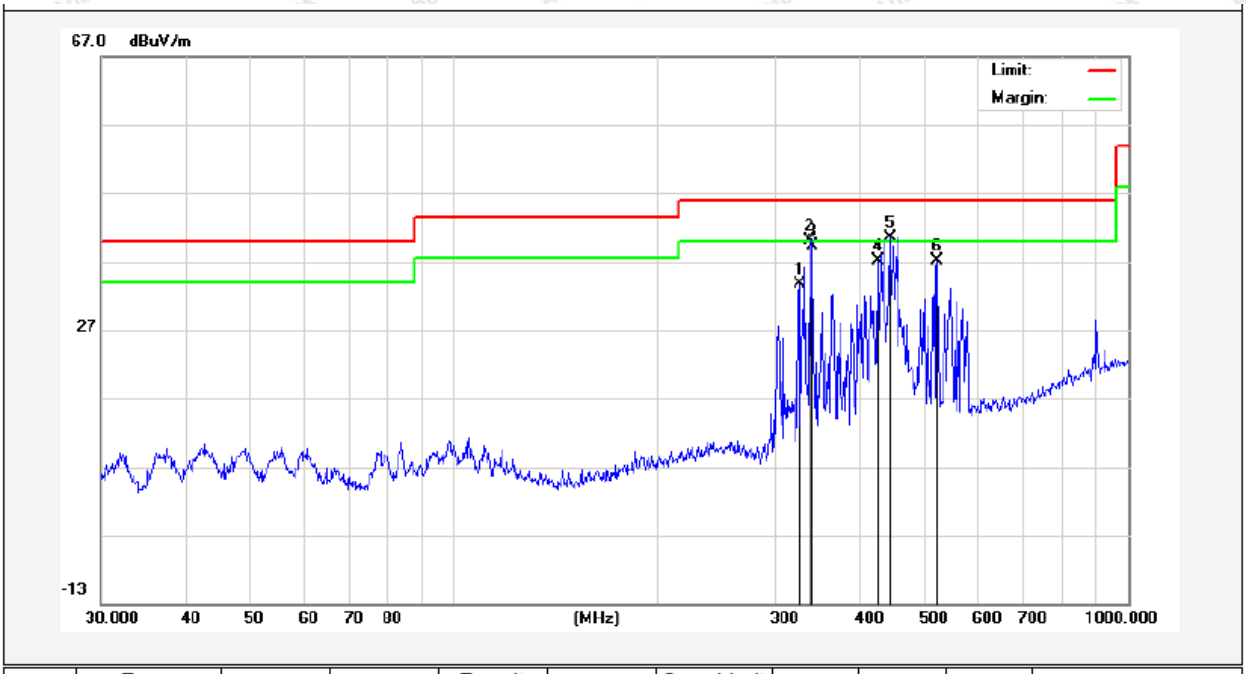
   Therefore PDCF is not needed.

3. Duty Cycle Factor=-8.91

**Test Results (30~1000MHz)**

| | | | |
|---|---|---|---|
| Job No.: | SZAWW191130009-01 | Temp.(℃)/Hum.(%RH): | 23℃/54%RH |
| Standard: | FCC PART 15C | Power Source: | DC 3.7V Battery inside |
| Test Mode: | TX Mode | Polarization: | Horizontal |

Note:

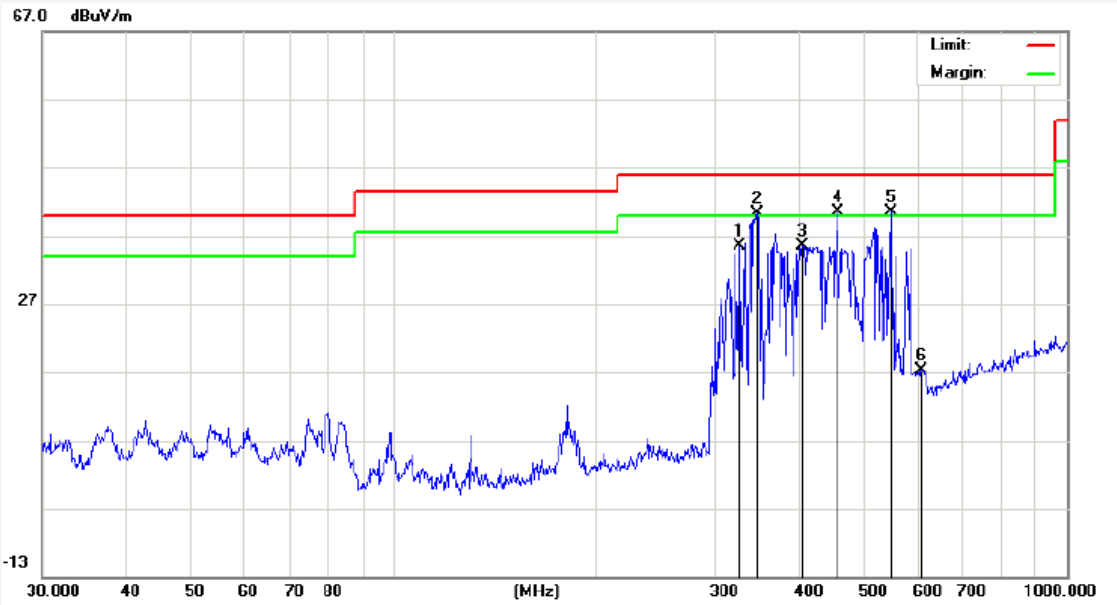



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 325.5957 | 50.77 | -17.10 | 33.67 | 46.00 | -12.33 | QP | 300 | 79 | |
| 2 | 337.2155 | 56.68 | -16.60 | 40.08 | 46.00 | -5.92 | QP | 300 | 140 | |
| 3 | 340.7817 | 55.83 | -16.45 | 39.38 | 46.00 | -6.62 | QP | 300 | 256 | |
| 4 | 425.0280 | 51.80 | -14.68 | 37.12 | 46.00 | -8.88 | QP | 300 | 333 | |
| 5 | 443.2943 | 54.96 | -14.49 | 40.47 | 46.00 | -5.53 | QP | 300 | 240 | |
| 6 | 520.8881 | 50.13 | -13.03 | 37.10 | 46.00 | -8.90 | QP | 300 | 55 | |

