# TEST REPORT

| | |
|---|---|
| Applicant Name : | Shenzhen Jiayz photo industrial.,Ltd |
| Address : | A16 Building,Intelligent Terminal Industrial Park of Silicon Valley Power,Guanlan Longhua District,Shenzhen, China |
| Report Number : | SZNS211129-61309E-RF-00 |
| FCC ID: | 2ARN3-MV2000WTX |

**Test Standard (s)**

FCC PART 15.247

**Sample Description**

| | |
|---|---|
| Product Type: | Microphone |
| Model No.: | SR-MV2000W TX |
| Multiple Model(s) No.: | SR-MV2000W(Please refer to DOS for Model difference) |
| Trade Mark: | N/A |
| Date Received: | 2021/11/29 |
| Date of Test: | 2021/12/15~2021/12/24 |
| Report Date: | 2021/12/29 |

| Test Result: | Pass* |
|---|---|

* In the configuration tested, the EUT complied with the standards above.

**Prepared and Checked By:**

Ting Lü
EMC Engineer

**Approved By:**

Robert Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".
Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.
This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

# TABLE OF CONTENTS

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Frequency Range | 2406~2474MHz |
| Maximum Conducted Peak Output Power | 5.65dBm |
| Technique | DTS |
| Modulation Type | GFSK |
| Antenna Specification* | 2dBi (provided by the applicant) |
| Voltage Range | DC 3.7V from battery or DC 5V from Type-C Port |
| Sample serial number | SZNS211129-61309E-RF-S6 for Conducted and Radiation Emissions(below 1G)<br>SZNS211129-61309E-RF-S5 for RF Conducted Test and Radiation Emissions(above 1G) (Assigned by ATC) |
| Sample/EUT Status | Good condition |

## Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

## Measurement Uncertainty

| Parameter | | Uncertainty |
|---|---|---|
| Occupied Channel Bandwidth | | 5% |
| RF Frequency | | $0.082*10^{-7}$ |
| RF output power, conducted | | 0.73dB |
| Unwanted Emission, conducted | | 1.6dB |
| AC Power Lines Conducted Emissions | | 2.72dB |
| Emissions, Radiated | 9kHz - 30MHz | 2.66dB |
| | 30MHz - 1GHz | 4.28dB |
| | 1GHz - 18GHz | 4.98dB |
| | 18GHz - 26.5GHz | 5.06dB |
| | 26.5GHz - 40GHz | 4.72dB |
| Temperature | | 1℃ |
| Humidity | | 6% |
| Supply voltages | | 0.4% |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in engineering mode.

Channel list

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| 1 | 2406 | 6 | 2426 | 11 | 2446 | 16 | 2466 |
| 2 | 2410 | 7 | 2430 | 12 | 2450 | 17 | 2470 |
| 3 | 2414 | 8 | 2434 | 13 | 2454 | 18 | 2474 |
| 4 | 2418 | 9 | 2438 | 14 | 2458 | / | / |
| 5 | 2422 | 10 | 2442 | 15 | 2462 | / | / |

Channel 1, 9, 18 was tested.

## EUT Exercise Software

EUT was configed to test mode by applicant.

## Equipment Modifications

No modification was made to the EUT tested.

### Special Accessories

No special accessory.

## Duty cycle

Please refer to the Appendix.

## Support Equipment List and Details

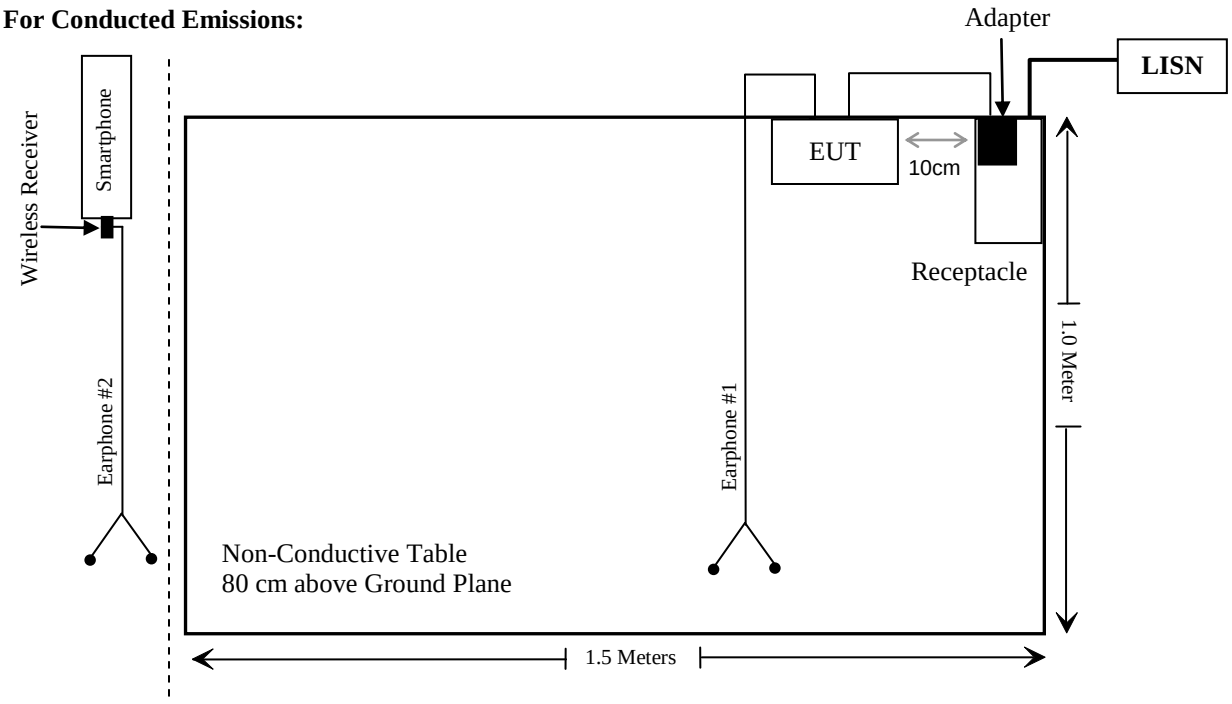
| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| TECNO | Adapter | A8-501000 | AH20211028 |
| HUAWEI | Smartphone | Mate 30 | FEC0220617000901 |
| Jiayz | Wireless Receiver | SR-MV2000W RX | S9 |
| Qilive | Earphone#1 | RF068 | 891226 |
| Unknown | Earphone#2 | Unknown | Earphone#2 |

