# TEST REPORT

| | |
|---|---|
| **Application No.:** | SZCR2306001911AT |
| **Applicant:** | SHANTOU ZINGO HOBBY CO., LTD |
| **Address of Applicant:** | FENGXIN INDUSTRIAL ZONE, FENGXIANG STREET, CHENGHAI DISTRICT, SHANTOU, GUANGDONG, CHINA |
| **Manufacturer:** | SHANTOU ZINGO HOBBY CO., LTD |
| **Address of Manufacturer:** | FENGXIN INDUSTRIAL ZONE, FENGXIANG STREET, CHENGHAI DISTRICT, SHANTOU, GUANGDONG, CHINA |
| **Equipment Under Test (EUT):** | |
| **EUT Name:** | remote control car |
| **Model No.:** | 9123A, 9118, 9119, 9121, 9113, 9113A, 9113B, 9113C, 9113D, 9113E, 9113F, 9113TD, 9113TF, 9111, 9111A, 9111B, 9111C, 9111D, 9111F, 9111H, 9111M, 9111L, 9111T, 9105, 9122, 9120A, 9120L, 9117, 86101, 86102, 83101, 83102, 84101, 84102, 85101, 85102, 87101, 87102 ♣ |
| ♣ | Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical. |
| **FCC ID:** | 2ASGE9042023 |
| **Standard(s) :** | 47 CFR Part 15, Subpart C 15.249 |
| **Date of Receipt:** | 2023-06-18 |
| **Date of Test:** | 2023-06-22 to 2023-06-30 |
| **Date of Issue:** | 2023-09-22 |
| **Test Result:** | **Pass*** |

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

Keny Xu
EMC Laboratory Manager

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| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 01 | | 2023-09-22 | | Original |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| | | Gebin Sun<br>**Gebin Sun/Project Engineer** | | |
| | | Eric Fu<br>**Eric Fu/Reviewer** | | |

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# 2 Test Summary

| Radio Spectrum Technical Requirement | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Antenna Requirement | 47 CFR Part 15, Subpart C 15.249 | N/A | 47 CFR Part 15, Subpart C 15.203 | Pass |

| Radio Spectrum Matter Part | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| 20dB Bandwidth | 47 CFR Part 15, Subpart C 15.249 | ANSI C63.10 (2013) Section 6.9 | 47 CFR Part 15, Subpart C 15.215 | Pass |
| Field Strength of the Fundamental Signal (15.249(a)) | | ANSI C63.10 (2013) Section 6.5&6.6 | 47 CFR Part 15, Subpart C 15.249(a) | Pass |
| Restricted Band Around Fundamental Frequency | | ANSI C63.10 (2013) Section 6.10.5 | 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209 | Pass |
| Radiated Emissions Below 1GHz | | ANSI C63.10 (2013) Section 6.4&6.5 | 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d) | Pass |
| Radiated Emissions Above 1GHz | | ANSI C63.10 (2013) Section 6.6 | 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d) | Pass |

**Declaration of EUT Family Grouping:**

Model No.: 9123A, 9118, 9119, 9121, 9113, 9113A, 9113B, 9113C, 9113D, 9113E, 9113F, 9113TD, 9113TF, 9111, 9111A, 9111B, 9111C, 9111D, 9111F, 9111H, 9111M, 9111L, 9111T, 9105, 9122, 9120A, 9120L, 9117, 86101, 86102, 83101, 83102, 84101, 84102, 85101, 85102, 87101, 87102

Only the model 9123A was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference on color, appearance and package.

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检验检测专用章
Inspection & Testing Services
SGS-CSTC Standards Technical Services Co.,Ltd. Shenzhen Branch Testing Center LLC Laboratory.

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# 4 General Information

## 4.1 Details of E.U.T.

| | |
|---|---|
| Power supply: | 3V DC(1.5V x 2 "AA" Size Batteries) for TX |
| Operation Frequency: | 2405.3MHz to 2452.3MHz |
| Modulation Type: | GFSK |
| Number of Channels: | 20 |
| Antenna Type: | Wire Antenna |
| Antenna Gain: | 0dBi |

**Channel List:**

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| **1** | 2405.3 | **6** | 2410.0 | **11** | 2417.0 | **16** | 2447.0 |
| **2** | 2405.5 | **7** | 2411.0 | **12** | 2443.3 | **17** | 2449.0 |
| **3** | 2407.0 | **8** | 2412.0 | **13** | 2444.0 | **18** | 2450.0 |
| **4** | 2408.0 | **9** | 2413.0 | **14** | 2445.0 | **19** | 2451.0 |
| **5** | 2409.0 | **10** | 2414.0 | **15** | 2446.0 | **20** | 2452.3 |

Remark:The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

## 4.2 Description of Support Units

| Description | Manufacturer | Model No. | Serial No. |
|---|---|---|---|
| -- | -- | -- | -- |
| The EUT has been tested as an independent unit. | | | |