**Test Results (30~1000MHz)**

| | | | |
|---|---|---|---|
| Job No.: | SZAWW191130009-01 | Temp.(℃)/Hum.(%RH): | 23℃/54%RH |
| Standard: | FCC PART 15C | Power Source: | DC 3.7V Battery inside |
| Test Mode: | TX Mode | Polarization: | Vertical |

Note:




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | Height (cm) | degree (deg) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 326.7395 | 51.46 | -16.05 | 35.41 | 46.00 | -10.59 | QP | 300 | 360 | |
| 2 | 346.8091 | 55.51 | -15.28 | 40.23 | 46.00 | -5.77 | QP | 300 | 104 | |
| 3 | 404.6664 | 49.72 | -14.14 | 35.58 | 46.00 | -10.42 | QP | 300 | 252 | |
| 4 | 455.9057 | 54.73 | -14.17 | 40.56 | 46.00 | -5.44 | QP | 300 | 99 | |
| 5 | 547.0977 | 52.56 | -12.02 | 40.54 | 46.00 | -5.46 | QP | 300 | 79 | |
| 6 | 607.7866 | 28.20 | -10.80 | 17.40 | 46.00 | -28.60 | QP | 300 | 54 | |

Remark:

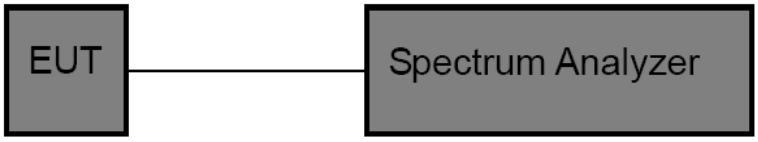
1. Results = Reading + Cable Loss +Ant Factor –Amplifier

# 5. 20DB Occupy Bandwidth Test

## 5.1. Test Standard and Limit

<table>
<tr><td>Test Standard</td><td>FCC Part15 C Section 15.231 (c)</td></tr>
<tr><td>Test Limit</td><td>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 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.<br>So the emission bandwidth limits have been calculated in below table:
<table>
<tr><th>Fundamental Frequency</th><th>Limit of 20dB Bandwidth</th></tr>
<tr><td>433.050 MHz</td><td>433050x0.0025=1082.625 kHz</td></tr>
<tr><td>433.900 MHz</td><td>433900x0.0025=1084.750 kHz</td></tr>
<tr><td>434.775 MHz</td><td>434775x0.0025=1086.938 kHz</td></tr>
</table></td></tr>
</table>

## 5.2. Test Setup



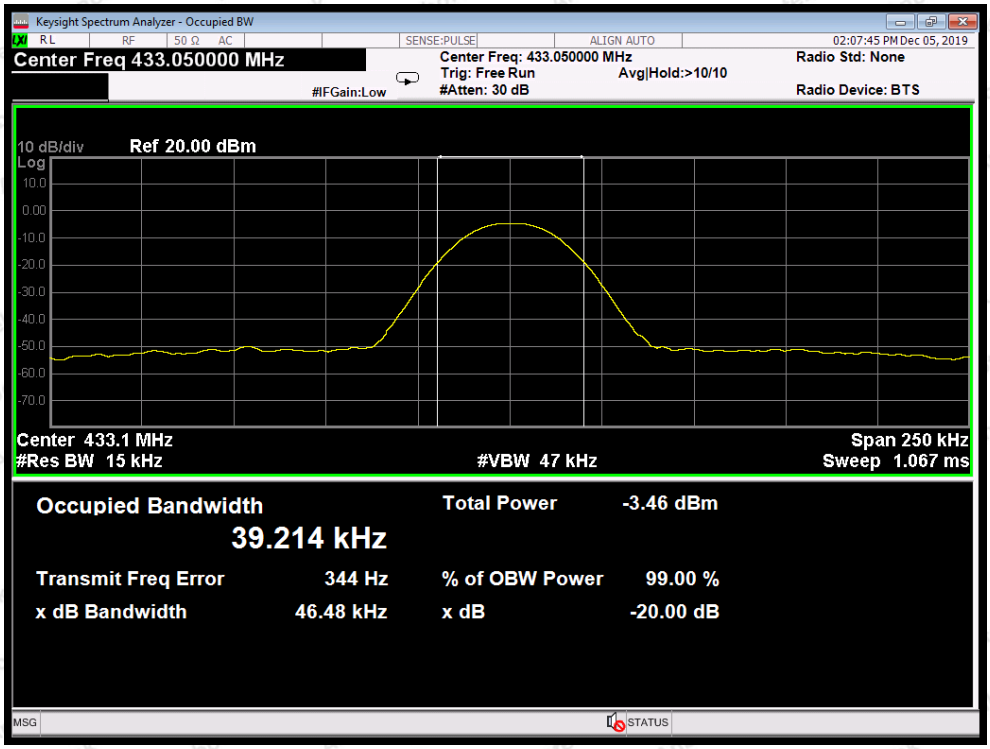

## 5.3. Test Procedure

1. Place the EUT on the table and set it in the continuously transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
   RBW = 100kHz, VBW≥3*RBW =300kHz,
   Span= 2MHz
   Detector= Peak
   Trace mode= Max hold.
   Sweep- auto couple.
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