## External I/O Cable

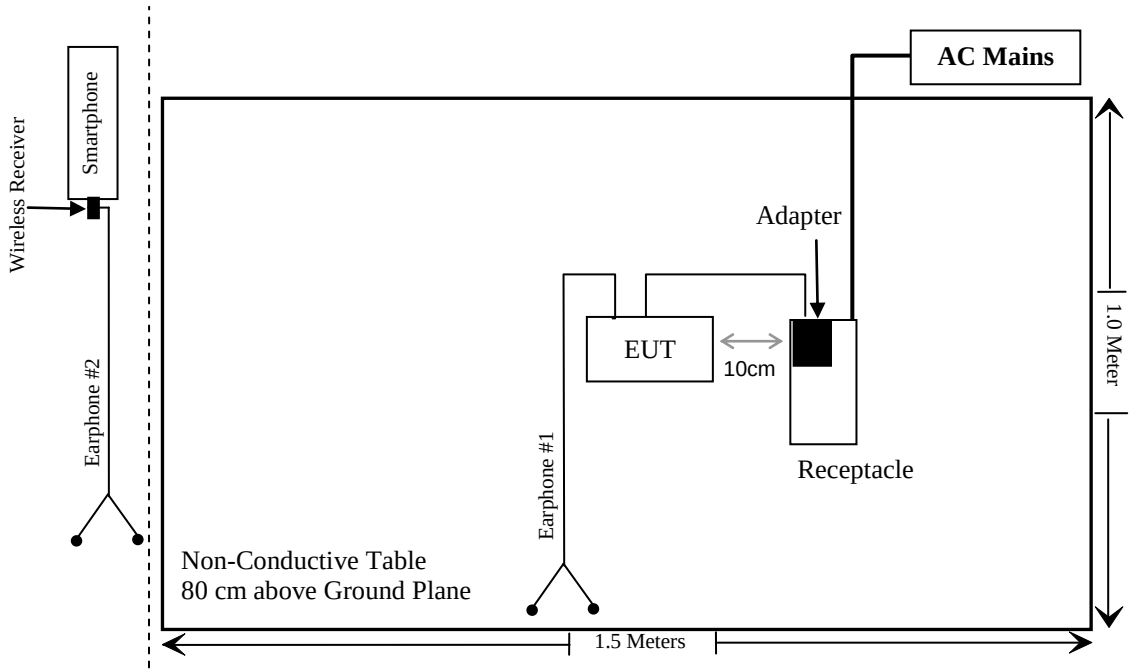
| Cable Description | Length (m) | From Port | To |
|---|---|---|---|
| Un-shielding Detachable USB-A to Type-C Cable | 2.0 | EUT | Adapter |

## Block Diagram of Test Setup

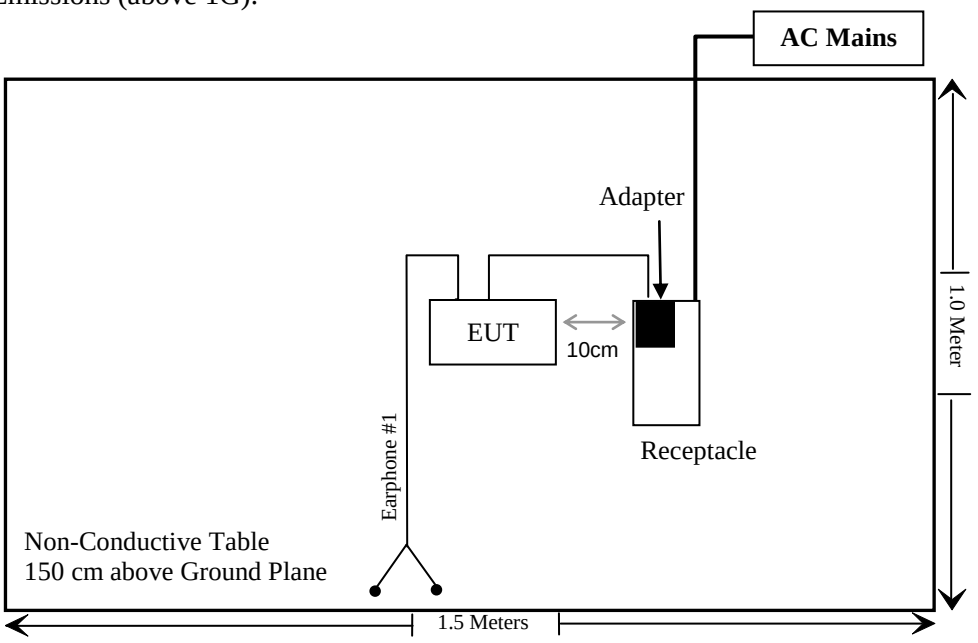
**For Conducted Emissions:**



For Radiated Emissions (below 1G):




For Radiated Emissions (above 1G):



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| §1.1307(b) & §2.1093 | RF EXPOSURE | Compliant |
| §15.203 | Antenna Requirement | Compliant |
| §15.207 (a) | AC Line Conducted Emissions | Compliant |
| §15.205, §15.209, §15.247(d) | Spurious Emissions | Compliant |
| §15.247 (a)(2) | 6 dB Emission Bandwidth | Compliant |
| §15.247(b)(3) | Maximum Conducted Output Power | Compliant |
| §15.247(d) | 100 kHz Bandwidth of Frequency Band Edge | Compliant |
| §15.247(e) | Power Spectral Density | Compliant |

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Conducted Emissions Test | | | | | |
| Rohde& Schwarz | EMI Test Receiver | ESCI | 100784 | 2021/12/13 | 2022/12/12 |
| Rohde & Schwarz | L.I.S.N. | ENV216 | 101314 | 2021/12/13 | 2022/12/12 |
| Anritsu Corp | 50 Coaxial Switch | MP59B | 6100237248 | 2021/12/13 | 2022/12/12 |
| Conducted Emission Test Software: e3 19821b (V9) | | | | | |
| Radiated Emission Test | | | | | |
| Rohde& Schwarz | Test Receiver | ESR | 102725 | 2021/12/13 | 2022/12/12 |
| Rohde&Schwarz | Spectrum Analyzer | FSV40 | 101949 | 2021/12/13 | 2022/12/12 |
| SONOMA INSTRUMENT | Amplifier | 310 N | 186131 | 2021/11/09 | 2022/11/08 |
| A.H. Systems, inc. | Preamplifier | PAM-0118P | 135 | 2021/11/09 | 2022/11/08 |
| Quinstar | Amplifier | QLW-18405536-J0 | 15964001002 | 2021/11/11 | 2022/11/10 |
| Schwarzbeck | Bilog Antenna | VULB9163 | 9163-323 | 2021/07/06 | 2024/07/05 |
| Schwarzbeck | Horn Antenna | BBHA9120D | 9120D-1067 | 2020/01/05 | 2023/01/04 |
| Schwarzbeck | HORN ANTENNA | BBHA9170 | 9170-359 | 2020/01/05 | 2023/01/04 |
| Radiated Emission Test Software: e3 19821b (V9) | | | | | |
| Unknown | RF Coaxial Cable | No.10 | N050 | 2021/12/14 | 2022/12/13 |
| Unknown | RF Coaxial Cable | No.11 | N1000 | 2021/12/14 | 2022/12/13 |
| Unknown | RF Coaxial Cable | No.12 | N040 | 2021/12/14 | 2022/12/13 |
| Unknown | RF Coaxial Cable | No.13 | N300 | 2021/12/14 | 2022/12/13 |
| Wainwright | High Pass Filter | WHKX3.6/18G-10SS | 5 | 2021/12/14 | 2022/12/13 |
| RF Conducted Test | | | | | |
| Rohde & Schwarz | Spectrum Analyzer | FSV-40 | 101495 | 2021/12/13 | 2022/12/12 |
| Tonscend | RF Control Unit | JS0806-2 | 19G8060182 | 2021/07/06 | 2022/07/05 |

