

# FCC Test Report

Client Name : Autel Intelligent Tech. Corp., Ltd.

Address : 7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili,  
Nanshan Shenzhen China

Product Name : Intelligent TPMS & Tire Service tool

Date : Nov. 12, 2020



## Shenzhen Anbotek Compliance Laboratory Limited



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# TEST REPORT

Applicant : Autel Intelligent Tech. Corp., Ltd.  
Manufacturer : Autel Intelligent Tech. Corp., Ltd.  
Product Name : Intelligent TPMS & Tire Service tool  
Model No. : MaxiTPMS ITS600  
Trade Mark : AUTEL  
Rating(s) : Input: DC 5V, 1.8A (with DC 3.8V, 5000mAh Battery inside)  
Adapter input: DC 5V,2A

**Test Standard(s) : FCC Part15 Subpart C, Section 15.231**

**Test Method(s) : ANSI C63.10: 2013**

The device described above is tested by Shenzhen Anbotech 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 Anbotech 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 Anbotech Compliance Laboratory Limited.

Date of Receipt

Sept. 07, 2020

Date of Test

Sept. 07~21, 2020

Prepared By

Yilia Zhong

(Engineer / Yilia Zhong)

Reviewer

Bibo Zhang

(Supervisor / Bibo Zhang)

Approved & Authorized Signer

Kingkong Jin

(Manager / Kingkong Jin)



# 1. General Information

## 1.1. Client Information

|              |   |                                                                                                                                |
|--------------|---|--------------------------------------------------------------------------------------------------------------------------------|
| Applicant    | : | Autel Intelligent Tech. Corp., Ltd.                                                                                            |
| Address      | : | 7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China                                                |
| Manufacturer | : | Autel Intelligent Tech. Corp., Ltd.                                                                                            |
| Address      | : | 7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China                                                |
| Factory 1    | : | Autel Intelligent Technology Corp.,Ltd.                                                                                        |
| Address      | : | 6th Floor, Building 1, Yanxiang Zhigu, NO.11 Gaoxin West Rd, Guangming New District, Shenzhen City, Guangdong Province, China. |
| Factory 2    | : | AUTEL VIETNAM COMPANY LIMITED                                                                                                  |
| Address      | : | 4th Floor, Factory#6, Land#CN1, An Duong Industrial Zone, Hong Phong Township, An Duong County, Hai Phong, Viet Nam            |

## 1.2. Description of Device (EUT)

|                     |   |                                                                                                                                                                                       |
|---------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name        | : | Intelligent TPMS & Tire Service tool                                                                                                                                                  |
| Model No.           | : | MaxiTPMS ITS600                                                                                                                                                                       |
| Trade Mark          | : | AUTEL                                                                                                                                                                                 |
| Test Power Supply   | : | AC 120V, 60Hz for adapter / AC 240V, 60Hz for adapter<br>DC 3.8V Battery inside                                                                                                       |
| Product Description | : | Operation Frequency:<br>WiFi 2.4G: 802.11g/ n(HT20)<br>2412-2462MHz<br>BT: 2402-2480MHz<br>WiFi 5.1G: 5180MHz~5240MHz<br>WiFi 5.8G: 5745MHz~5825MHz<br>433.92MHz<br>315 MHz<br>125KHz |
|                     | : | Number of Channel:<br>WiFi 2.4G: 11 Channels for 802.11g/ n(HT20)<br>BDR&EDR: 79 Channels<br>WiFi 5.1G: 4 Channels for 802.11a<br>4 Channels for 802.11n(HT20)                        |

|                                                                                                                                                                            |                     |                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                            |                     | 4 Channels for 802.11ac(HT20)<br>2 Channels for 802.11n(HT40)<br>2 Channels for 802.11ac(HT40)<br>1 Channels for 802.11ac(HT80)<br>WiFi 5.8G: 5 Channels for 802.11a<br>5 Channels for 802.11n(HT20)<br>5 Channels for 802.11ac(HT20)<br>2 Channels for 802.11n(HT40)<br>2 Channels for 802.11ac(HT40)<br>1 Channels for 802.11ac(HT80)<br>433.92MHz: 1 Channels |
|                                                                                                                                                                            | Modulation Type:    | WiFi 2.4G: 802.11g/n OFDM<br>BDR&EDR: GFSK, $\pi/4$ -DQPSK, 8-DPSK<br>WiFi 5.1G: OFDM with<br>BPSK/QPSK/16QAM/64QAM/256QAM<br>WiFi 5.8G: OFDM with<br>BPSK/QPSK/16QAM/64QAM/256QAM<br>433.92MHz: ASK / FSK<br>315 MHz: ASK / FSK<br>125KHz: ASK                                                                                                                  |
|                                                                                                                                                                            | Antenna Type:       | BT: PIFA Antenna<br>WiFi 2.4G & WiFi 5.1G & WiFi 5.8G: PIFA Antenna<br>433.92MHz: PCB Antenna<br>315 MHz: PCB Antenna<br>125KHz: Inductive loop coil Antenna                                                                                                                                                                                                     |
|                                                                                                                                                                            | Antenna Gain(Peak): | BT: 1.6 dBi<br>WiFi 2.4G: 2.3 dBi<br>WiFi 5.1G & WiFi 5.8G: 2.7 dBi<br>433.92MHz: -10 dBi<br>315 MHz: -10 dBi<br>125KHz: -10 dBi                                                                                                                                                                                                                                 |
| <b>Remark:</b> 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.2) This report is for 433.92MHz module. |                     |                                                                                                                                                                                                                                                                                                                                                                  |

### 1.3. Auxiliary Equipment Used During Test

|         |   |                                                                        |
|---------|---|------------------------------------------------------------------------|
| Adapter | : | MODEL:GME10C-050200FUu<br>I/P:100-240V~50-60Hz 0.28A<br>O/P: DC 5V, 2A |
|---------|---|------------------------------------------------------------------------|

#### 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       | TX Mode     |

| For Radiated Emission |             |
|-----------------------|-------------|
| Final Test Mode       | Description |
| Mode 1                | TX Mode     |

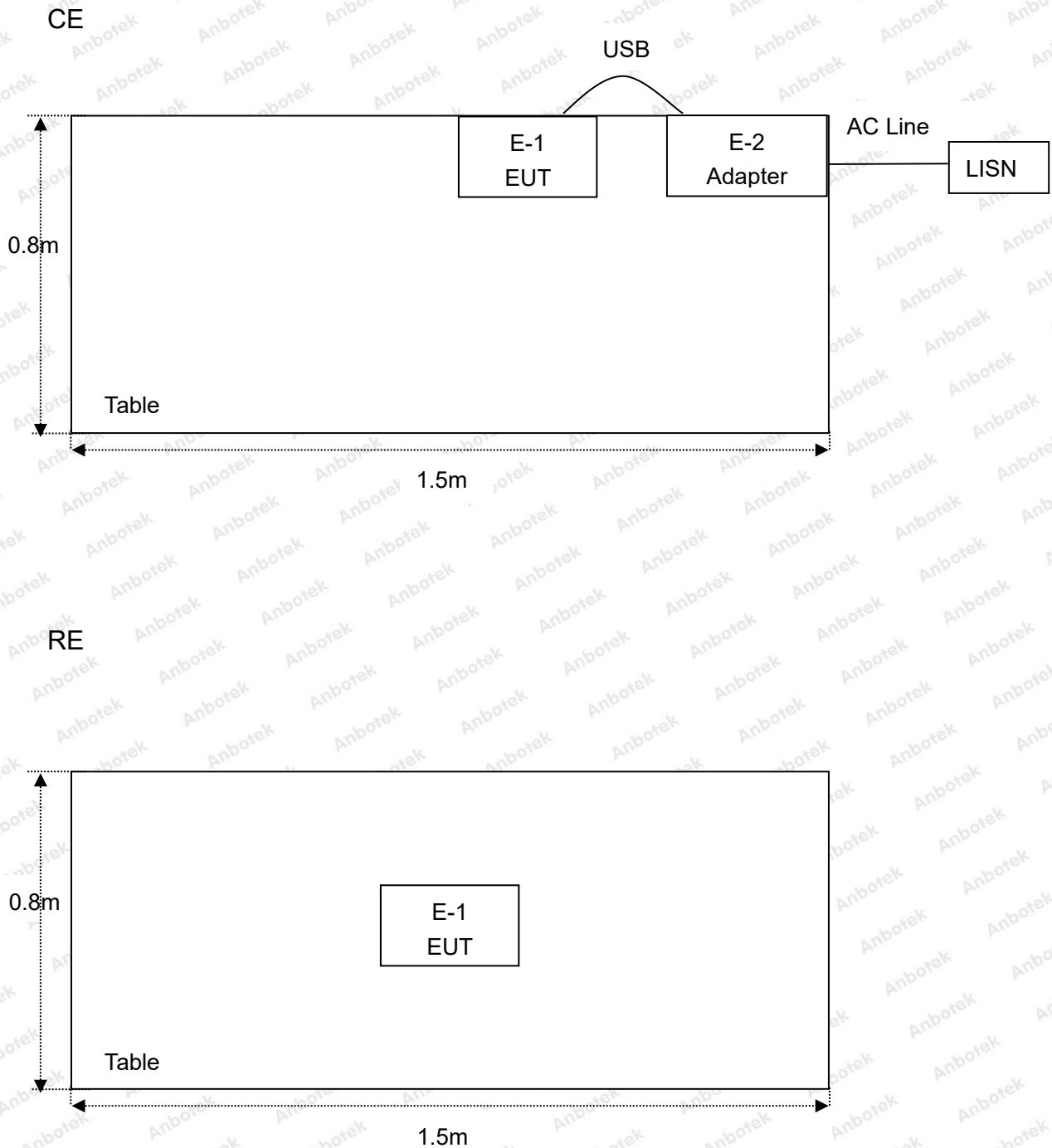
Note: During the test, the EUT was keeping continuous transmission.

#### 1.5. List of channels

| Channel | Freq.<br>(MHz) | Note<br>(Modulation Type) |
|---------|----------------|---------------------------|
| 01      | 433.92         | ASK / FSK                 |



## 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.<br>Artificial Mains<br>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<br>Direction    | RSU-M2           | 38303         | Nov. 04, 2019 | 1 Year        |
| 4.   | MAX Spectrum<br>Analysis                    | Agilent                    | N9020A           | MY51170037    | Nov. 04, 2019 | 1 Year        |
| 5.   | Preamplifier                                | SKET Electronic            | BK1G18G30<br>D   | KD17503       | Nov. 04, 2019 | 1 Year        |
| 6.   | Double Ridged Horn<br>Antenna               | Instruments<br>corporation | GTH-0118         | 351600        | Nov. 01, 2019 | 1 Year        |
| 7.   | Bilog Broadband<br>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-K<br>F | J211060628    | Nov. 01, 2019 | 1 Year        |
| 10.  | Pre-amplifier                               | SONOMA                     | 310N             | 186860        | Nov. 04, 2019 | 1 Year        |
| 11.  | EMI Test Software<br>EZ-EMC                 | SHURPLE                    | N/A              | N/A           | N/A           | N/A           |
| 12.  | RF Test Control<br>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<br>Analysis                    | Agilent                    | N9020A           | MY51170037    | Nov. 04, 2019 | 1 Year        |
| 16.  | MXG RF Vector<br>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<br>Temperature<br>Humidity Chamber | ZHONGJIAN                  | ZJ-KHWS80<br>B   | 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 Anbotech Compliance Laboratory Limited, 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 No. 184111, September 30, 2020.

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

Shenzhen Anbotech 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, September 30, 2020.