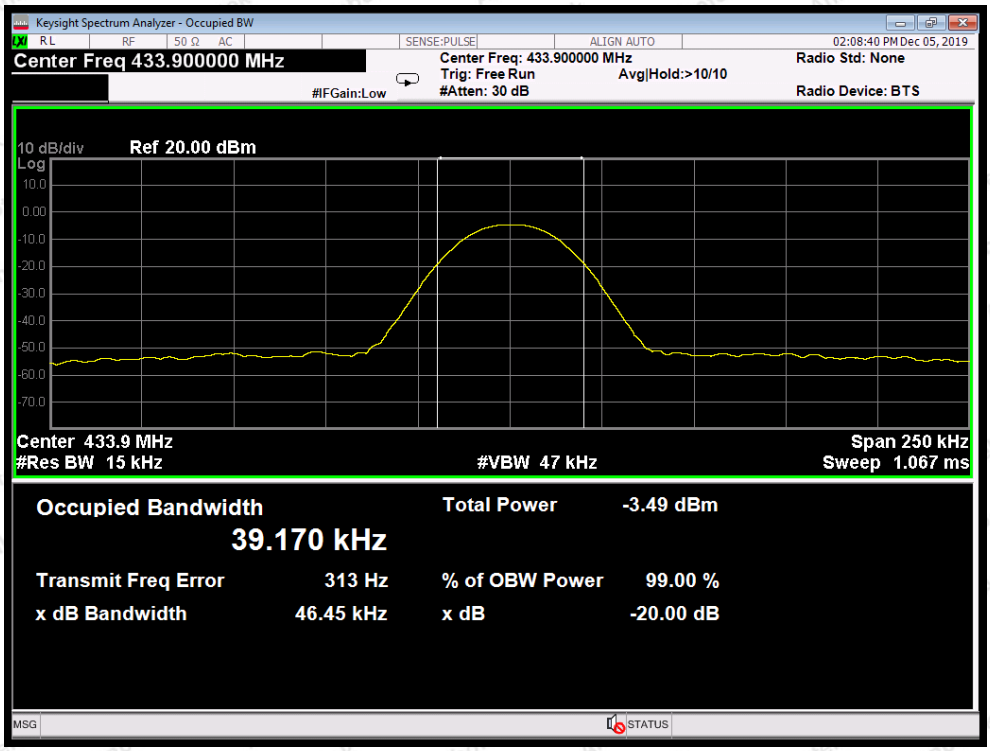
## 5.4. Test Data

| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | 20dB Bandwidth | Test Mode | : | Continuously transmitting |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

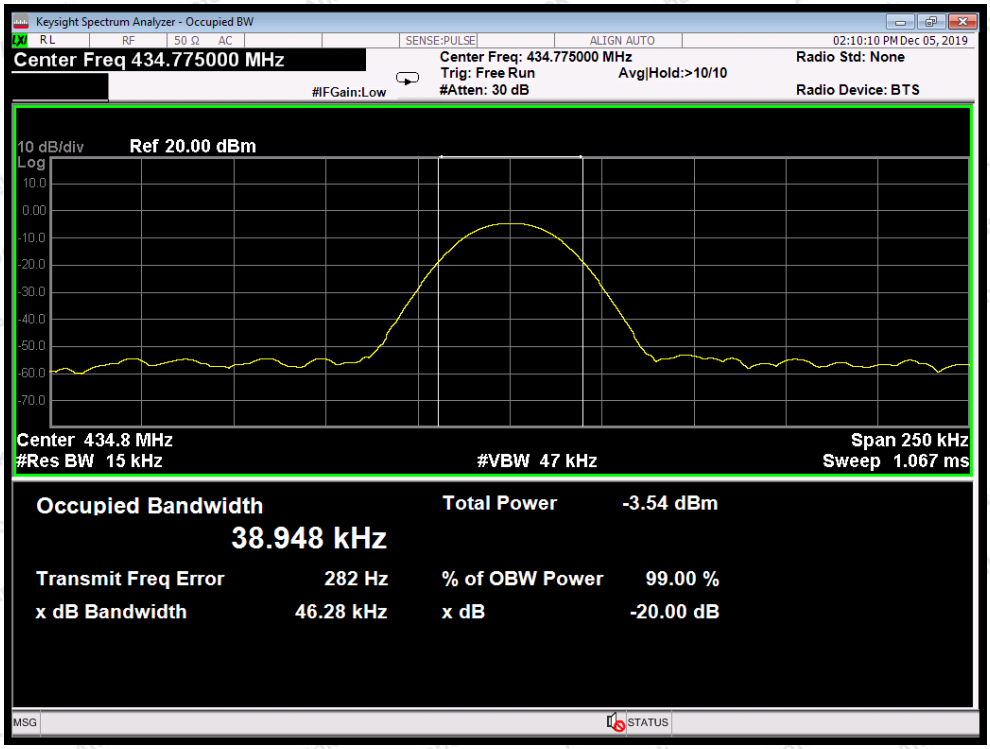
| Freq. (MHz) | Modulation Type | Bandwidth (kHz) | Limit (kHz) | Results |
|---|---|---|---|---|
| 433.050 | GFSK | 46.48 | <1082.625 | PASS |
| 433.900 | GFSK | 46.45 | <1084.750 | PASS |
| 434.775 | GFSK | 46.28 | <1086.938 | PASS |




433.050MHz




433.90MHz



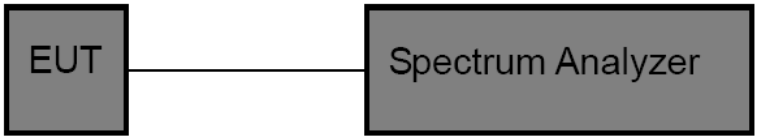

434.775MHz

# 6. Dwell Time Test

## 6.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part 15.231(a)(1) |
| Test Limit | According to FCC Part 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 |