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC §15.247 (i), §1.1307 (b) (1) & §2.1093 – RF EXPOSURE

## Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

**For worst case:**

| Frequency (MHz) | Maximum Tune-up power | | Calculated Distance (mm) | Calculated Value | Threshold (1-g SAR) | SAR Test Exclusion |
|---|---|---|---|---|---|---|
| | (dBm) | (mW) | | | | |
| 2406-2474 | 6.0 | 3.98 | 5 | 1.3 | 3.0 | **Yes** |

Note: Basically, a 5 mm distance or more between device and head when use for speak

**Result: No Standalone SAR test is required**

# FCC §15.203 - ANTENNA REQUIREMENT

## Applicable Standard

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## Antenna Connector Construction

The EUT has one internal antenna which was permanently attached, the antenna gain is 2.0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

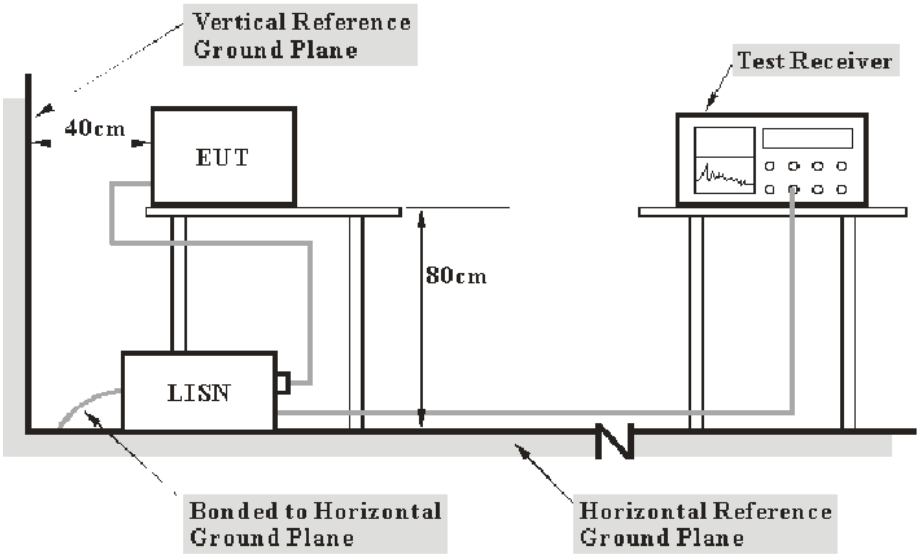
**Result:** Compliance.

# FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

## Applicable Standard

FCC §15.207(a)

## EUT Setup




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

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

## EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|---|---|
| 150 kHz – 30 MHz | 9 kHz |

## Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

## Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss. The basic equation is as follows:

Factor = LISN VDF + Cable Loss

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a over limit of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

Over Limit = Level – Limit
Level = Read Level – Factor

## Test Data

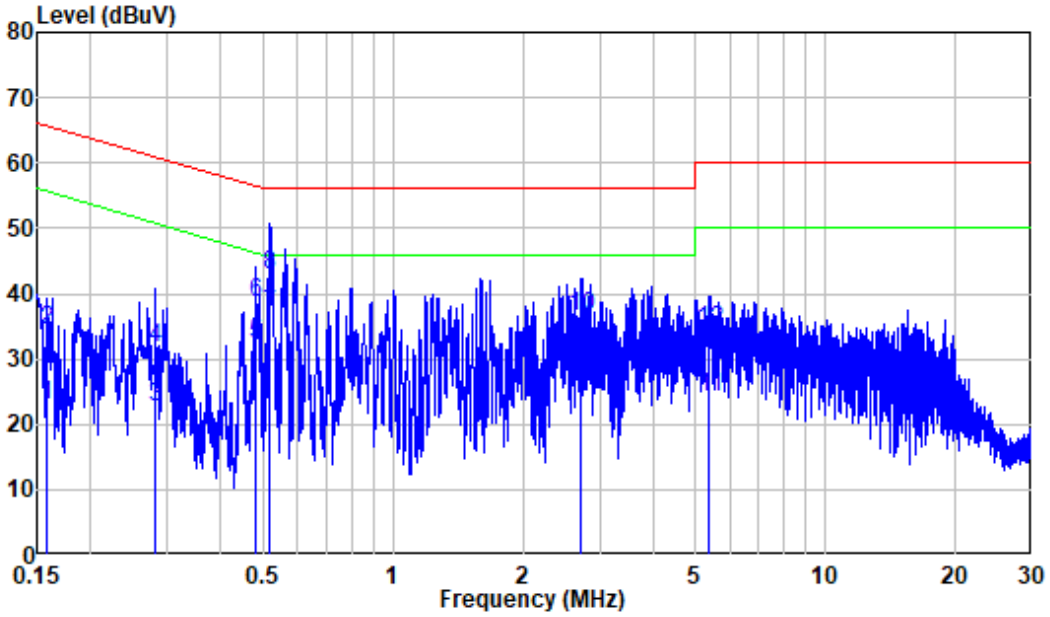
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23 ℃ |
| **Relative Humidity:** | 60 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bin Duan on 2021-12-23.*