#### Test Location

Shenzhen Anbotech 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      | PASS   |
| 15.205/15.209/15.231(b)                                     | Spurious Emission       | PASS   |
| 15.231(c)                                                   | 20dB Occupied Bandwidth | PASS   |
| 15.231(a)                                                   | Dwell time              | PASS   |
| <b>Remark:</b> "N/A" is an abbreviation for Not Applicable. |                         |        |

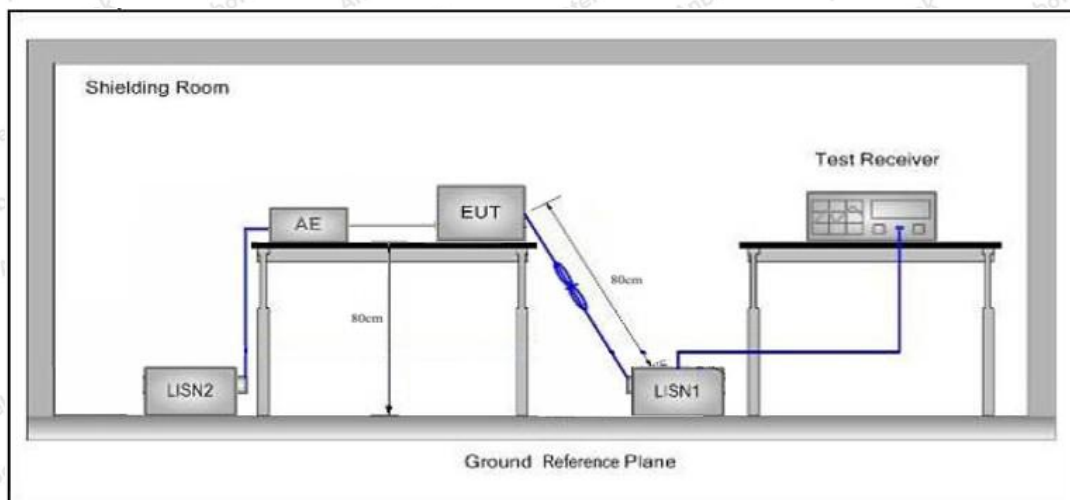
### 3. Conducted Emission Test

#### 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.  
(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.

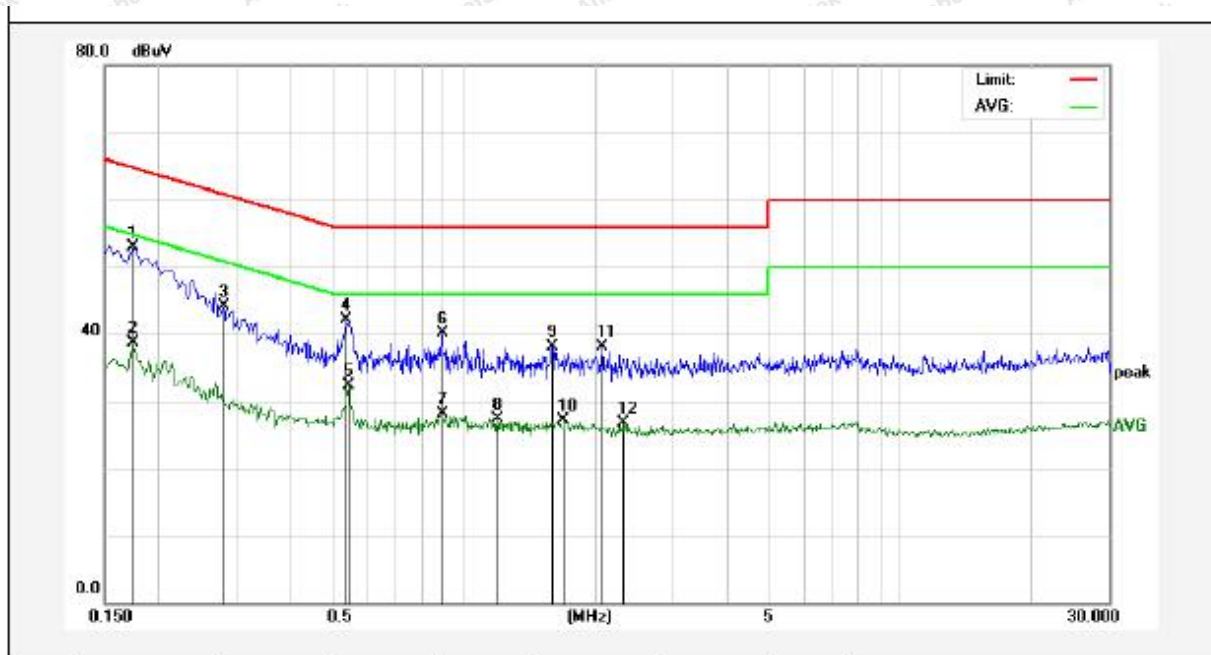
#### 3.4. Test Data

Only the worst case data was showed in the report, please to see the following pages.



**ASK:****Conducted Emission Test Data**

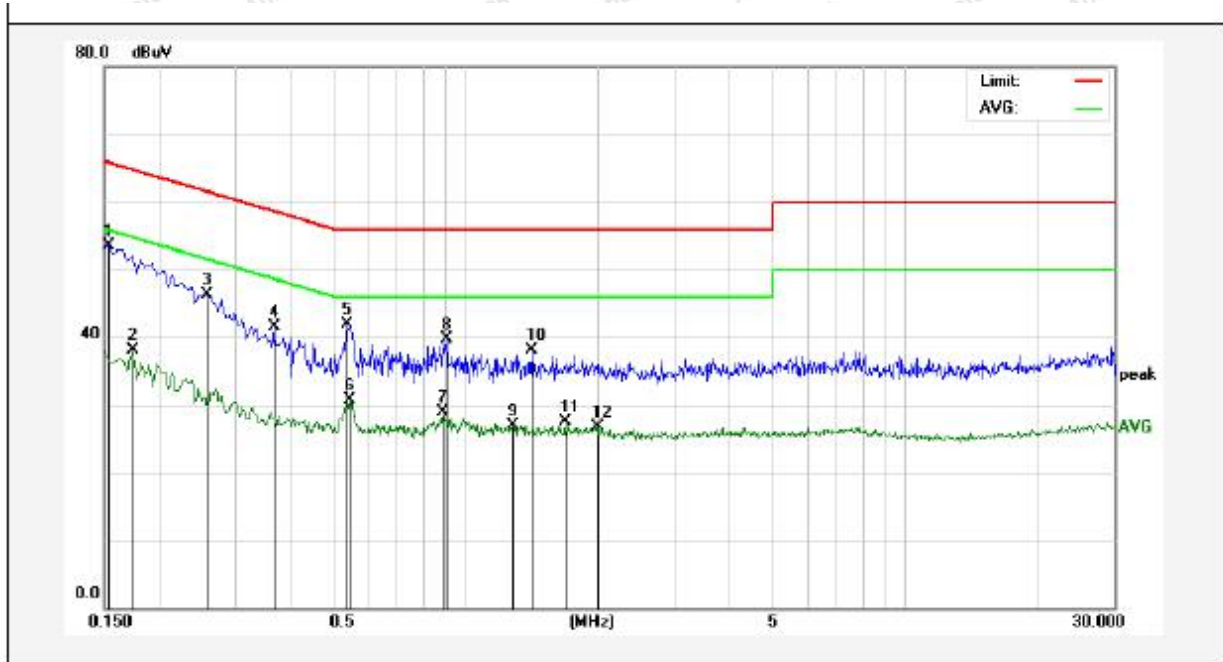
Test Site: 1# Shielded Room  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Live Line  
Tem.: 24.0°C Hum.: 53%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1740      | 23.37          | 29.46       | 52.83         | 64.76        | -11.93          | QP       |        |
| 2   | 0.1740      | 9.32           | 29.46       | 38.78         | 54.76        | -15.98          | AVG      |        |
| 3   | 0.2819      | 14.59          | 29.43       | 44.02         | 60.76        | -16.74          | QP       |        |
| 4   | 0.5380      | 12.59          | 29.52       | 42.11         | 56.00        | -13.89          | QP       |        |
| 5   | 0.5460      | 2.85           | 29.52       | 32.37         | 46.00        | -13.63          | AVG      |        |
| 6   | 0.8900      | 10.50          | 29.61       | 40.11         | 56.00        | -15.89          | QP       |        |
| 7   | 0.8900      | -1.46          | 29.61       | 28.15         | 46.00        | -17.85          | AVG      |        |
| 8   | 1.1940      | -2.36          | 29.64       | 27.28         | 46.00        | -18.72          | AVG      |        |
| 9   | 1.5980      | 8.55           | 29.64       | 38.19         | 56.00        | -17.81          | QP       |        |
| 10  | 1.6940      | -2.59          | 29.64       | 27.05         | 46.00        | -18.95          | AVG      |        |
| 11  | 2.0700      | 8.37           | 29.65       | 38.02         | 56.00        | -17.98          | QP       |        |
| 12  | 2.3179      | -3.04          | 29.66       | 26.62         | 46.00        | -19.38          | AVG      |        |

**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
Test Specification: AC 120V, 60Hz for adapter  
Comment: Neutral Line  
Tem.: 24.0°C Hum.: 53%

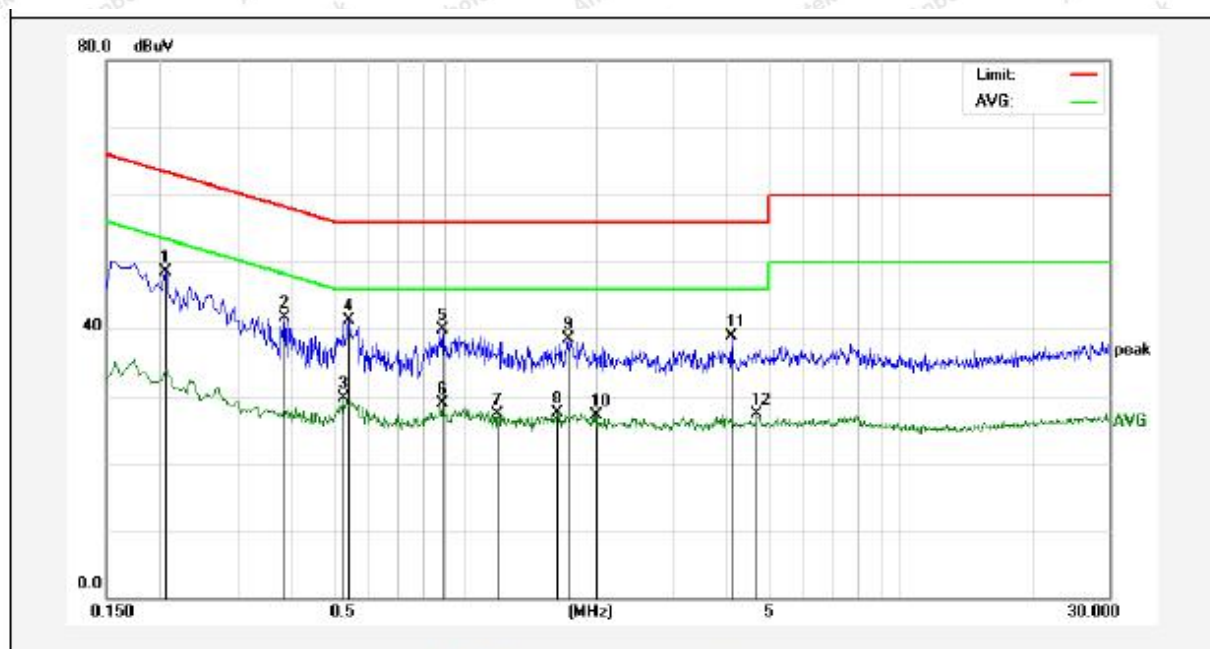


| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1539      | 24.09          | 29.46       | 53.55         | 65.78        | -12.23          | QP       |        |
| 2   | 0.1740      | 8.71           | 29.46       | 38.17         | 54.76        | -16.59          | AVG      |        |
| 3   | 0.2580      | 16.79          | 29.44       | 46.23         | 61.49        | -15.26          | QP       |        |
| 4   | 0.3660      | 12.08          | 29.46       | 41.54         | 58.59        | -17.05          | QP       |        |
| 5   | 0.5380      | 12.43          | 29.52       | 41.95         | 56.00        | -14.05          | QP       |        |
| 6   | 0.5460      | 1.28           | 29.52       | 30.80         | 46.00        | -15.20          | AVG      |        |
| 7   | 0.8860      | -0.70          | 29.61       | 28.91         | 46.00        | -17.09          | AVG      |        |
| 8   | 0.9060      | 10.02          | 29.61       | 39.63         | 56.00        | -16.37          | QP       |        |
| 9   | 1.2860      | -2.73          | 29.65       | 26.92         | 46.00        | -19.08          | AVG      |        |
| 10  | 1.4180      | 8.40           | 29.65       | 38.05         | 56.00        | -17.95          | QP       |        |
| 11  | 1.6860      | -2.16          | 29.64       | 27.48         | 46.00        | -18.52          | AVG      |        |
| 12  | 1.9940      | -2.85          | 29.65       | 26.80         | 46.00        | -19.20          | AVG      |        |