## 6.2. Test Setup




## 6.3. Test Procedure

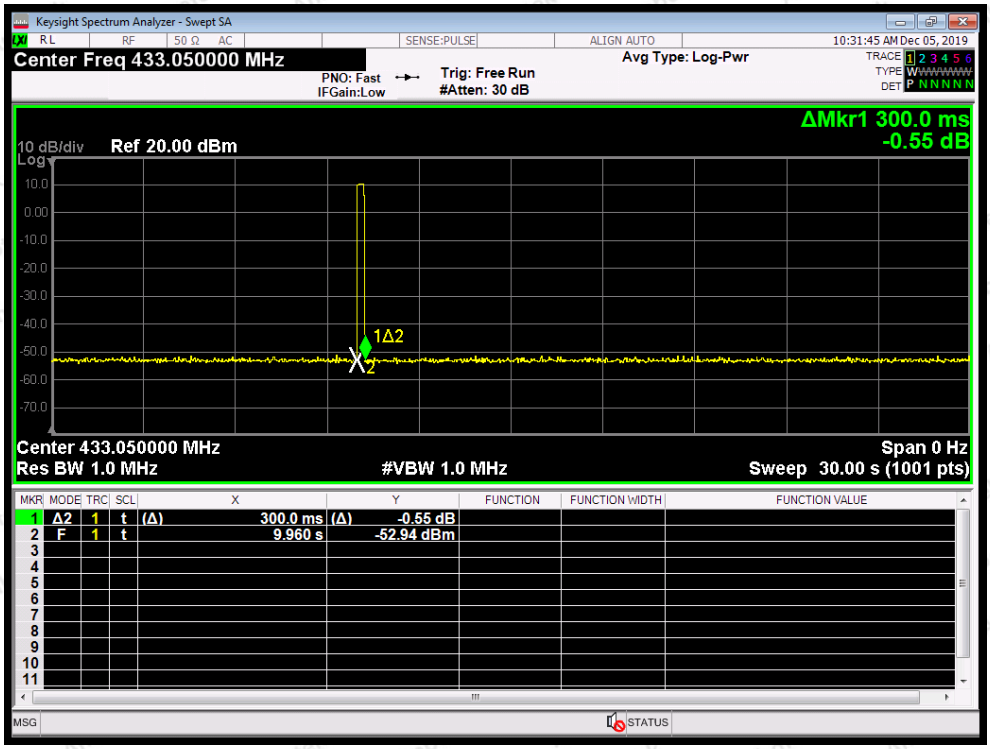
1. Place the EUT on the table and set it in continuously transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as
   RBW=1000kHz, VBW= 1000 kHz, Span= 0Hz, Sweep Time= 20 Seconds.
3. Record the Delta mark time.

## 6.4. Test Data

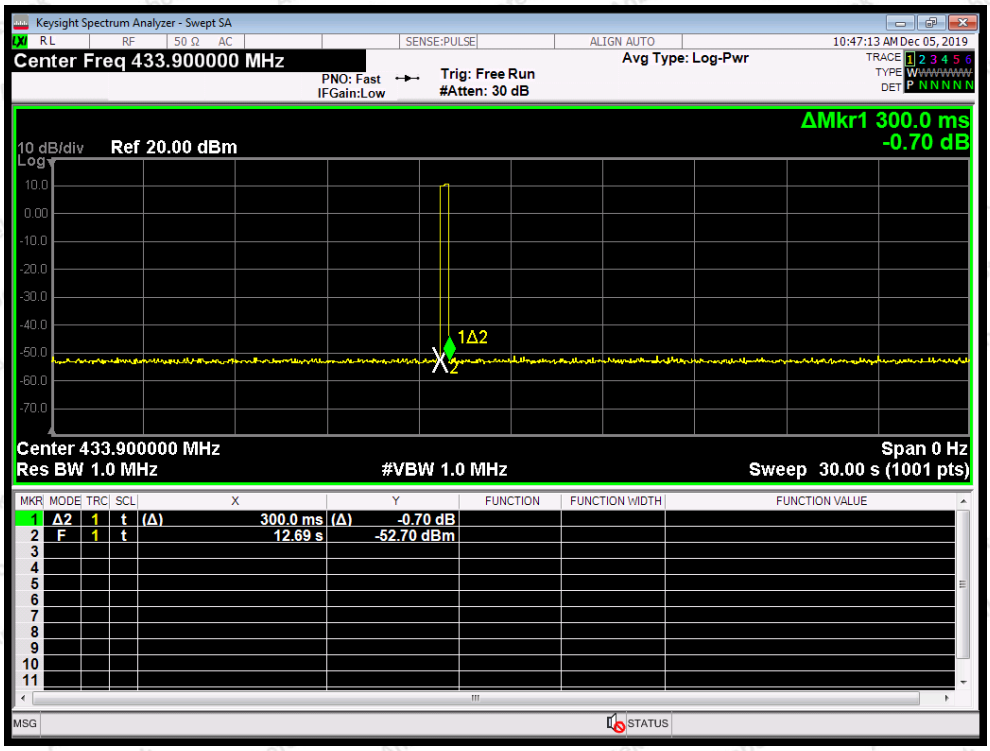
| | | | | | |
|---|---|---|---|---|---|
| Test Item | : | Dwell Time | Test Mode | : | Continuously transmitting |
| Test Voltage | : | DC 3.7V Battery inside | Temperature | : | 24℃ |
| Test Result | : | PASS | Humidity | : | 55%RH |

| Freq. (MHz) | Test Mode | Transmitting time(s) | Limit(s) | Result |
|---|---|---|---|---|
| 433.050 | GFSK mode | 0.3 | ≤5 | PASS |
| 433.900 | GFSK mode | 0.3 | ≤5 | PASS |
| 434.775 | GFSK mode | 0.3 | ≤5 | PASS |