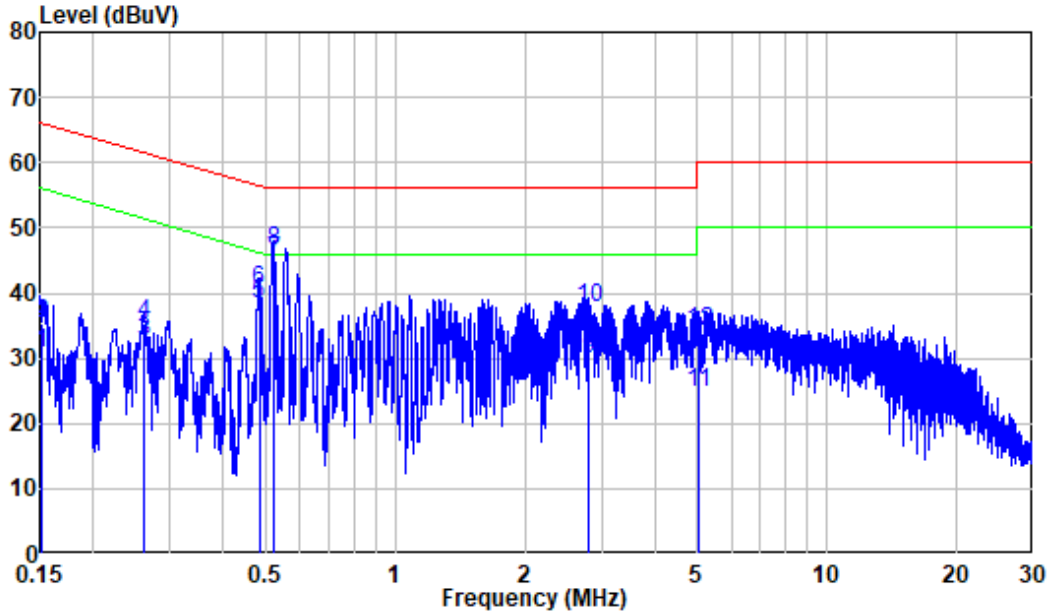
*EUT operation mode: Normal link*

**AC 120V/60 Hz, Line**




| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.159 | 9.88 | 13.05 | 22.93 | 55.53 | -32.60 | Average |
| 2 | 0.159 | 9.88 | 24.65 | 34.53 | 65.53 | -31.00 | QP |
| 3 | 0.282 | 9.80 | 12.82 | 22.62 | 50.76 | -28.14 | Average |
| 4 | 0.282 | 9.80 | 21.94 | 31.74 | 60.76 | -29.02 | QP |
| 5 | 0.482 | 9.80 | 22.59 | 32.39 | 46.31 | -13.92 | Average |
| 6 | 0.482 | 9.80 | 28.95 | 38.75 | 56.31 | -17.56 | QP |
| 7 | 0.517 | 9.81 | 26.97 | 36.78 | 46.00 | -9.22 | Average |
| 8 | 0.517 | 9.81 | 32.95 | 42.76 | 56.00 | -13.24 | QP |
| 9 | 2.712 | 9.93 | 18.12 | 28.05 | 46.00 | -17.95 | Average |
| 10 | 2.712 | 9.93 | 26.63 | 36.56 | 56.00 | -19.44 | QP |
| 11 | 5.390 | 10.00 | 14.09 | 24.09 | 50.00 | -25.91 | Average |
| 12 | 5.390 | 10.00 | 24.32 | 34.32 | 60.00 | -25.68 | QP |

**AC 120V/60 Hz, Neutral**




| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.152 | 9.91 | 20.74 | 30.65 | 55.88 | -25.23 | Average |
| 2 | 0.152 | 9.91 | 25.33 | 35.24 | 65.88 | -30.64 | QP |
| 3 | 0.260 | 9.97 | 22.62 | 32.59 | 51.42 | -18.83 | Average |
| 4 | 0.260 | 9.97 | 25.24 | 35.21 | 61.42 | -26.21 | QP |
| 5 | 0.483 | 9.90 | 28.59 | 38.49 | 46.28 | -7.79 | Average |
| 6 | 0.483 | 9.90 | 30.46 | 40.36 | 56.28 | -15.92 | QP |
| 7 | 0.522 | 9.91 | 35.05 | 44.96 | 46.00 | -1.04 | Average |
| 8 | 0.522 | 9.91 | 36.71 | 46.62 | 56.00 | -9.38 | QP |
| 9 | 2.794 | 9.98 | 19.90 | 29.88 | 46.00 | -16.12 | Average |
| 10 | 2.794 | 9.98 | 27.69 | 37.67 | 56.00 | -18.33 | QP |
| 11 | 5.031 | 10.05 | 14.62 | 24.67 | 50.00 | -25.33 | Average |
| 12 | 5.031 | 10.05 | 23.92 | 33.97 | 60.00 | -26.03 | QP |

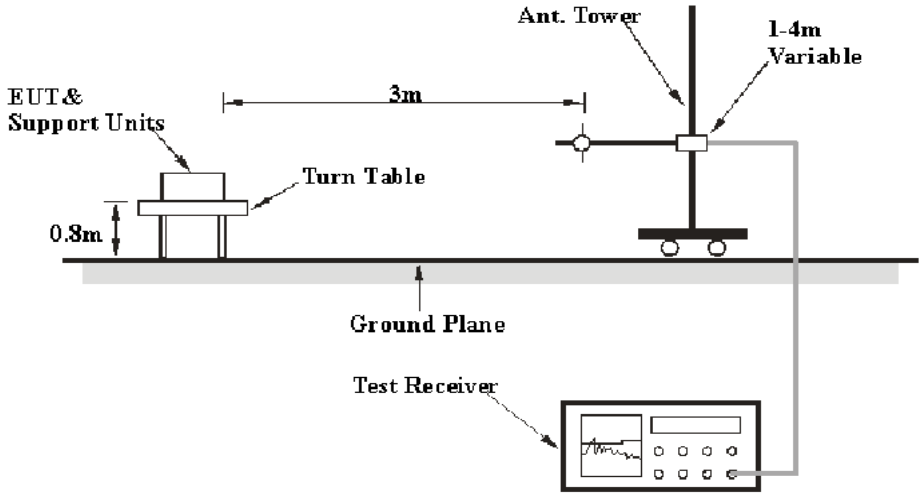
# FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

## Applicable Standard

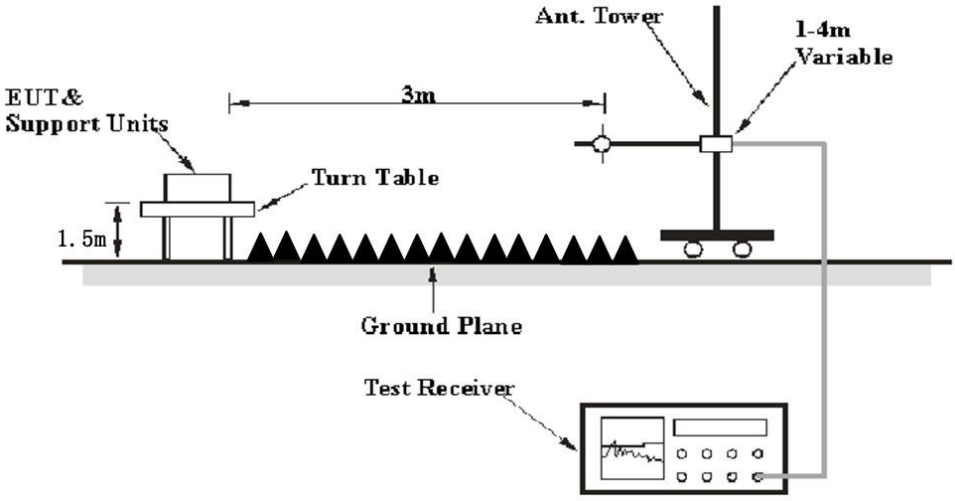
FCC §15.247 (d); §15.209; §15.205;

## EUT Setup

**Below 1 GHz:**




**Above 1GHz:**




The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

## EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Measurement |
|---|---|---|---|---|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | PK |
| | 1MHz | 10 Hz Note 1 | / | Average |
| | 1MHz | ＞1/T Note 2 | / | Average |

Note 1: when duty cycle is no less than 98%
Note 2: when duty cycle is less than 98%

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

## Corrected Factor & Margin Calculation

The Corrected Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit or Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin/over limit of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin/Over Limit = Corrected Amplitude/Level - Limit
Corrected Amplitude/Level = Reading - Corrected Factor