**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Live Line  
Tem.: 24.0°C Hum.: 53%

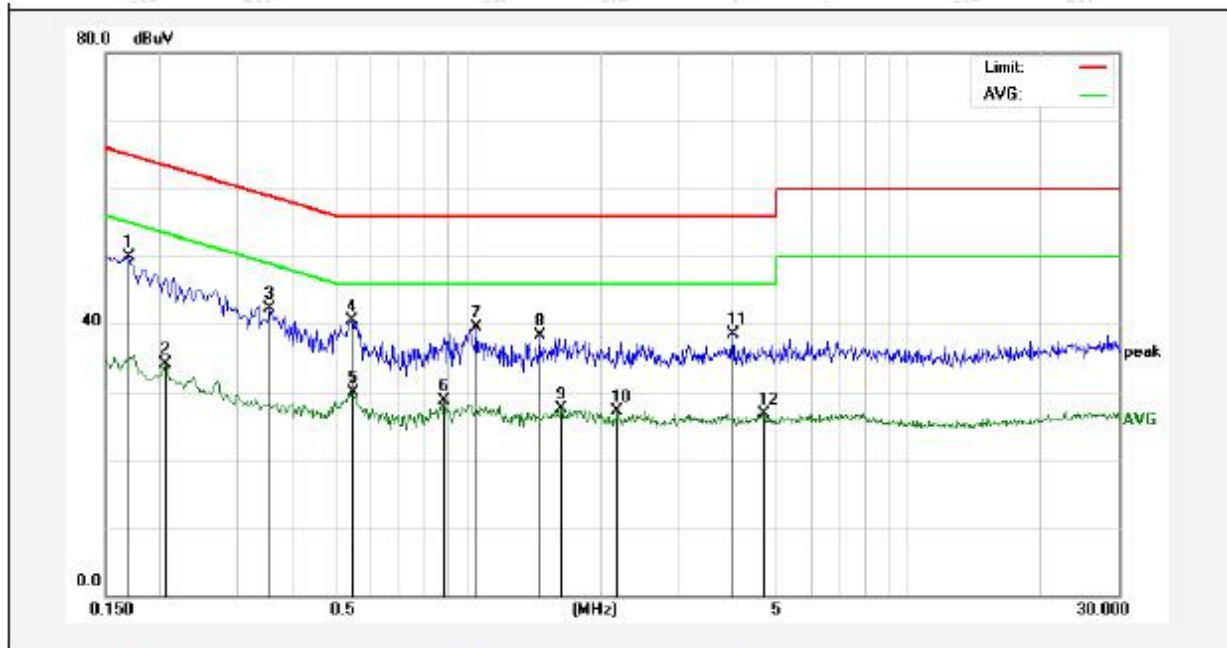


| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.2060      | 19.11          | 29.45       | 48.56         | 63.36        | -14.80          | QP       |        |
| 2   | 0.3860      | 12.14          | 29.47       | 41.61         | 58.15        | -16.54          | QP       |        |
| 3   | 0.5260      | 0.10           | 29.52       | 29.62         | 46.00        | -16.38          | AVG      |        |
| 4   | 0.5420      | 11.75          | 29.52       | 41.27         | 56.00        | -14.73          | QP       |        |
| 5   | 0.8860      | 10.24          | 29.61       | 39.85         | 56.00        | -16.15          | QP       |        |
| 6   | 0.8860      | -0.75          | 29.61       | 28.86         | 46.00        | -17.14          | AVG      |        |
| 7   | 1.1860      | -2.32          | 29.64       | 27.32         | 46.00        | -18.68          | AVG      |        |
| 8   | 1.6300      | -2.15          | 29.64       | 27.49         | 46.00        | -18.51          | AVG      |        |
| 9   | 1.7220      | 8.81           | 29.64       | 38.45         | 56.00        | -17.55          | QP       |        |
| 10  | 2.0059      | -2.61          | 29.65       | 27.04         | 46.00        | -18.96          | AVG      |        |
| 11  | 4.0860      | 9.17           | 29.70       | 38.87         | 56.00        | -17.13          | QP       |        |
| 12  | 4.6900      | -2.45          | 29.72       | 27.27         | 46.00        | -18.73          | AVG      |        |



**Conducted Emission Test Data**

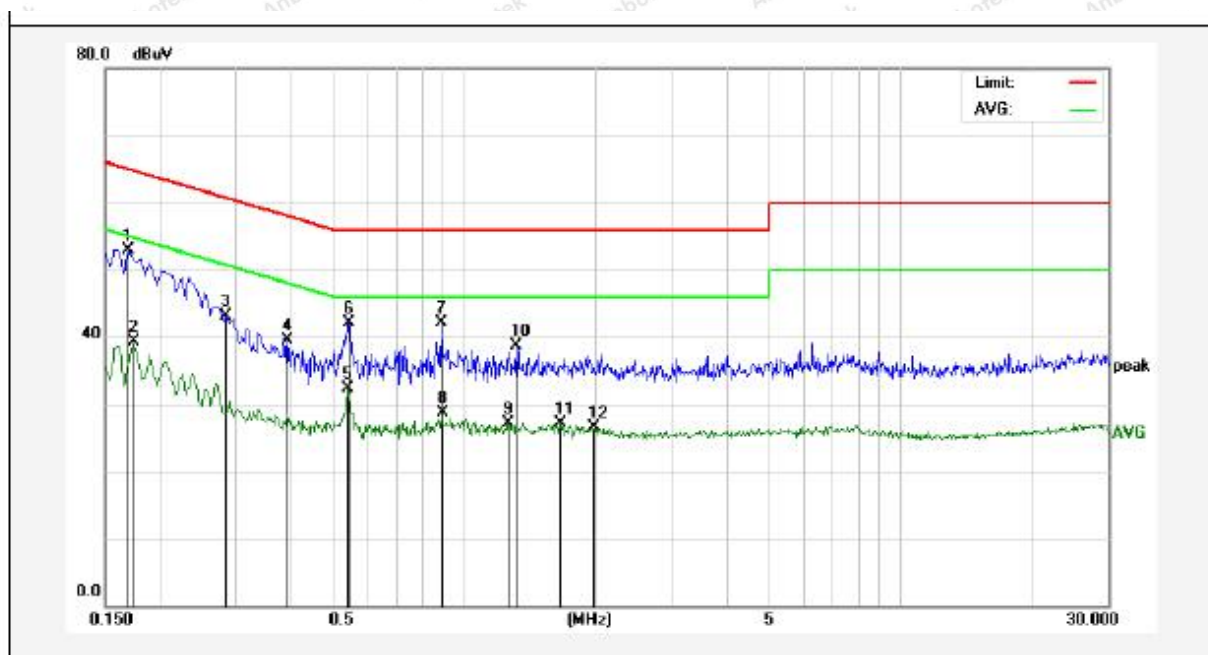
Test Site: 1# Shielded Room  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Neutral Line  
Tem.: 24.0°C Hum.: 53%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1700      | 20.47          | 29.46       | 49.93         | 64.96        | -15.03          | QP       |        |
| 2   | 0.2060      | 4.60           | 29.45       | 34.05         | 53.36        | -19.31          | AVG      |        |
| 3   | 0.3540      | 12.93          | 29.45       | 42.38         | 58.87        | -16.49          | QP       |        |
| 4   | 0.5460      | 11.02          | 29.52       | 40.54         | 56.00        | -15.46          | QP       |        |
| 5   | 0.5500      | 0.47           | 29.52       | 29.99         | 46.00        | -16.01          | AVG      |        |
| 6   | 0.8820      | -0.95          | 29.61       | 28.66         | 46.00        | -17.34          | AVG      |        |
| 7   | 1.0460      | 9.88           | 29.64       | 39.52         | 56.00        | -16.48          | QP       |        |
| 8   | 1.4540      | 8.63           | 29.65       | 38.28         | 56.00        | -17.72          | QP       |        |
| 9   | 1.6340      | -2.14          | 29.64       | 27.50         | 46.00        | -18.50          | AVG      |        |
| 10  | 2.1820      | -2.54          | 29.65       | 27.11         | 46.00        | -18.89          | AVG      |        |
| 11  | 4.0020      | 8.81           | 29.70       | 38.51         | 56.00        | -17.49          | QP       |        |
| 12  | 4.7100      | -3.07          | 29.72       | 26.65         | 46.00        | -19.35          | AVG      |        |

**FSK:****Conducted Emission Test Data**

Test Site: 1# Shielded Room  
 Test Specification: AC 120V, 60Hz for adapter  
 Comment: Live Line  
 Tem.: 24.0°C Hum.: 53%

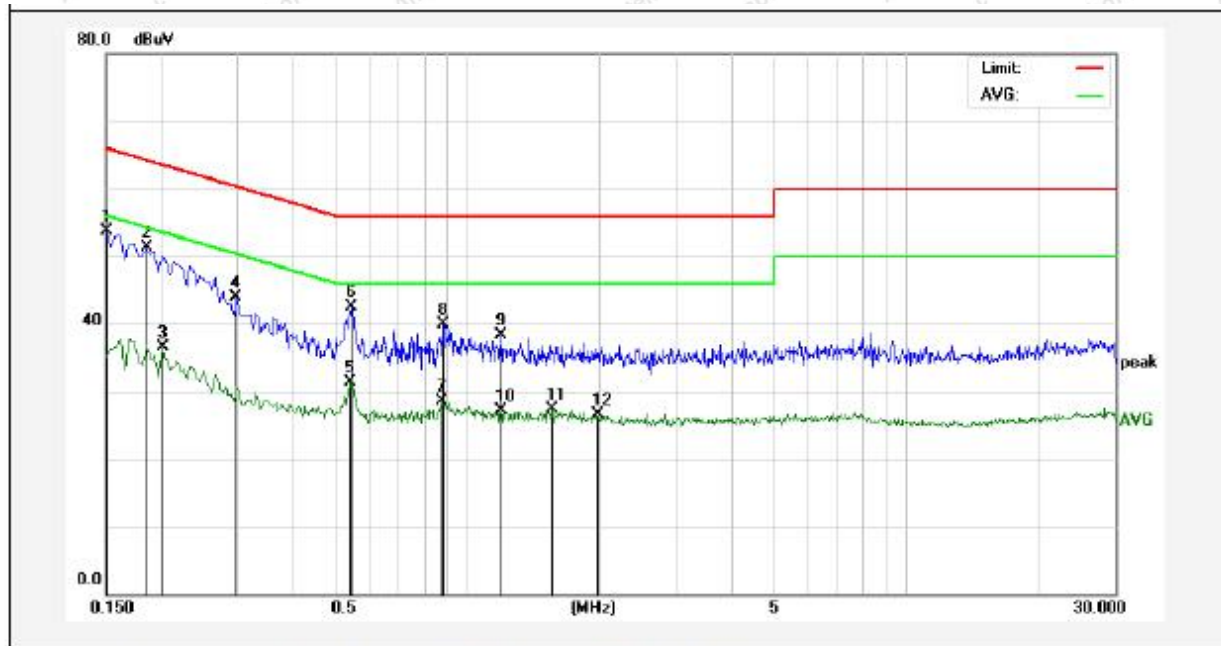


| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1700      | 23.47          | 29.46       | 52.93         | 64.96        | -12.03          | QP       |        |
| 2   | 0.1740      | 9.87           | 29.46       | 39.33         | 54.76        | -15.43          | AVG      |        |
| 3   | 0.2860      | 13.75          | 29.43       | 43.18         | 60.64        | -17.46          | QP       |        |
| 4   | 0.3940      | 10.12          | 29.47       | 39.59         | 57.98        | -18.39          | QP       |        |
| 5   | 0.5420      | 2.73           | 29.52       | 32.25         | 46.00        | -13.75          | AVG      |        |
| 6   | 0.5460      | 12.64          | 29.52       | 42.16         | 56.00        | -13.84          | QP       |        |
| 7   | 0.8860      | 12.43          | 29.61       | 42.04         | 56.00        | -13.96          | QP       |        |
| 8   | 0.8940      | -1.00          | 29.61       | 28.61         | 46.00        | -17.39          | AVG      |        |
| 9   | 1.2660      | -2.46          | 29.65       | 27.19         | 46.00        | -18.81          | AVG      |        |
| 10  | 1.3220      | 9.05           | 29.65       | 38.70         | 56.00        | -17.30          | QP       |        |
| 11  | 1.6660      | -2.47          | 29.64       | 27.17         | 46.00        | -18.83          | AVG      |        |
| 12  | 1.9700      | -3.05          | 29.65       | 26.60         | 46.00        | -19.40          | AVG      |        |