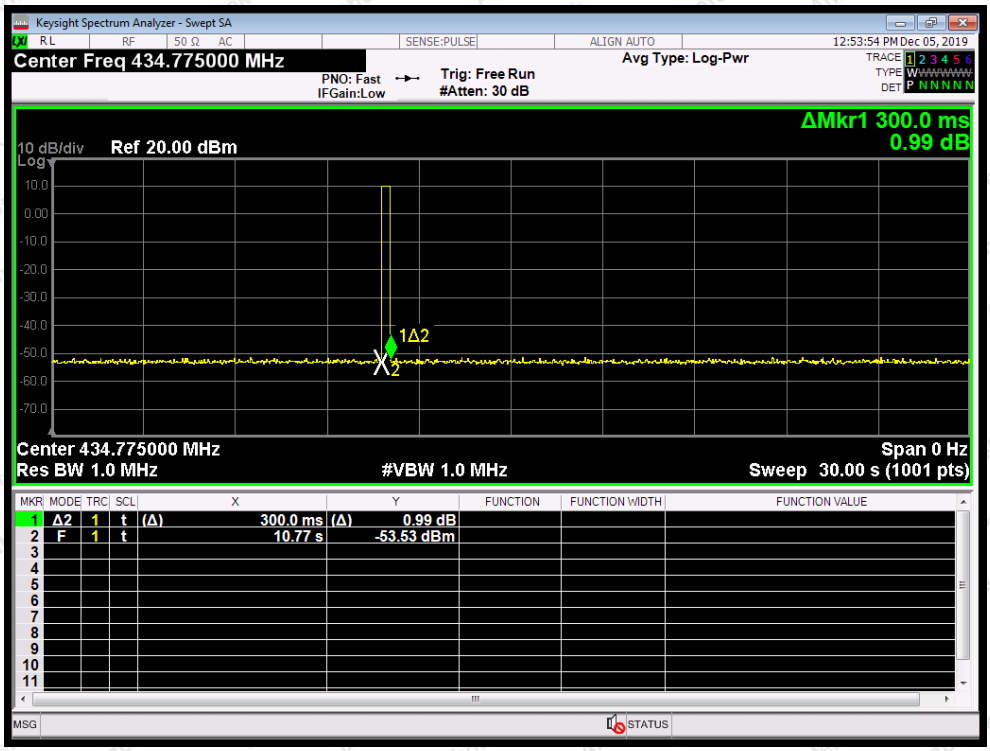
Please refer the following plot.




433.05MHz




433.90MHz


Keysight Spectrum Analyzer - Swept SA
Center Freq 434.775000 MHz
Avg Type: Log-Pwr
12:53:54 PM Dec 05, 2019
Trig: Free Run
#Atten: 30 dB
PNO: Fast
IFGain:Low
ΔMkr1 300.0 ms
0.99 dB
10 dB/div
Ref 20.00 dBm
Center 434.775000 MHz
Span 0 Hz
Res BW 1.0 MHz
#VBW 1.0 MHz
Sweep 30.00 s (1001 pts)
1 Δ2 1 t (Δ) 300.0 ms (Δ) 0.99 dB
2 F 1 t 10.77 s -53.53 dBm

434.775MHz

# 7. Antenna Requirement

## 7.1. Test Standard and Requirement

| | |
|---|---|
| Test Standard | FCC Part15 Section 15.203 |
| Requirement | 1) 15.203 requirement:<br>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.<br>Antenna requirement must meet at least one of the following:<br>1) Antenna must be permanently attached to device.<br>2) The antenna must use a unique type of connector to attach to the device.<br>3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device. |