# Test Data

## Environmental Conditions

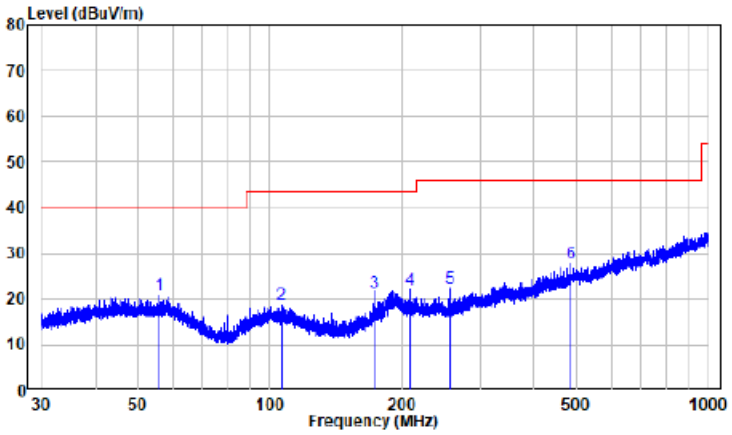
| | |
|---|---|
| **Temperature:** | 25℃ |
| **Relative Humidity:** | 64 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Chao Mo on 2021-12-24 for below 1GHz and 2021-12-24 for above 1GHz.*

*EUT operation mode: Transmitting*

**30MHz-1GHz:** *(normal link)*

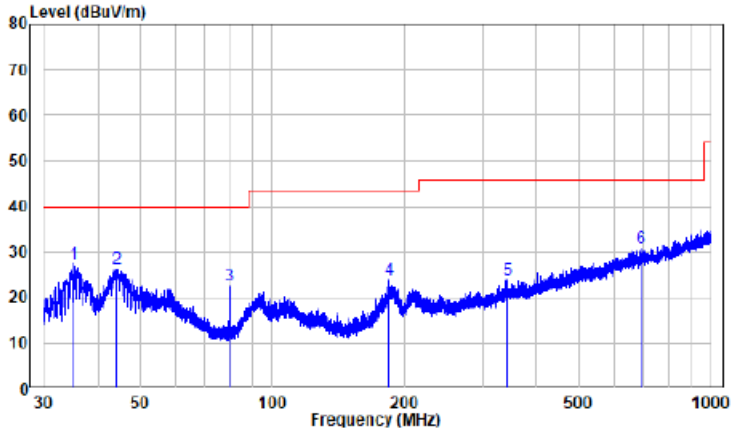
**Horizontal:**




Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS211129-61309E-RF
Test Mode: Charging+Communication

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 56.10 | -10.17 | 30.87 | 20.70 | 40.00 | -19.30 | Peak |
| 2 | 106.01 | -11.92 | 30.55 | 18.63 | 43.50 | -24.87 | Peak |
| 3 | 172.37 | -13.33 | 34.86 | 21.53 | 43.50 | -21.97 | Peak |
| 4 | 208.12 | -11.85 | 34.03 | 22.18 | 43.50 | -21.32 | Peak |
| 5 | 256.86 | -10.60 | 33.05 | 22.45 | 46.00 | -23.55 | Peak |
| 6 | 483.49 | -4.92 | 32.76 | 27.84 | 46.00 | -18.16 | Peak |

**Vertical**




Site : chamber
Condition: 3m Vertical
Job No. : SZNS211129-61309E-RF
Test Mode: Charging+Communication

| | Freq | Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 35.36 | -11.42 | 38.88 | 27.46 | 40.00 | -12.54 | Peak |
| 2 | 44.16 | -9.91 | 36.26 | 26.35 | 40.00 | -13.65 | Peak |
| 3 | 79.98 | -16.79 | 39.42 | 22.63 | 40.00 | -17.37 | Peak |
| 4 | 183.60 | -12.34 | 36.10 | 23.76 | 43.50 | -19.74 | Peak |
| 5 | 342.73 | -7.31 | 31.31 | 24.00 | 46.00 | -22.00 | Peak |
| 6 | 688.66 | -1.51 | 32.36 | 30.85 | 46.00 | -15.15 | Peak |

**Above 1GHz:**

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | PK/QP/AV | | Height (m) | Polar (H/V) | | | | |
| Low Channel | | | | | | | | | |
| 2310 | 67.79 | PK | 328 | 1.0 | H | -7.24 | 60.55 | 74 | -13.45 |
| 2310 | 53.52 | AV | 328 | 1.0 | H | -7.24 | 46.28 | 54 | -7.72 |
| 2310 | 68.69 | PK | 80 | 2.2 | V | -7.24 | 61.45 | 74 | -12.55 |
| 2310 | 53.41 | AV | 80 | 2.2 | V | -7.24 | 46.17 | 54 | -7.83 |
| 2390 | 70.74 | PK | 258 | 1.3 | H | -7.22 | 63.52 | 74 | -10.48 |
| 2390 | 54.37 | AV | 258 | 1.3 | H | -7.22 | 47.15 | 54 | -6.85 |
| 2390 | 70.23 | PK | 39 | 1.8 | V | -7.22 | 63.01 | 74 | -10.99 |
| 2390 | 54.26 | AV | 39 | 1.8 | V | -7.22 | 47.04 | 54 | -6.96 |
| 4812 | 55.58 | PK | 107 | 1.6 | H | -3.52 | 52.06 | 54 | -1.94 |
| 4812 | 57.80 | PK | 166 | 1.7 | V | -3.52 | 54.28 | 74 | -19.72 |
| 4812 | 44.36 | AV | 166 | 1.7 | V | -3.52 | 40.84 | 54 | -13.16 |
| Middle Channel | | | | | | | | | |
| 4876 | 55.87 | PK | 297 | 2.5 | H | -3.40 | 52.47 | 54 | -1.53 |
| 4876 | 57.99 | PK | 196 | 1.0 | V | -3.40 | 54.59 | 74 | -19.41 |
| 4876 | 45.92 | AV | 196 | 1.0 | V | -3.40 | 42.52 | 54 | -11.48 |
| High Channel | | | | | | | | | |
| 2483.5 | 69.44 | PK | 225 | 2.5 | H | -7.20 | 62.24 | 74 | -11.76 |
| 2483.5 | 55.22 | AV | 225 | 2.5 | H | -7.20 | 48.02 | 54 | -5.98 |
| 2483.5 | 69.75 | PK | 288 | 2.3 | V | -7.20 | 62.55 | 74 | -11.45 |
| 2483.5 | 54.93 | AV | 288 | 2.3 | V | -7.20 | 47.73 | 54 | -6.27 |
| 2500 | 68.65 | PK | 10 | 1.2 | H | -7.18 | 61.47 | 74 | -12.53 |
| 2500 | 54.59 | AV | 10 | 1.2 | H | -7.18 | 47.41 | 54 | -6.59 |
| 2500 | 68.42 | PK | 173 | 1.9 | V | -7.18 | 61.24 | 74 | -12.76 |
| 2500 | 54.42 | AV | 173 | 1.9 | V | -7.18 | 47.24 | 54 | -6.76 |
| 4948 | 55.57 | PK | 303 | 1.6 | H | -3.05 | 52.52 | 54 | -1.48 |
| 4948 | 57.69 | PK | 7 | 1.2 | V | -3.05 | 54.64 | 74 | -19.36 |
| 4948 | 44.57 | AV | 7 | 1.2 | V | -3.05 | 41.52 | 54 | -12.48 |