**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
 Test Specification: AC 120V, 60Hz for adapter  
 Comment: Neutral Line  
 Tem.: 24.0°C Hum.: 53%

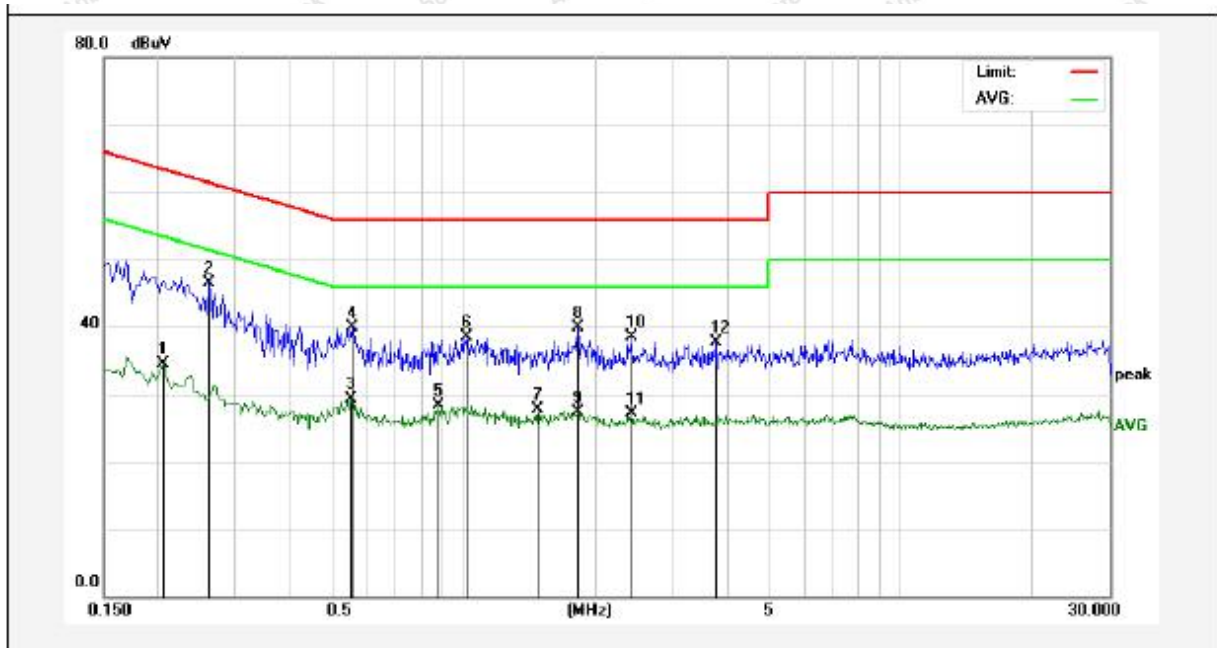


| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1500      | 24.23          | 29.46       | 53.69         | 65.99        | -12.30          | QP       |        |
| 2   | 0.1860      | 21.85          | 29.46       | 51.31         | 64.21        | -12.90          | QP       |        |
| 3   | 0.2020      | 6.96           | 29.45       | 36.41         | 53.52        | -17.11          | AVG      |        |
| 4   | 0.2980      | 14.56          | 29.43       | 43.99         | 60.30        | -16.31          | QP       |        |
| 5   | 0.5420      | 1.76           | 29.52       | 31.28         | 46.00        | -14.72          | AVG      |        |
| 6   | 0.5460      | 13.06          | 29.52       | 42.58         | 56.00        | -13.42          | QP       |        |
| 7   | 0.8740      | -1.09          | 29.61       | 28.52         | 46.00        | -17.48          | AVG      |        |
| 8   | 0.8820      | 10.29          | 29.61       | 39.90         | 56.00        | -16.10          | QP       |        |
| 9   | 1.1940      | 8.64           | 29.64       | 38.28         | 56.00        | -17.72          | QP       |        |
| 10  | 1.1940      | -2.46          | 29.64       | 27.18         | 46.00        | -18.82          | AVG      |        |
| 11  | 1.5660      | -2.42          | 29.64       | 27.22         | 46.00        | -18.78          | AVG      |        |
| 12  | 1.9700      | -3.10          | 29.65       | 26.55         | 46.00        | -19.45          | AVG      |        |



**Conducted Emission Test Data**

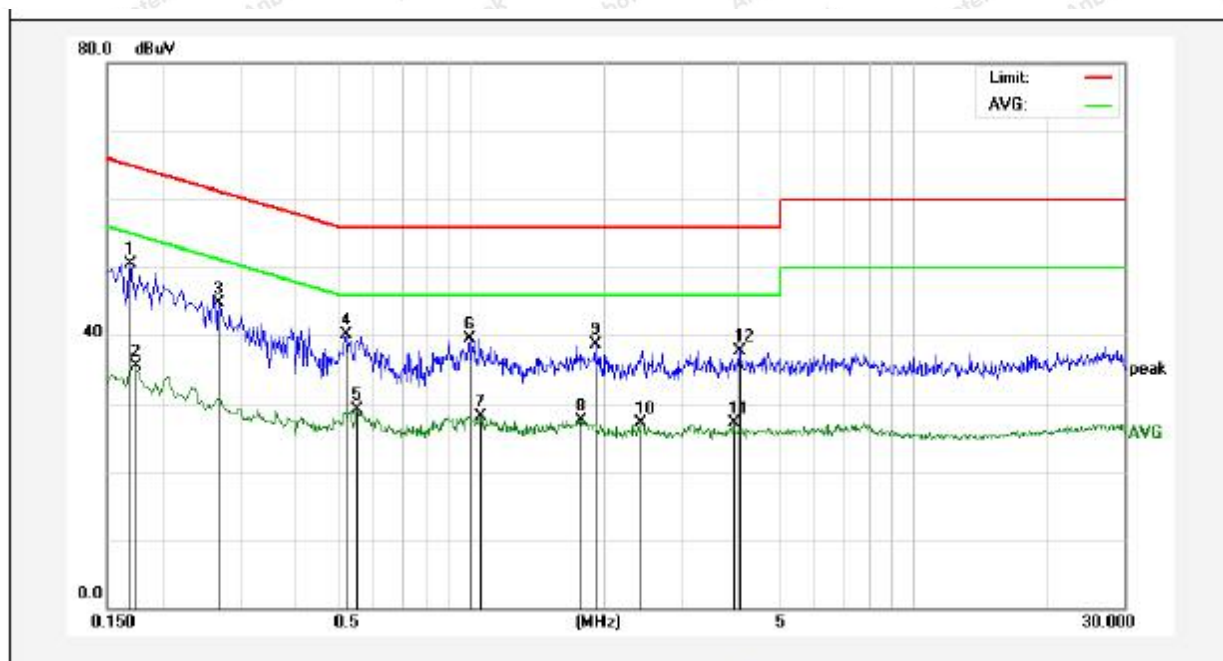
Test Site: 1# Shielded Room  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Live Line  
Tem.: 24.0℃ Hum.: 53%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.2060      | 5.00           | 29.45       | 34.45         | 53.36        | -18.91          | AVG      |        |
| 2   | 0.2620      | 17.17          | 29.43       | 46.60         | 61.36        | -14.76          | QP       |        |
| 3   | 0.5540      | -0.30          | 29.53       | 29.23         | 46.00        | -16.77          | AVG      |        |
| 4   | 0.5580      | 10.45          | 29.53       | 39.98         | 56.00        | -16.02          | QP       |        |
| 5   | 0.8780      | -1.29          | 29.61       | 28.32         | 46.00        | -17.68          | AVG      |        |
| 6   | 1.0180      | 8.86           | 29.64       | 38.50         | 56.00        | -17.50          | QP       |        |
| 7   | 1.4780      | -1.99          | 29.65       | 27.66         | 46.00        | -18.34          | AVG      |        |
| 8   | 1.8260      | 10.27          | 29.65       | 39.92         | 56.00        | -16.08          | QP       |        |
| 9   | 1.8260      | -2.32          | 29.65       | 27.33         | 46.00        | -18.67          | AVG      |        |
| 10  | 2.4180      | 8.91           | 29.66       | 38.57         | 56.00        | -17.43          | QP       |        |
| 11  | 2.4340      | -2.58          | 29.66       | 27.08         | 46.00        | -18.92          | AVG      |        |
| 12  | 3.7700      | 8.04           | 29.70       | 37.74         | 56.00        | -18.26          | QP       |        |

**Conducted Emission Test Data**

Test Site: 1# Shielded Room  
Test Specification: AC 240V, 60Hz for adapter  
Comment: Neutral Line  
Tem.: 24.0°C Hum.: 53%



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|-----|-------------|----------------|-------------|---------------|--------------|-----------------|----------|--------|
| 1   | 0.1700      | 20.98          | 29.46       | 50.44         | 64.96        | -14.52          | QP       |        |
| 2   | 0.1740      | 6.08           | 29.46       | 35.54         | 54.76        | -19.22          | AVG      |        |
| 3   | 0.2700      | 15.37          | 29.43       | 44.80         | 61.12        | -16.32          | QP       |        |
| 4   | 0.5220      | 10.60          | 29.52       | 40.12         | 56.00        | -15.88          | QP       |        |
| 5   | 0.5540      | -0.36          | 29.53       | 29.17         | 46.00        | -16.83          | AVG      |        |
| 6   | 0.9940      | 9.87           | 29.64       | 39.51         | 56.00        | -16.49          | QP       |        |
| 7   | 1.0540      | -1.58          | 29.64       | 28.06         | 46.00        | -17.94          | AVG      |        |
| 8   | 1.7740      | -2.11          | 29.65       | 27.54         | 46.00        | -18.46          | AVG      |        |
| 9   | 1.9100      | 9.12           | 29.65       | 38.77         | 56.00        | -17.23          | QP       |        |
| 10  | 2.4340      | -2.59          | 29.66       | 27.07         | 46.00        | -18.93          | AVG      |        |
| 11  | 3.9300      | -2.61          | 29.70       | 27.09         | 46.00        | -18.91          | AVG      |        |
| 12  | 4.0579      | 8.04           | 29.70       | 37.74         | 56.00        | -18.26          | QP       |        |



## 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                        |
| <b>Remark:</b><br>(1)The lower limit shall apply at the transition frequency.<br>(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,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ .