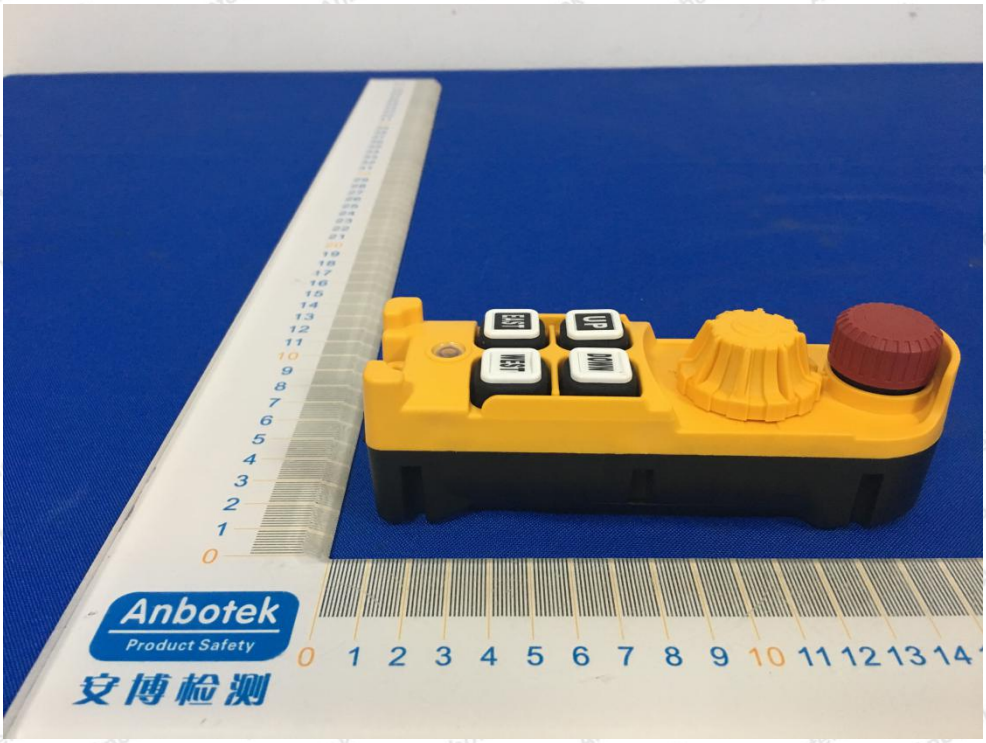
## 7.2. Antenna Connected Construction

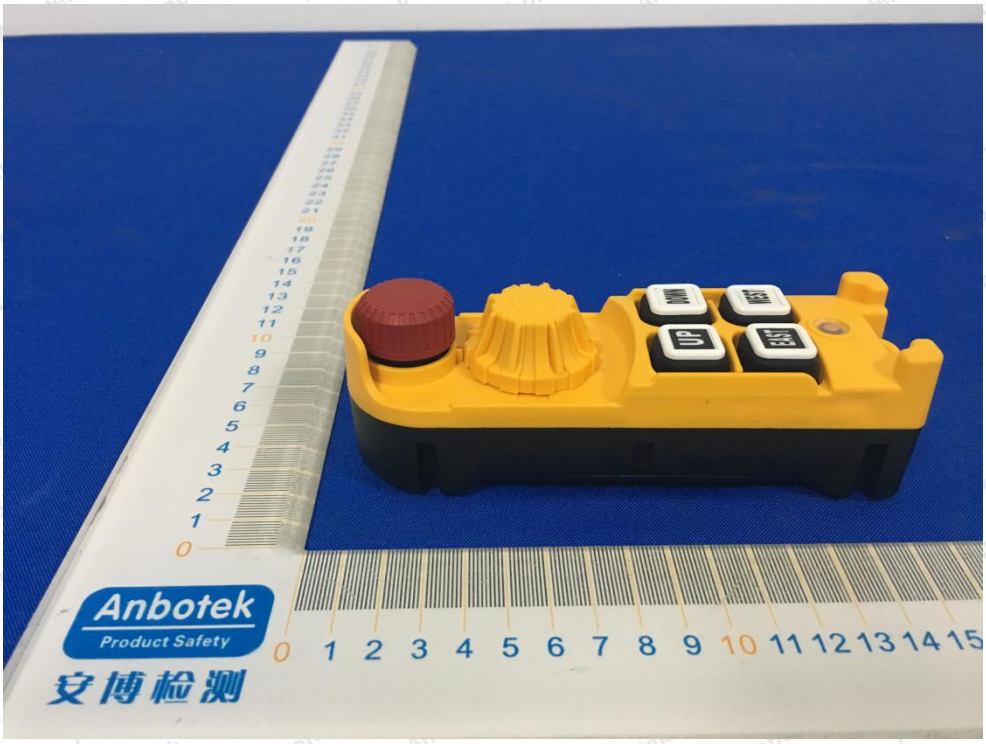
The antenna is a Monopole antenna which permanently attached, and the best case gain of the antenna is 1.5 dBi. It complies with the standard requirement.

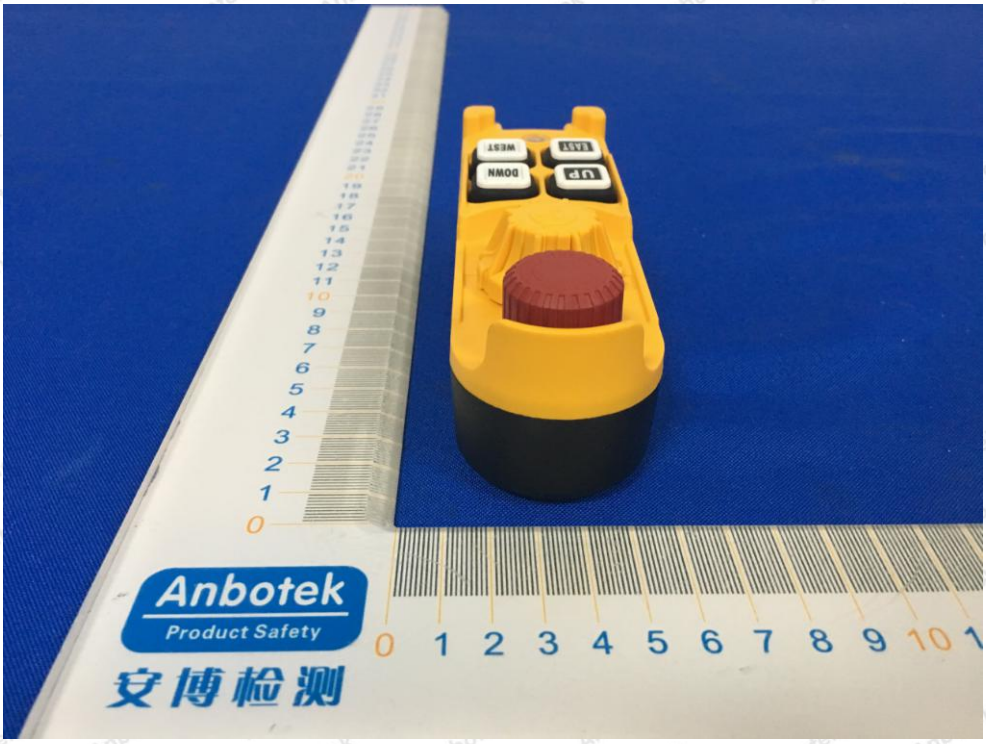
# APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiated Emission Measurement