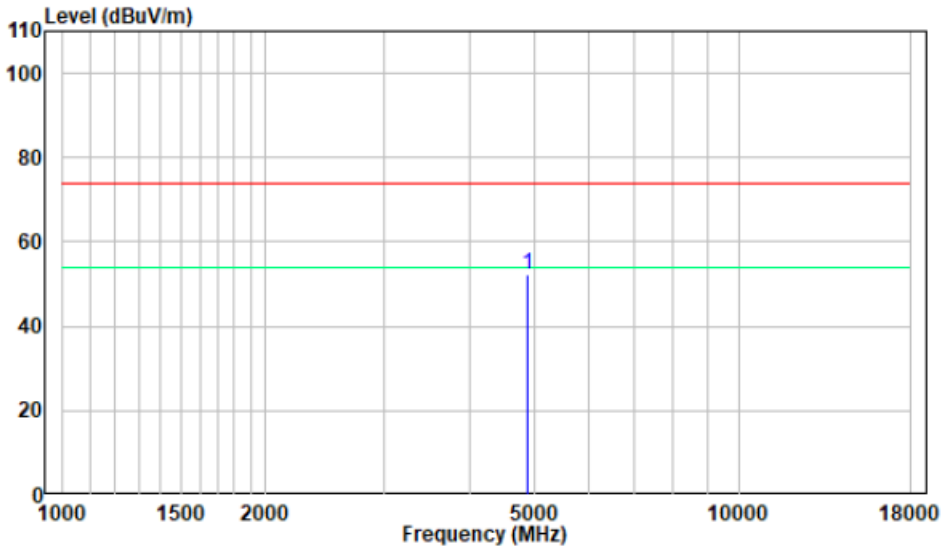
**Note:**
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Corrected. Amplitude – Limit
The other spurious emission is in the noise floor level was not recorded.
When the test result of peak was less than the limit of average, just peak value were recorded.

## 1-18GHz

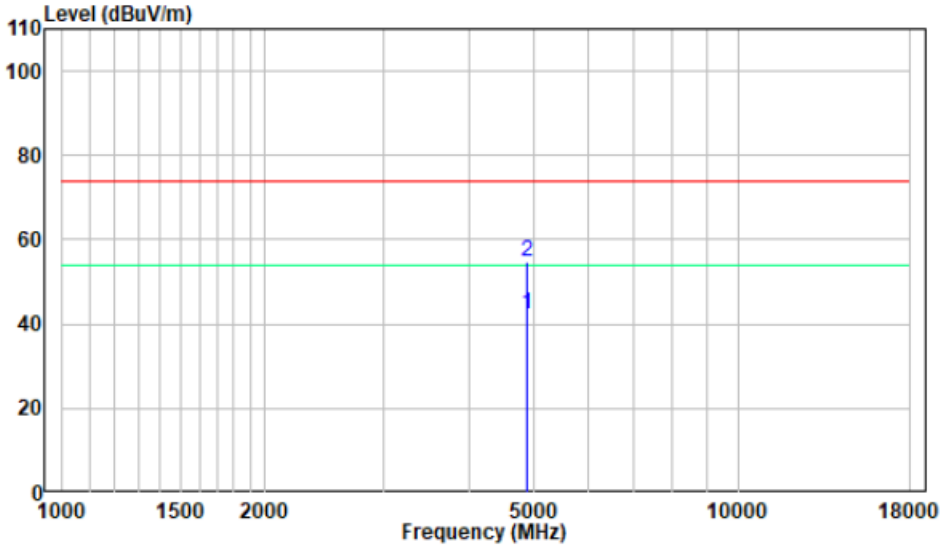
**Pre-scan plot**

**Middle Channel**

**Horizontal:**




**Vertical:**

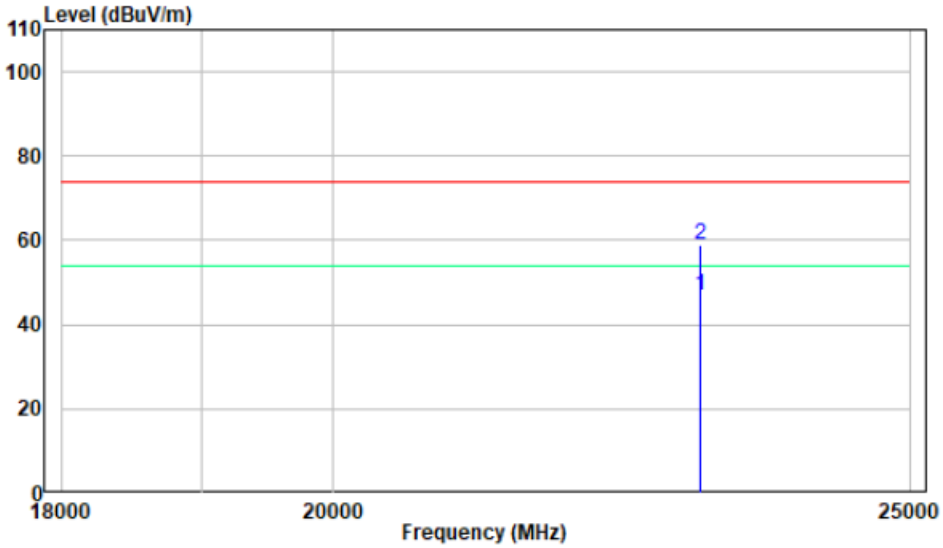


## 18-25GHz

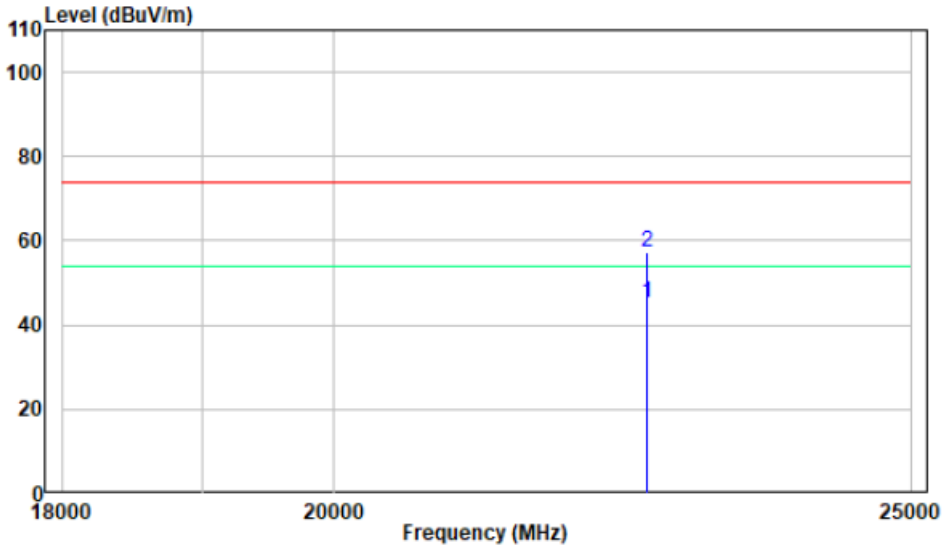
**Pre-scan plot**

**Middle Channel**

**Horizontal:**




**Vertical:**



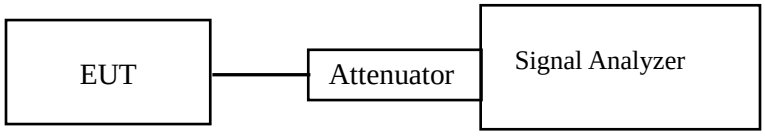
# FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

## Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Paul Liu on 2021-12-15.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

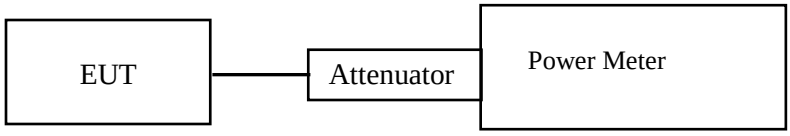
# FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

## Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

## Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Paul Liu on 2021-12-15.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

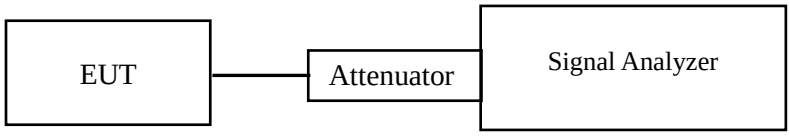
# FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

## Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Paul Liu on 2021-12-15.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

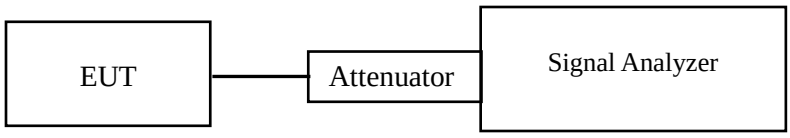
# FCC §15.247(e) - POWER SPECTRAL DENSITY

## Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

## Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = power averaging (rms) or sample detector (when rms not available).
6. Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
7. Sweep time = auto couple.
8. Employ trace averaging (rms) mode over a minimum of 100 traces.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.




## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 53 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Paul Liu on 2021-12-15.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# APPENDIX

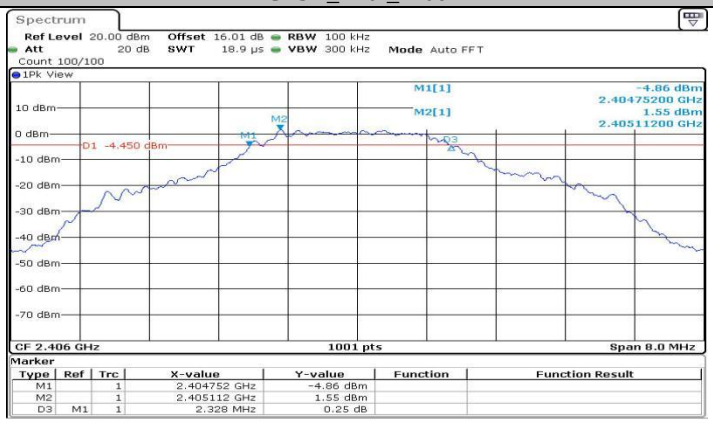
## Appendix A: DTS Bandwidth

### Test Result

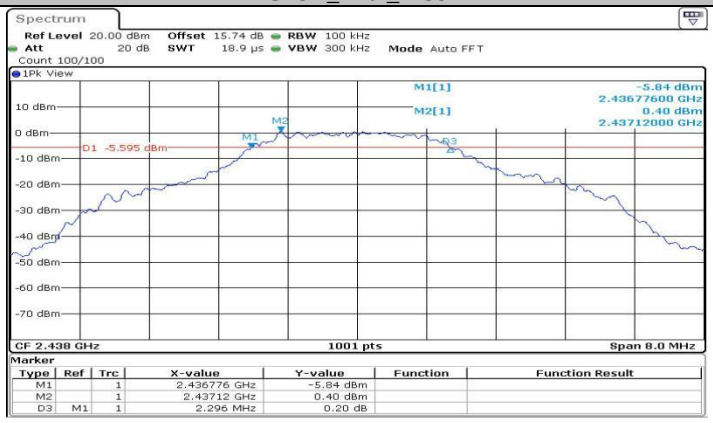
| Test Mode | Antenna | Channel | DTS BW [MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| GFSK | Ant1 | 2406 | 2.328 | 0.5 | PASS |
| | | 2438 | 2.296 | 0.5 | PASS |
| | | 2474 | 2.168 | 0.5 | PASS |

## Test Graphs

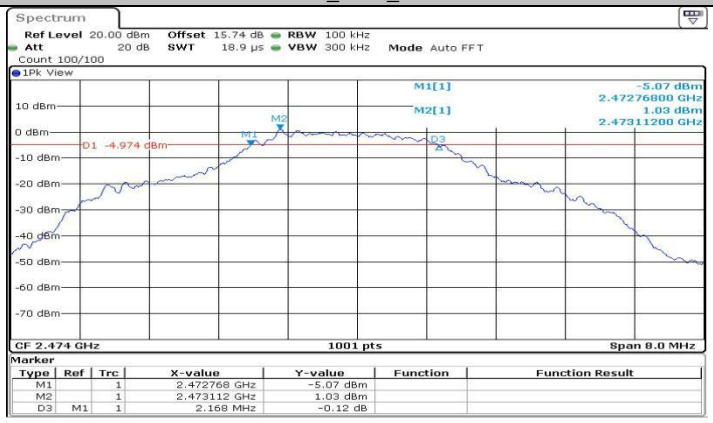
GFSK_Ant1_2406




GFSK_Ant1_2438




GFSK_Ant1_2474



## Appendix B: Occupied Channel Bandwidth

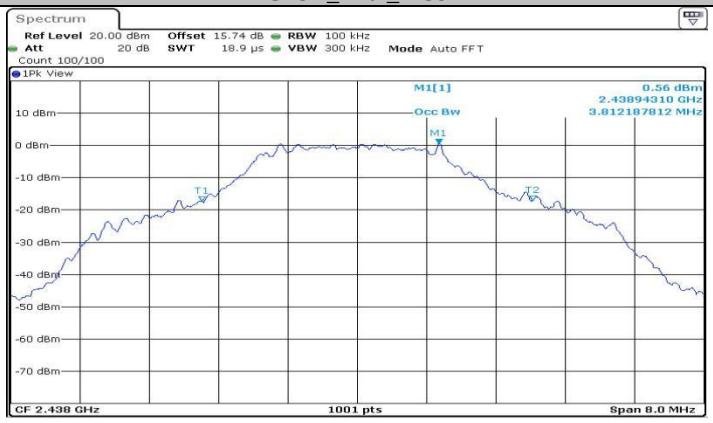
### Test Result

| Test Mode | Antenna | Channel | OCB [MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| GFSK | Ant1 | 2406 | 3.812 | --- | PASS |
| | | 2438 | 3.812 | --- | PASS |
| | | 2474 | 3.812 | --- | PASS |

## Test Graphs

GFSK_Ant1_2406


GFSK_Ant1_2438




GFSK_Ant1_2474

## Appendix C: Maximum conducted Peak output power

### Test Result

| Test Mode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| GFSK | Ant1 | 2406 | 5.65 | ≤30 | PASS |
| | | 2438 | 5.24 | ≤30 | PASS |
| | | 2474 | 4.60 | ≤30 | PASS |