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level

Emission Level (dBuV/m)=20log Emission Level( $\mu\text{V/m}$ )

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

| Fundamental Frequency (MHz) | Field Strength of Fundamental (dBuV/m)@3m |
|-----------------------------|-------------------------------------------|
| 433.92                      | 80.82 (AVG)                               |
| 433.92                      | 100.82 (Peak)                             |



## 4.2. Test Setup

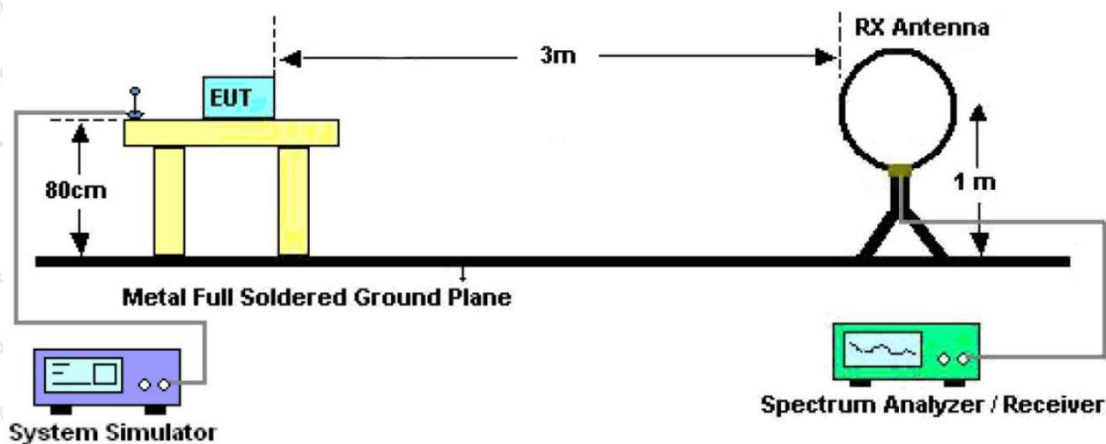


Figure 1. Below 30MHz

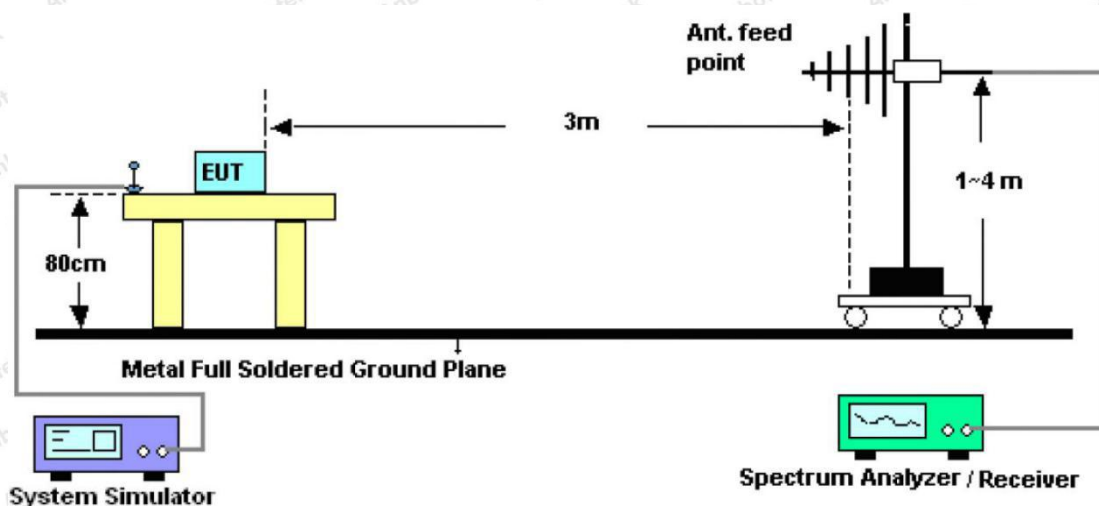


Figure 2. 30MHz to 1GHz

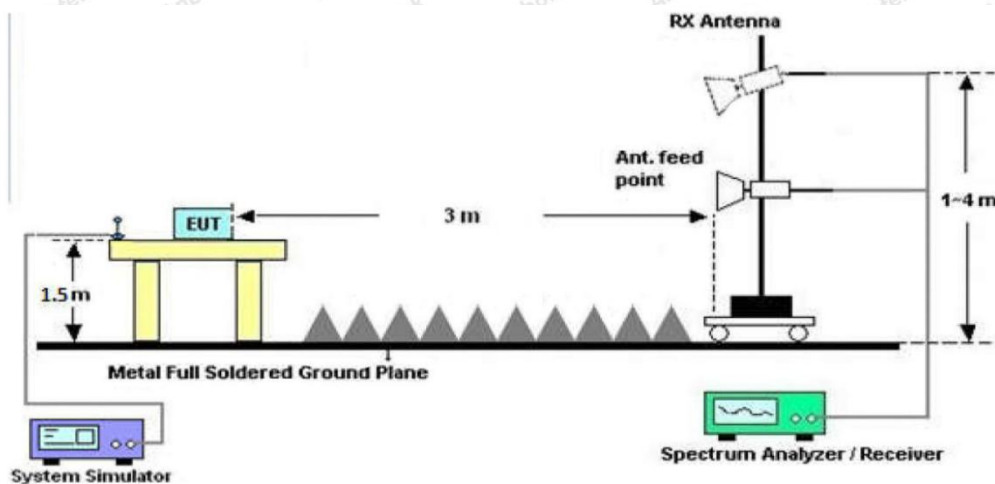


Figure 3. Above 1 GHz

### 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.

**ASK:****Test Results (Fundamental 433.92MHz)**

| 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 |
| 433.92    | H       | 94.34    | 1.52       | 12.64      | 31.45     | -                 | 77.05    | 100.82   | PK   |
| 433.92    | H       | 94.34    | 1.52       | 12.64      | 31.45     | -12.9             | 64.15    | 80.82    | AV   |
| 433.92    | V       | 97.29    | 1.52       | 12.64      | 31.45     | -                 | 80.00    | 100.82   | PK   |
| 433.92    | V       | 97.29    | 1.52       | 12.64      | 31.45     | -12.9             | 67.10    | 80.82    | AV   |

**Remark:**

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

2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 8.55ms

$2/PW=2/8.55=0.23\text{kHz}$

$RBW(1000\text{kHz}) > 2/PW (0.23\text{kHz})$

Therefore PDCF is not needed.

**3. Duty Cycle Factor**

Calculate Formula:

$AV=PEAK + \text{Duty Cycle Factor}$

$\text{Duty Cycle Factor}=20\log(\text{Duty Cycle})$

$\text{Duty Cycle}= \text{on time}/ \text{period}$

**Test Data:**

$T \text{ on time}=8.55\text{ms} \times 10=85.5 \text{ ms}$

$T \text{ period}=509.6\text{ms}-132\text{ms}=377.6\text{ms}$

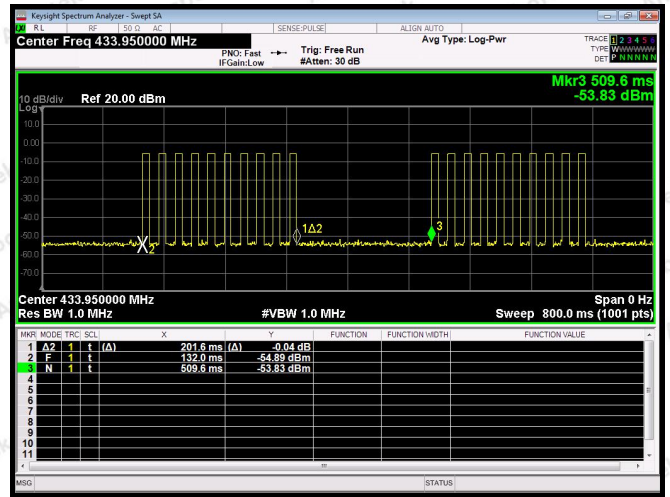
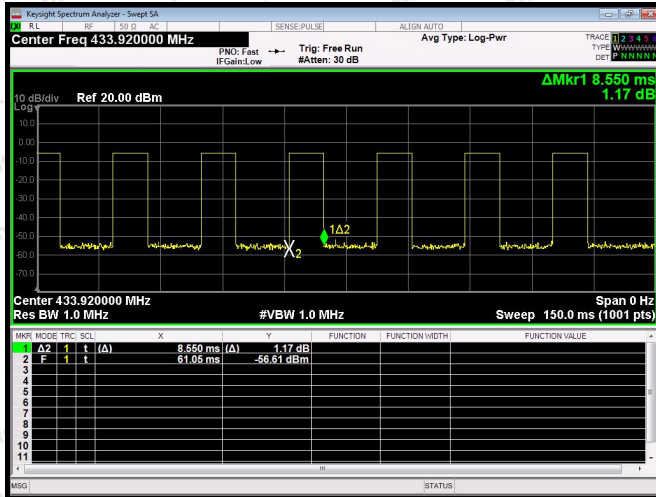
$\text{Duty Cycle}=22.64\%$

$\text{Duty Cycle Factor}=20\log(\text{Duty Cycle})=-12.9$



T on time slot-1

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 |
| 867.84    | H       | 74.10    | 1.92       | 12.71      | 31.72     | -                 | 57.01    | 80.82    | PK   |
| 867.84    | H       | 74.10    | 1.92       | 12.71      | 31.72     | -12.9             | 44.11    | 60.82    | AV   |
| 867.84    | V       | 76.28    | 1.92       | 12.71      | 31.72     | -                 | 59.19    | 80.82    | PK   |
| 867.84    | V       | 76.28    | 1.92       | 12.71      | 31.72     | -12.9             | 46.29    | 60.82    | AV   |
| 1301.76   | H       | 63.35    | 2.38       | 21.43      | 32.45     | -                 | 54.71    | 74       | PK   |
| 1301.76   | H       | 63.35    | 2.38       | 21.43      | 32.45     | -12.9             | 41.81    | 54       | AV   |
| 1301.76   | V       | 65.41    | 2.38       | 18.56      | 32.45     | -                 | 53.90    | 74       | PK   |
| 1301.76   | V       | 65.41    | 2.38       | 18.56      | 32.45     | -12.9             | 41.00    | 54       | AV   |

Remark :

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

2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 8.55ms

 $2/PW=2/8.55=0.23\text{kHz}$  $RBW(1000\text{kHz}) > 2/PW (0.23\text{kHz})$ 

Therefore PDCF is not needed.