# APPENDIX II -- EXTERNAL PHOTOGRAPH

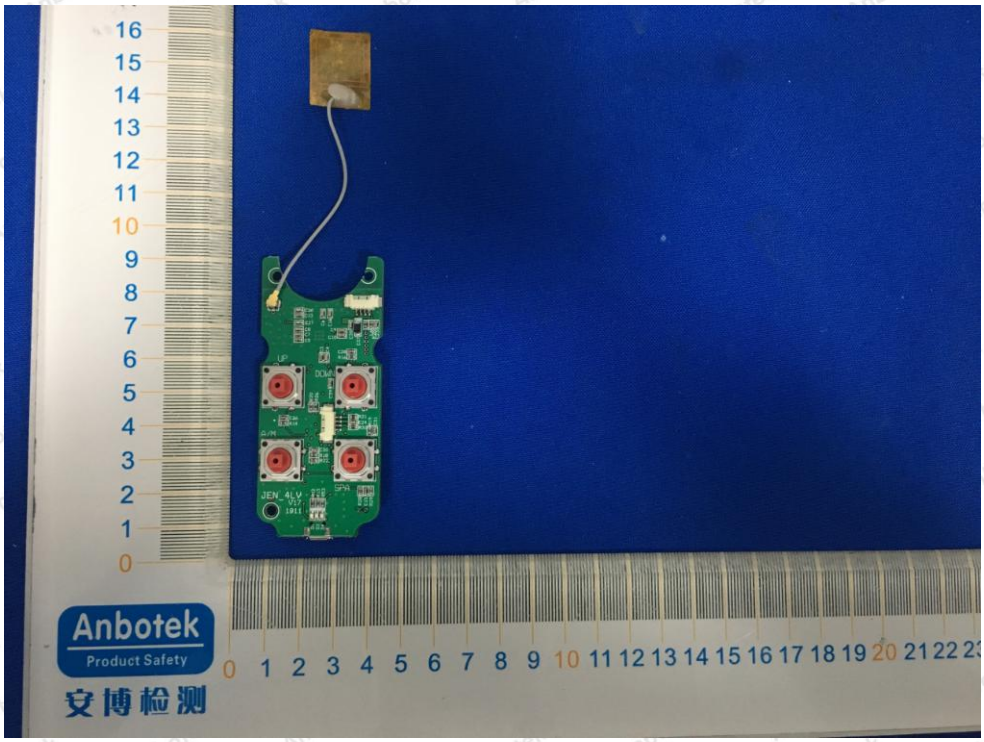

UP
FAST
FAST
UP
Anbotek
Product Safety
安博检测

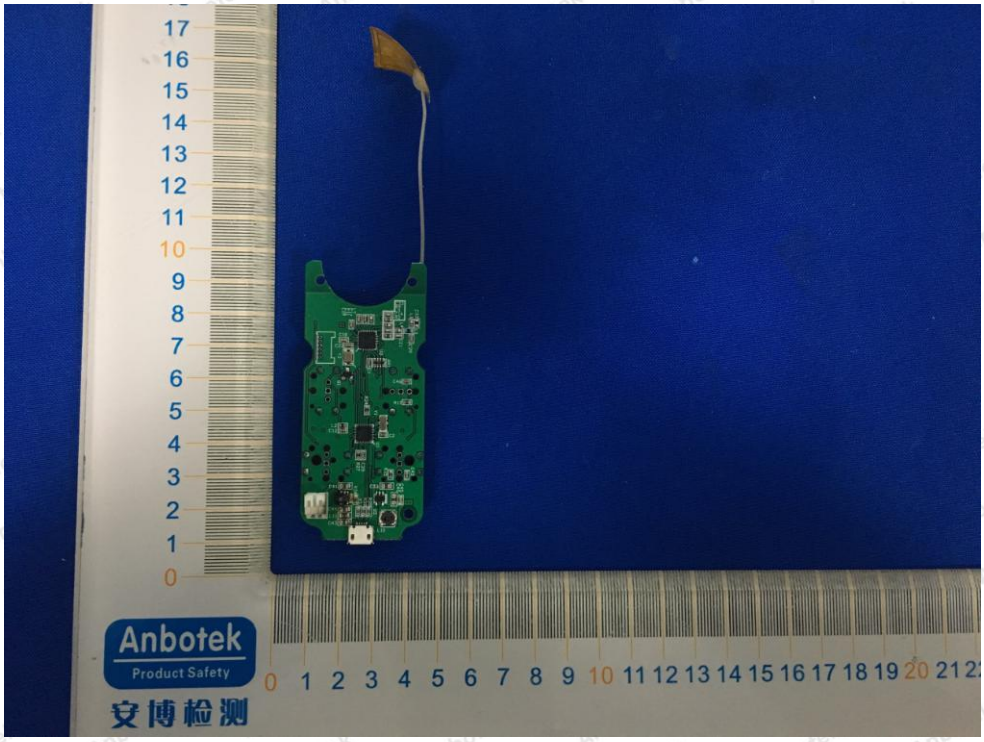

UP
FAST
UP
FAST
Anbotek
Product Safety
安博检测

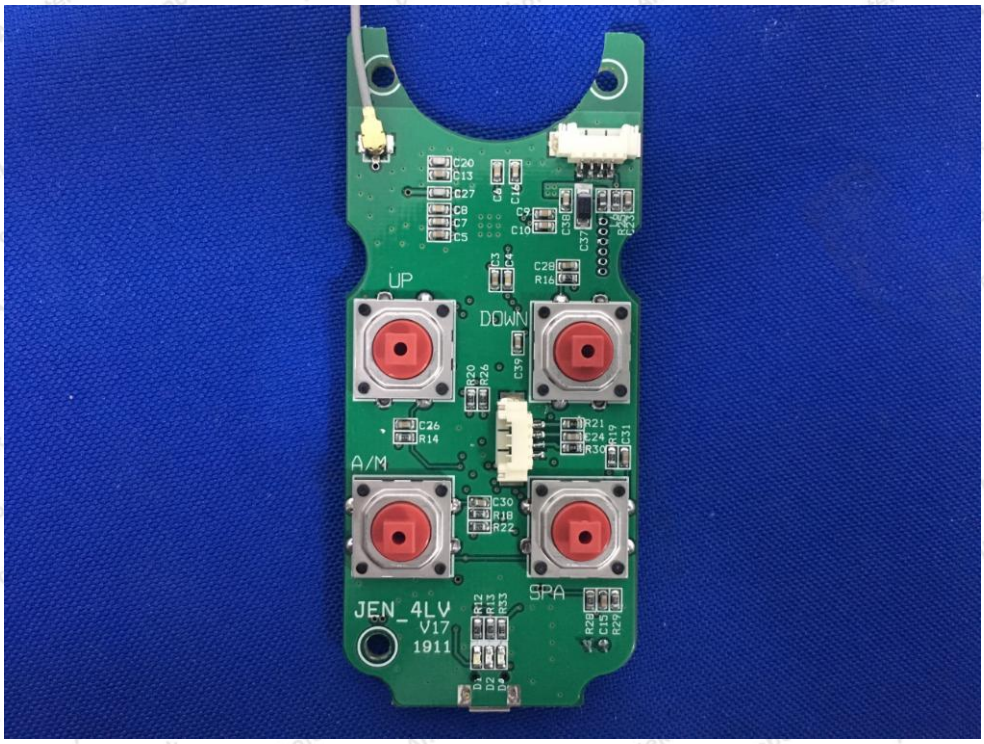

WEST
EAST
DOWN
UP
Anbotek
Product Safety