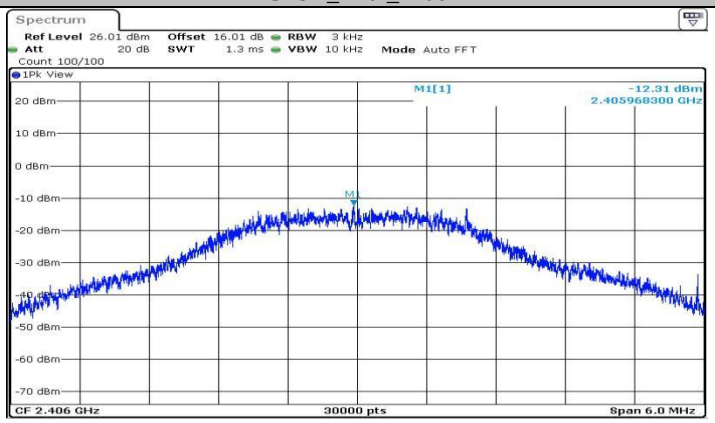
## Appendix D: Maximum power spectral density

### Test Result

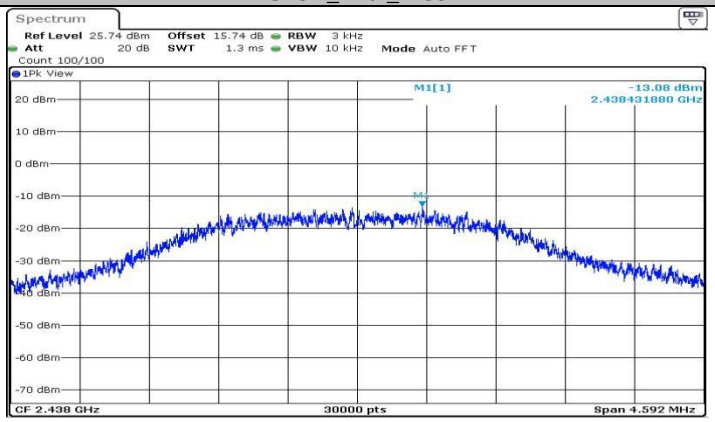
| Test Mode | Antenna | Channel | Result[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|---|---|---|---|---|---|
| GFSK | Ant1 | 2406 | -12.31 | ≤8 | PASS |
| | | 2438 | -13.08 | ≤8 | PASS |
| | | 2474 | -13.97 | ≤8 | PASS |

## Test Graphs

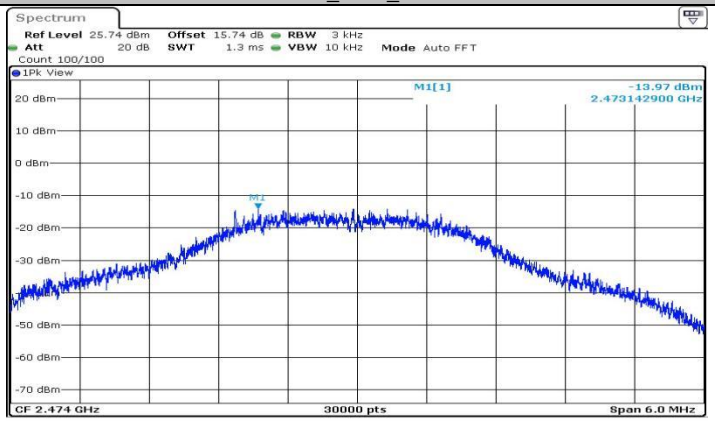
GFSK_Ant1_2406




GFSK_Ant1_2438



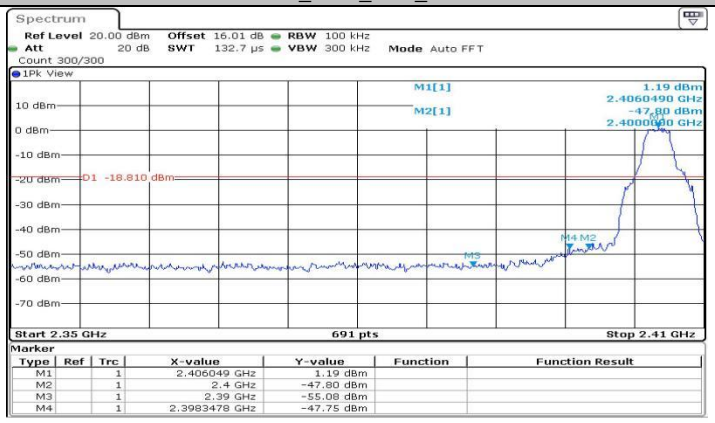

GFSK_Ant1_2474



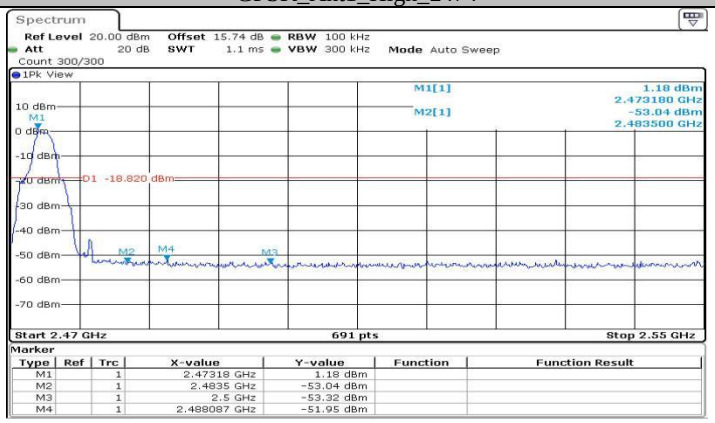
# Appendix E: Band edge measurements

## Test Graphs

GFSK_Ant1_Low_2406




GFSK_Ant1_High_2474



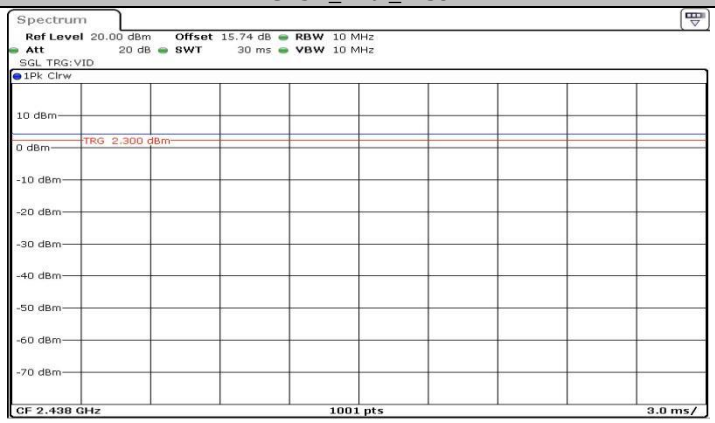
# AppendixF: Duty Cycle

## Test Result

| Test Mode | Antenna | Channel | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] |
|---|---|---|---|---|---|
| GFSK | Ant1 | 2438 | 30.00 | 30.00 | 100 |

## Test Graphs

GFSK_Ant1_2438




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