3. Duty Cycle Factor=-12.9

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FCC ID: WQ8TPMS609T

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## Test Results (30~1000MHz)

Job No.: 18220WC00130001

Temp.(°C)/Hum.(%RH): 24.6°C/50%RH

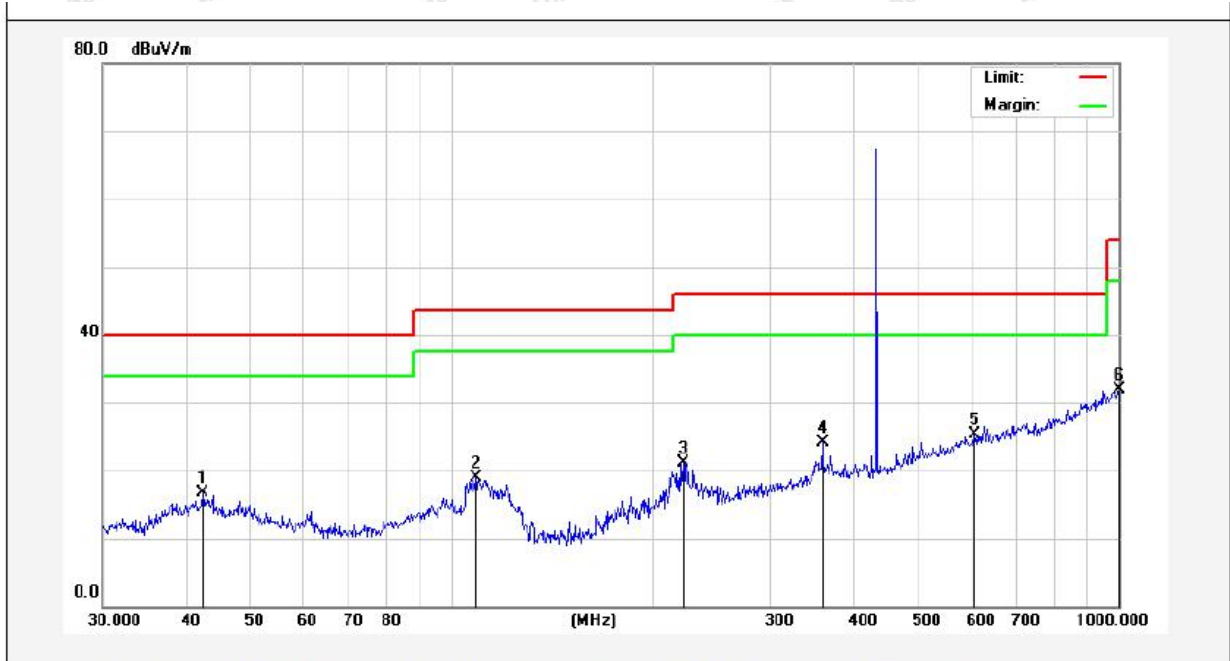
Standard: FCC PART 15C

Power Source: DC 3.8V 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   | 42.3022     | 31.30          | -14.68        | 16.62           | 40.00          | -23.38          | QP       | 100         | 0            |        |
| 2   | 108.6470    | 39.96          | -20.99        | 18.97           | 43.50          | -24.53          | QP       | 100         | 360          |        |
| 3   | 222.1698    | 40.61          | -19.41        | 21.20           | 46.00          | -24.80          | QP       | 100         | 0            |        |
| 4   | 359.1860    | 37.01          | -12.99        | 24.02           | 46.00          | -21.98          | QP       | 100         | 360          |        |
| 5   | 607.7867    | 32.14          | -6.75         | 25.39           | 46.00          | -20.61          | QP       | 100         | 0            |        |
| 6   | 1000.0000   | 31.50          | 0.32          | 31.82           | 54.00          | -22.18          | QP       | 100         | 360          |        |





Report No.: 18220WC00130005

FCC ID: WQ8TPMS609T

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## Test Results (30~1000MHz)

Job No.: 18220WC00130001

Temp.(°C)/Hum.(%RH): 24.6°C/50%RH

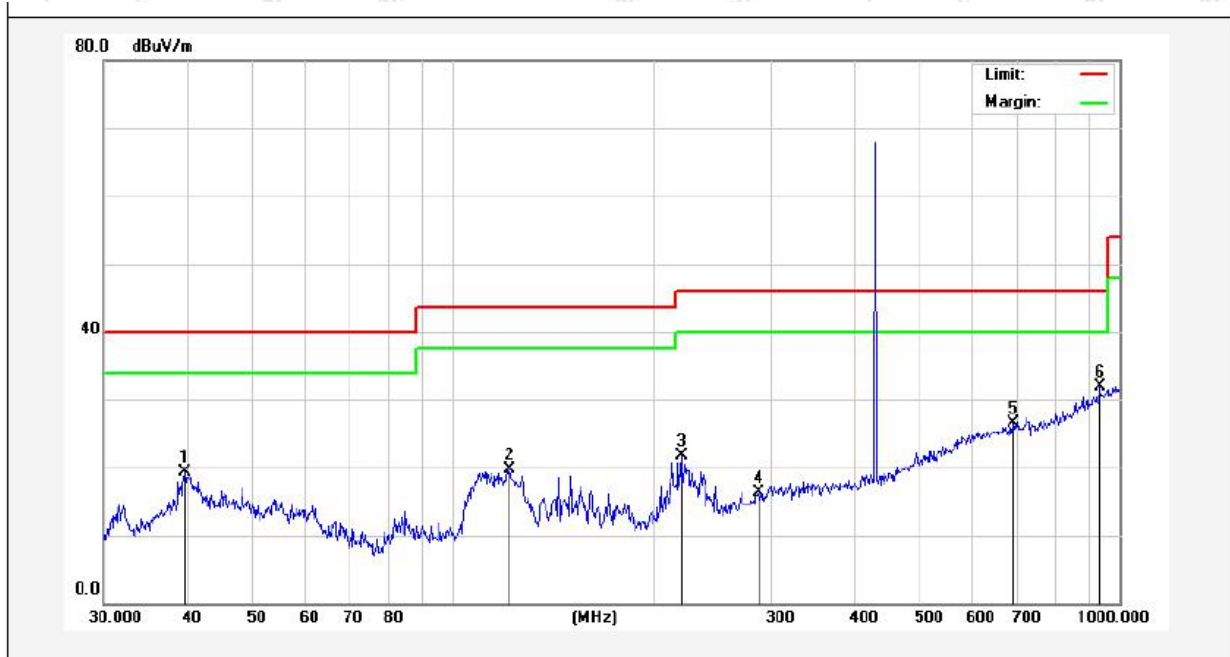
Standard: FCC PART 15C

Power Source: DC 3.8V 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   | 39.5757     | 33.12          | -13.81        | 19.31           | 40.00          | -20.69          | QP       | 100         | 0            |        |
| 2   | 121.5486    | 37.85          | -18.14        | 19.71           | 43.50          | -23.79          | QP       | 100         | 360          |        |
| 3   | 219.8449    | 38.20          | -16.44        | 21.76           | 46.00          | -24.24          | QP       | 100         | 0            |        |
| 4   | 286.9823    | 30.24          | -13.88        | 16.36           | 46.00          | -29.64          | QP       | 100         | 360          |        |
| 5   | 691.9867    | 32.59          | -6.13         | 26.46           | 46.00          | -19.54          | QP       | 100         | 0            |        |
| 6   | 932.2715    | 33.00          | -1.14         | 31.86           | 46.00          | -14.14          | QP       | 100         | 360          |        |

**FSK:****Test Results (Fundamental 433.92MHz)**

| 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 |
| 433.92    | H       | 94.46    | 1.52       | 12.64      | 31.45     | -                 | 77.17    | 100.82   | PK   |
| 433.92    | H       | 94.46    | 1.52       | 12.64      | 31.45     | -12.71            | 64.46    | 80.82    | AV   |
| 433.92    | V       | 97.28    | 1.52       | 12.64      | 31.45     | -                 | 79.99    | 100.82   | PK   |
| 433.92    | V       | 97.28    | 1.52       | 12.64      | 31.45     | -12.71            | 67.28    | 80.82    | AV   |

**Remark:**

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

2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 8.70ms

$2/PW=2/8.55=0.23\text{kHz}$

$RBW(1000\text{kHz}) > 2/PW (0.23\text{KHz})$

Therefore PDCF is not needed.

**3. Duty Cycle Factor**

Calculate Formula:

$AV=PEAK + \text{Duty Cycle Factor}$

$\text{Duty Cycle Factor}=20\log(\text{Duty Cycle})$

$\text{Duty Cycle}= \text{on time}/ \text{period}$

**Test Data:**

$T \text{ on time}=8.70\text{ms} \times 10=87.0 \text{ ms}$

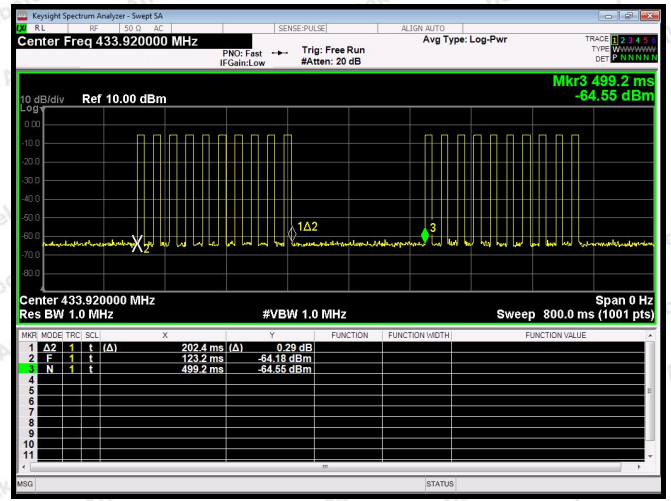
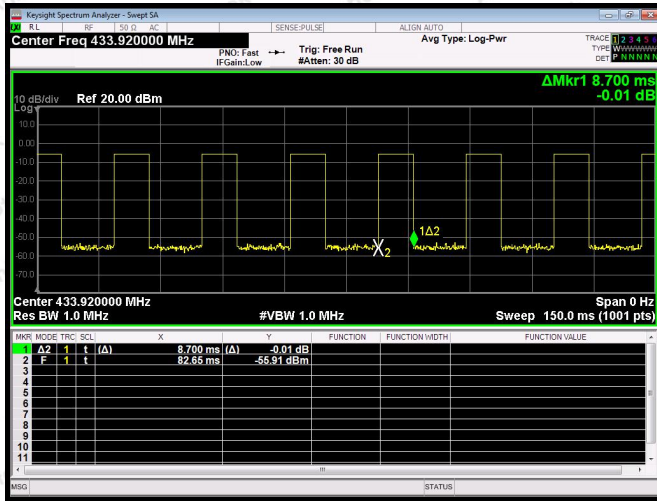
$T \text{ period}=499.2\text{ms}-123.2\text{ms}=376.0\text{ms}$

$\text{Duty Cycle}=23.14\%$

$\text{Duty Cycle Factor} =20\log(\text{Duty Cycle})=-12.71$

T on time slot-1

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 |
| 867.84    | H       | 74.24    | 1.92       | 12.71      | 31.72     | -                 | 57.15    | 80.82    | PK   |
| 867.84    | H       | 74.24    | 1.92       | 12.71      | 31.72     | -12.71            | 44.44    | 60.82    | AV   |
| 867.84    | V       | 76.78    | 1.92       | 12.71      | 31.72     | -                 | 59.69    | 80.82    | PK   |
| 867.84    | V       | 76.78    | 1.92       | 12.71      | 31.72     | -12.71            | 46.98    | 60.82    | AV   |
| 1301.76   | H       | 63.09    | 2.38       | 21.43      | 32.45     | -                 | 54.45    | 74       | PK   |
| 1301.76   | H       | 63.09    | 2.38       | 21.43      | 32.45     | -12.71            | 41.74    | 54       | AV   |
| 1301.76   | V       | 65.21    | 2.38       | 18.56      | 32.45     | -                 | 53.70    | 74       | PK   |
| 1301.76   | V       | 65.21    | 2.38       | 18.56      | 32.45     | -12.71            | 40.99    | 54       | AV   |

Remark :

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

2. Pulse Desensitization Correction Factor

Pulse Width (PW)= 8.70ms

 $2/PW=2/8.55=0.23\text{kHz}$  $RBW(1000\text{kHz}) > 2/PW (0.23\text{kHz})$ 

Therefore PDCF is not needed.