安博检测

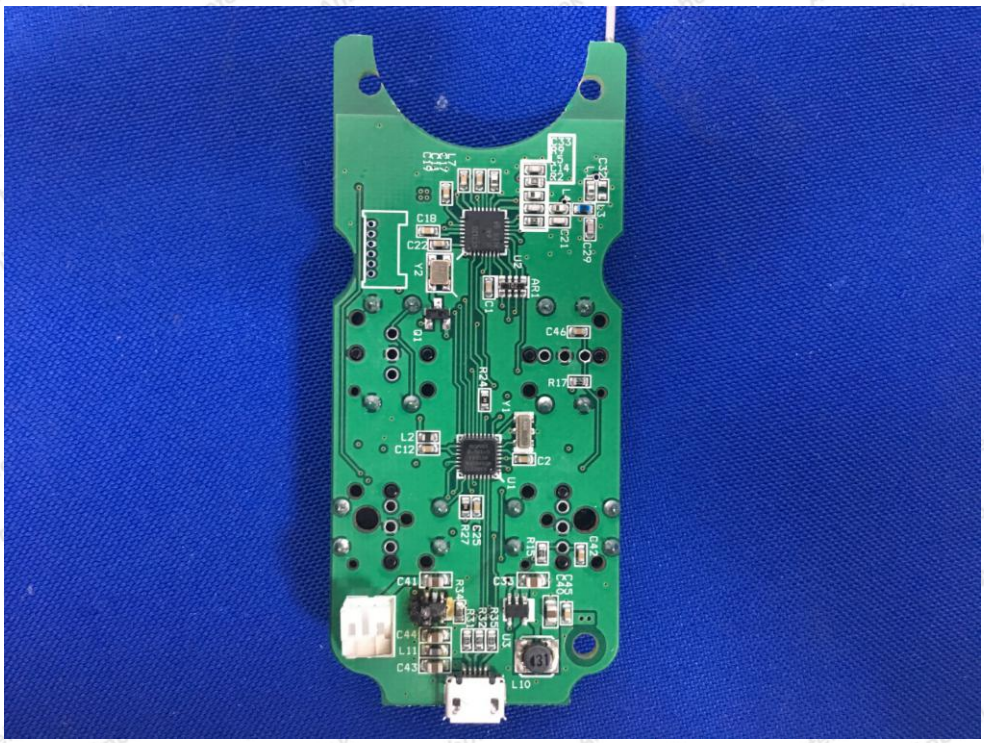
UP
DOWN
EAST
WEST
Anbotek
Product Safety
安博检测

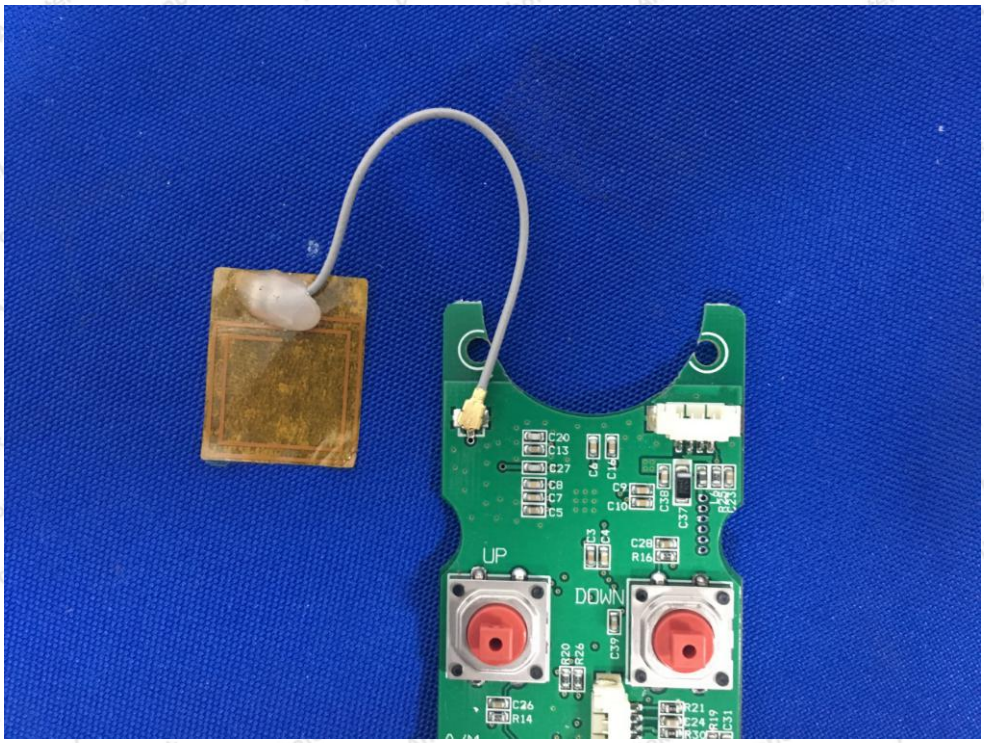
# APPENDIX III -- INTERNAL PHOTOGRAPH




Anbotek
Product Safety
安博检测


UP
DOWN
A/M
SPA
JEN_4LV
V17
1911






---------- End of Report ----------