3. Duty Cycle Factor=-12.71

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## Test Results (30~1000MHz)

Job No.: 18220WC00130001

Temp.(°C)/Hum.(%RH): 24.6°C/50%RH

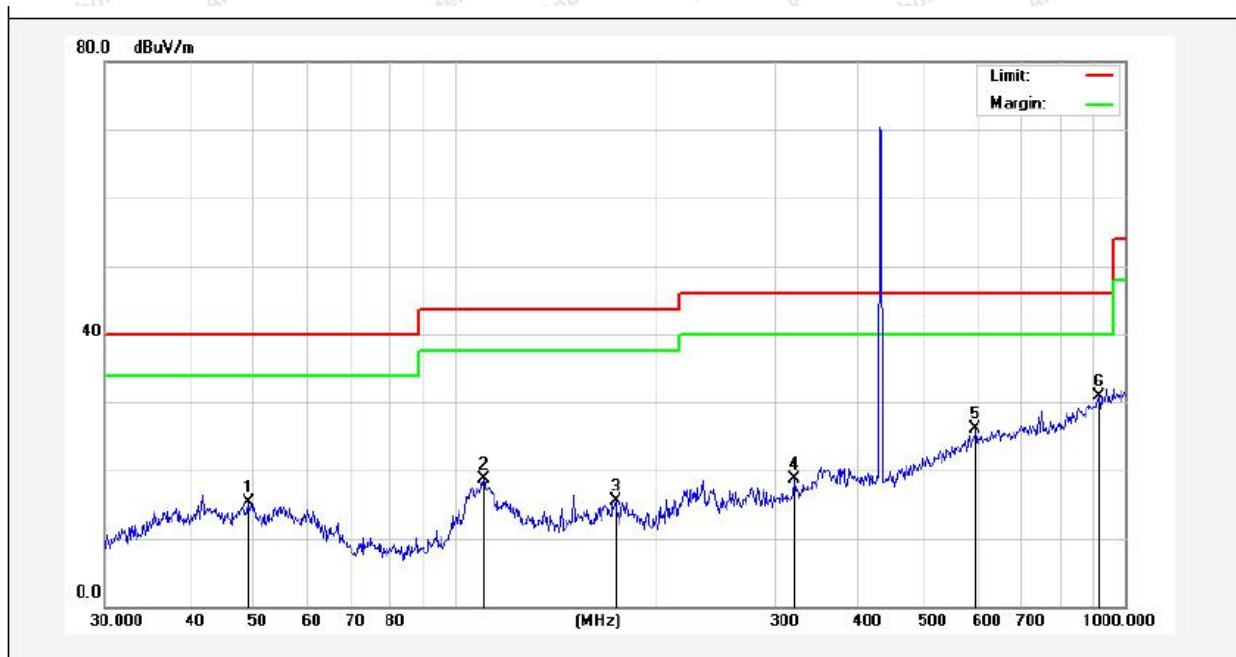
Standard: FCC PART 15C

Power Source: DC 3.8V 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   | 49.0145     | 29.96          | -14.73        | 15.23           | 40.00          | -24.77          | QP       | 100         | 0            |        |
| 2   | 110.1816    | 39.91          | -21.25        | 18.66           | 43.50          | -24.84          | QP       | 100         | 360          |        |
| 3   | 173.2051    | 36.59          | -21.15        | 15.44           | 43.50          | -28.06          | QP       | 100         | 0            |        |
| 4   | 319.9370    | 32.49          | -13.78        | 18.71           | 46.00          | -27.29          | QP       | 100         | 360          |        |
| 5   | 597.2234    | 32.85          | -6.82         | 26.03           | 46.00          | -19.97          | QP       | 100         | 0            |        |
| 6   | 912.8620    | 32.40          | -1.48         | 30.92           | 46.00          | -15.08          | QP       | 100         | 360          |        |



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## Test Results (30~1000MHz)

Job No.: 18220WC00130001

Temp.(°C)/Hum.(%RH): 24.6°C/50%RH

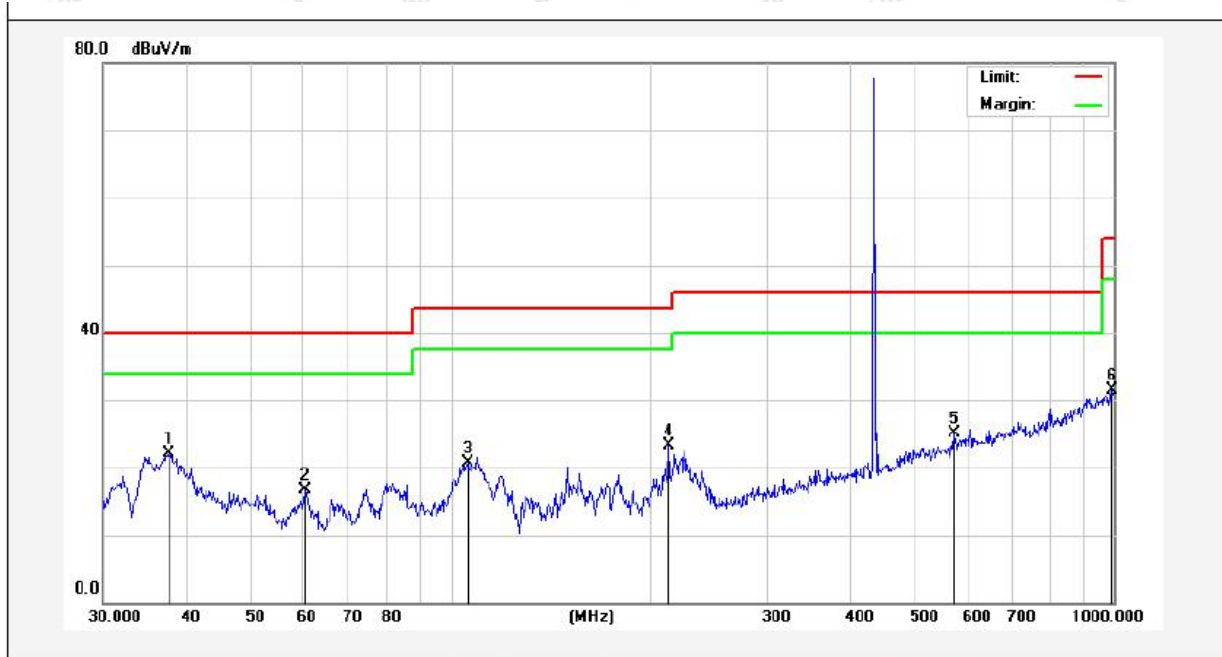
Standard: FCC PART 15C

Power Source: DC 3.8V 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   | 37.6798     | 36.99          | -14.84        | 22.15           | 40.00          | -17.85          | QP       | 100         | 0            |        |
| 2   | 60.2800     | 33.01          | -16.31        | 16.70           | 40.00          | -23.30          | QP       | 100         | 360          |        |
| 3   | 106.0126    | 36.37          | -15.62        | 20.75           | 43.50          | -22.75          | QP       | 100         | 0            |        |
| 4   | 213.0150    | 40.02          | -16.70        | 23.32           | 43.50          | -20.18          | QP       | 100         | 360          |        |
| 5   | 574.6258    | 32.56          | -7.40         | 25.16           | 46.00          | -20.84          | QP       | 100         | 0            |        |
| 6   | 993.0113    | 31.29          | 0.15          | 31.44           | 54.00          | -22.56          | QP       | 100         | 360          |        |

Remark:

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

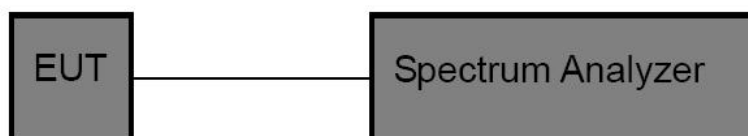


## 5. 20DB Occupy Bandwidth Test

### 5.1. Test Standard and Limit

| Test Standard         | FCC Part15 C Section 15.231 (c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                         |            |                                              |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|------------|----------------------------------------------|
| Test Limit            | <p>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.</p> <p>So the emission bandwidth limits have been calculated in below table:</p> <table><tr><th>Fundamental Frequency</th><th>Limit of 20dB Bandwidth</th></tr><tr><td>433.92 MHz</td><td><math>433920 \times 0.0025 = 1084.80 \text{ kHz}</math></td></tr></table> | Fundamental Frequency | Limit of 20dB Bandwidth | 433.92 MHz | $433920 \times 0.0025 = 1084.80 \text{ kHz}$ |
| Fundamental Frequency | Limit of 20dB Bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                         |            |                                              |
| 433.92 MHz            | $433920 \times 0.0025 = 1084.80 \text{ kHz}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                         |            |                                              |

### 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 = 10kHz, VBW $\geq$ 3\*RBW =30kHz,  
Span= 500KHz  
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

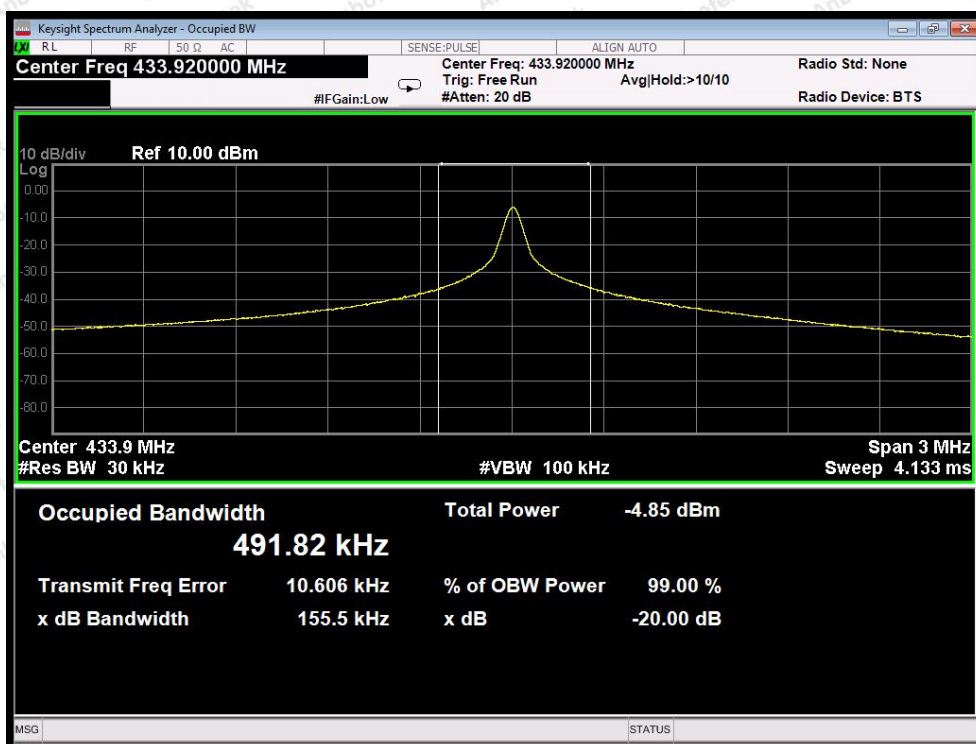
Test Item : 20dB Bandwidth  
Test Voltage : DC 3.8V Battery inside  
Test Result : PASS

Test Mode : Continuously transmitting  
Temperature : 23.6℃  
Humidity : 54%RH

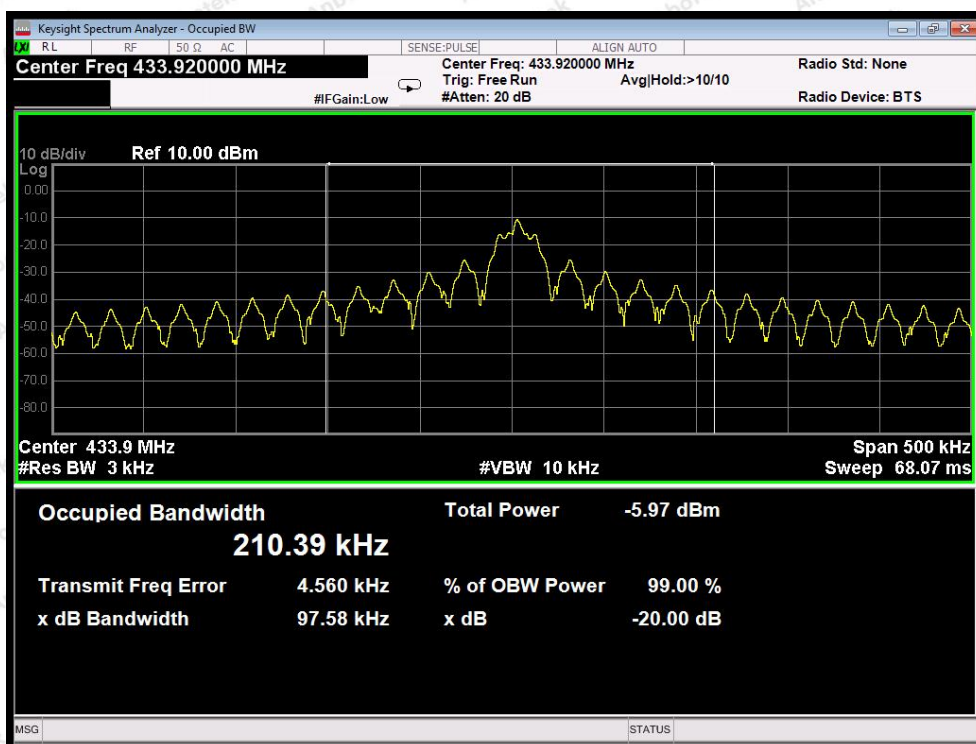
| Freq.<br>(MHz) | Modulation Type | 20DB Bandwidth<br>(kHz) | Limit<br>(kHz) | 99% BW<br>(KHz) | Results |
|----------------|-----------------|-------------------------|----------------|-----------------|---------|
| 433.92         | ASK             | 155.5                   | <1084.80       | 210.39          | PASS    |
| 433.92         | FSK             | 209.5                   | <1084.80       | 118.16          | PASS    |

ASK:

## Plot of 20DB Bandwidth

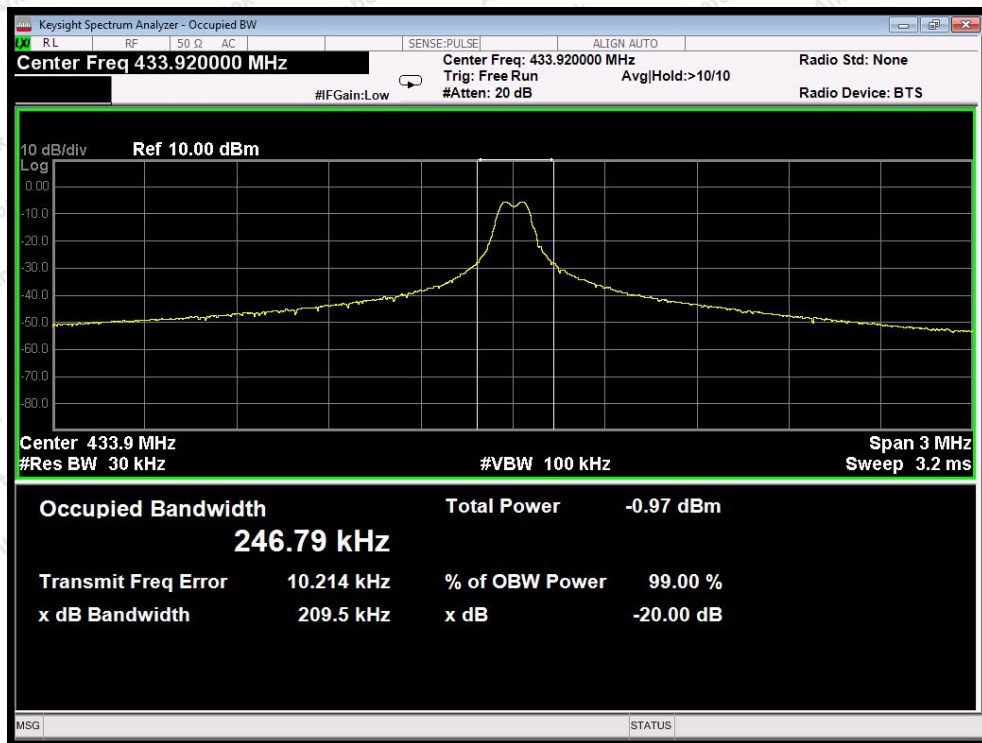


## Plot of 99% Bandwidth

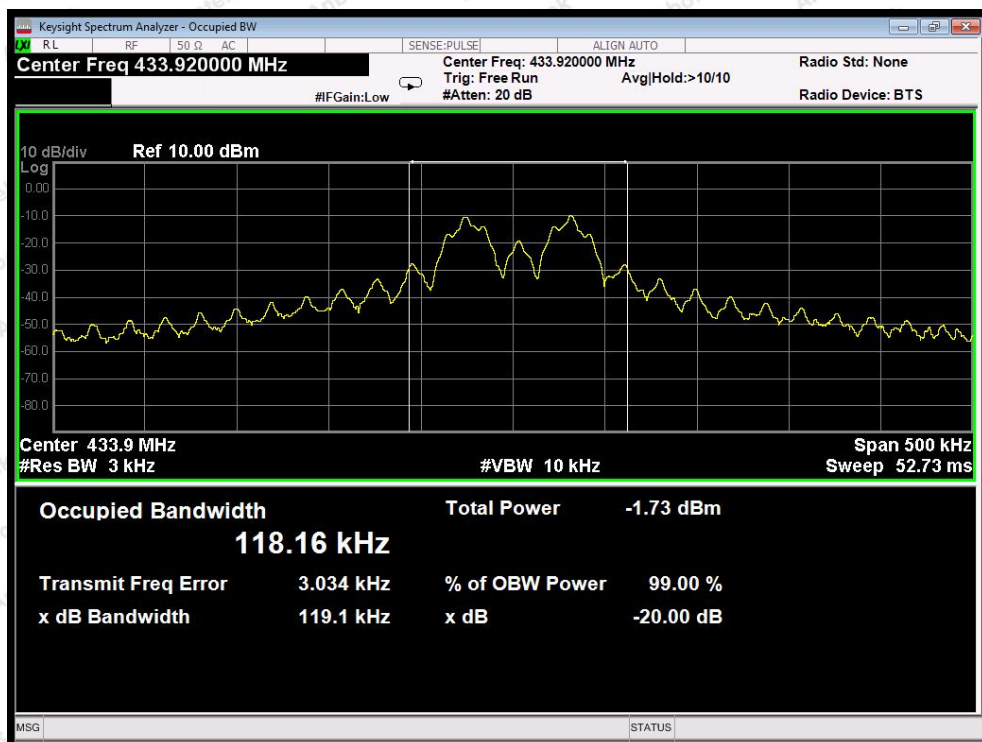




## Plot of 20DB Bandwidth



## Plot of 99% Bandwidth

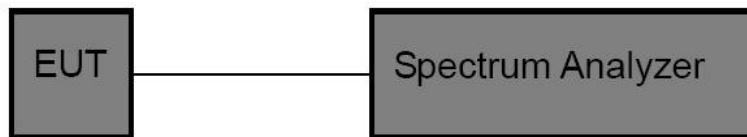


## 6. Dwell Time Test

### 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.

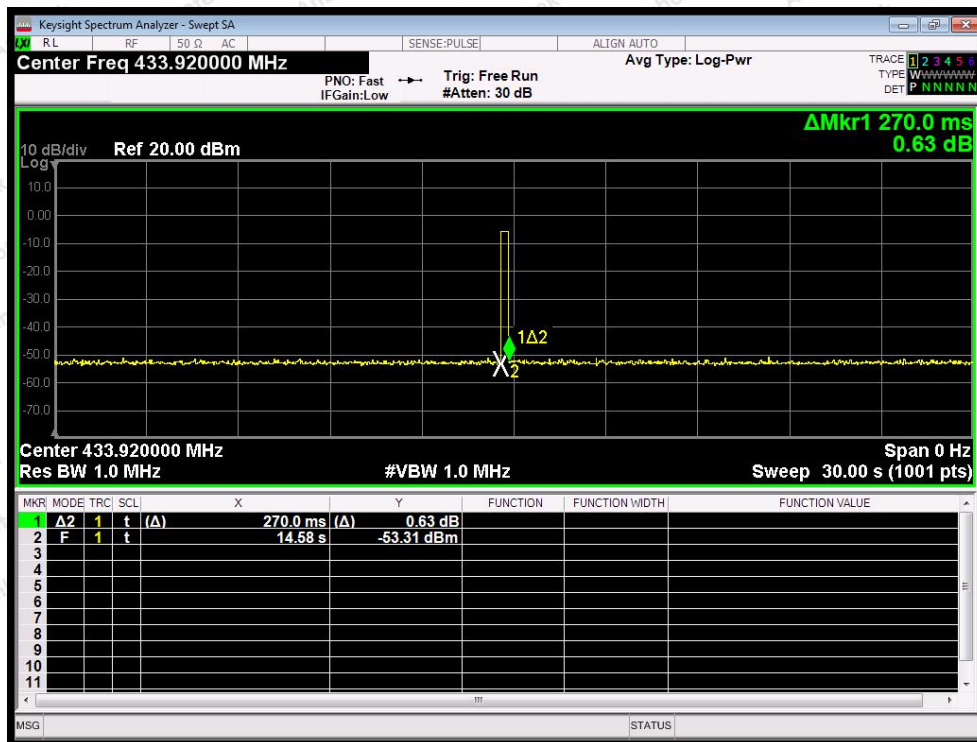
### 6.4. Test Data

|              |                          |             |                             |
|--------------|--------------------------|-------------|-----------------------------|
| Test Item    | : Dwell Time             | Test Mode   | : Continuously transmitting |
| Test Voltage | : DC 3.8V Battery inside | Temperature | : 23.6°C                    |
| Test Result  | : PASS                   | Humidity    | : 54%RH                     |

| Test Mode | Transmitting time(s) | Limit(s) | Result |
|-----------|----------------------|----------|--------|
| ASK mode  | 0.27                 | ≤5       | PASS   |
| FSK mode  | 0.27                 | ≤5       | PASS   |

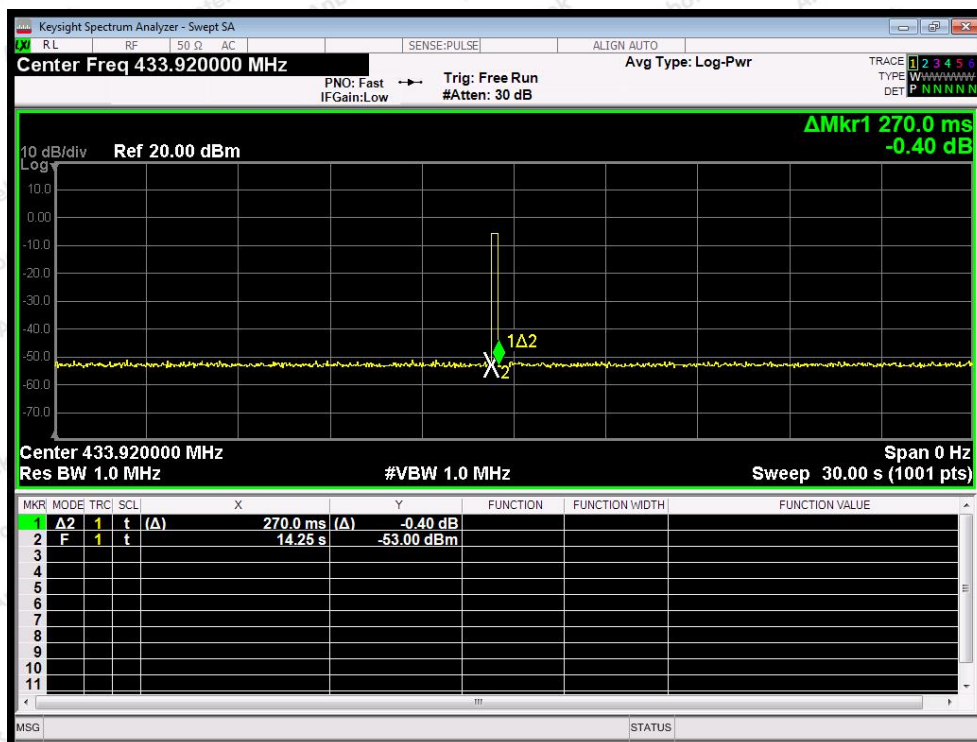
Please refer the following plot.

ASK:



Dwell Time

FSK





## 7. Antenna Requirement

### 7.1. Test Standard and Requirement

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Standard | FCC Part15 Section 15.203                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Requirement   | <p>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:</p> <p>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.</p> |

### 7.2. Antenna Connected Construction

The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is -10 dBi. It complies with the standard requirement.

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