## 4.3 Measurement Uncertainty

| Test Item | Measurement Uncertainty |
|---|---|
| 20dB Bandwidth | ± 3% |
| Field Strength of the Fundamental Signal (15.249(a)) | ± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz) |
| Restricted Band Around Fundamental Frequency | ± 6.0dB (Below 1GHz);± 4.6dB (Above 1GHz) |
| Radiated Emissions Below 1GHz | ± 6.0dB for 3m; ± 5.0dB for 10m |
| Radiated Emissions Above 1GHz | ± 4.6dB (1GHz-18GHz);± 4.8dB (18MHz-40GHz) |

Remark:
The $U_{lab}$ (lab Uncertainty) is less than $U_{cispr/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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## 4.4 Test Location

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No tests were sub-contracted.

## 4.5 Test Facility

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

**• A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

**• VCCI (Member No. 1937)**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

**• FCC –Designation Number: CN1336**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

**• Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

## 4.6 Deviation from Standards

None

## 4.7 Abnormalities from Standard Conditions

None

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# 5 Equipment List

| 20dB Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| DC Power Supply | Chroma | 62012P-80-60 | SEM011-11 | 2022-10-20 | 2023-10-19 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | SEM004-19 | 2023-03-21 | 2024-03-20 |
| Measurement Software | TST PASS | TST PASS V2.0 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM031-01 | 2022-07-08 | 2023-07-07 |
| Attenuator | Huber+Suhner | 6620_SMA-50-1 | SEM021-09 | 2023-03-31 | 2024-03-30 |

| Field Strength of the Fundamental Signal (15.249(a)) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | AUDIX | N/A | SEM001-02 | 2022-04-02 | 2025-04-01 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | SEM008-04 | 2023-03-20 | 2024-03-19 |
| Horn Antenna | Rohde&Schwarz | HF907 | SEM003-07 | 2022-07-24 | 2024-07-23 |
| Microwave system amplifier | Agilent | 83017A | SEM005-25 | 2022-09-21 | 2023-09-20 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM026-01 | 2022-07-08 | 2023-07-07 |

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| Restricted Band Around Fundamental Frequency | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | AUDIX | N/A | SEM001-02 | 2022-04-02 | 2025-04-01 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | SEM008-04 | 2023-03-20 | 2024-03-19 |
| Horn Antenna | Rohde&Schwarz | HF907 | SEM003-07 | 2022-07-24 | 2024-07-23 |
| Microwave system amplifier | Agilent | 83017A | SEM005-25 | 2022-09-21 | 2023-09-20 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM026-01 | 2022-07-08 | 2023-07-07 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA 9170 | SEM003-15 | 2022-08-10 | 2024-08-09 |
| Pre-Amplifier | Compliance Directions Systems Inc. | PAP-2640-50 | SEM005-08 | 2023-03-20 | 2024-03-19 |

| Radiated Emissions Below 1GHz | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| Loop Antenna | ETS-Lindgren | 6502 | SEM003-08 | 2021-11-30 | 2023-11-29 |
| 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEM001-01 | 2020-07-19 | 2023-07-18 |
| MXE EMI Receiver | Agilent Technologies | N9038A | SEM004-15 | 2022-10-20 | 2023-10-19 |
| BiConiLog Antenna | ETS-LINDGREN | 3142C | SEM003-01 | 2021-09-17 | 2023-09-16 |
| Pre-Amplifier | Agilent Technologies | 8447D | SEM005-01 | 2023-03-20 | 2024-03-19 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM025-01 | 2022-07-08 | 2023-07-07 |

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| Radiated Emissions Above 1GHz | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | AUDIX | N/A | SEM001-02 | 2022-04-02 | 2025-04-01 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | SEM008-04 | 2023-03-20 | 2024-03-19 |
| Horn Antenna | Rohde&Schwarz | HF907 | SEM003-07 | 2022-07-24 | 2024-07-23 |
| Microwave system amplifier | Agilent | 83017A | SEM005-25 | 2022-09-21 | 2023-09-20 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM026-01 | 2022-07-08 | 2023-07-07 |

| General used equipment | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal Date** | **Cal Due Date** |
| Humidity/ Temperature Indicator | Mingle | N/A | SEM002-08 | 2022-09-04 | 2023-09-03 |
| Humidity/ Temperature Indicator | Anymetre | TH101B | SEM002-09 | 2022-09-04 | 2023-09-03 |
| Barometer | Changchun Meteorological Industry Factory | DYM3 | SEM002-01 | 2023-03-23 | 2024-03-22 |

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# 6 Radio Spectrum Technical Requirement

## 6.1 Antenna Requirement

### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

### 6.1.2 Conclusion

Standard Requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi

Antenna location: Refer to internal photo.

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# 7 Radio Spectrum Matter Test Results

## 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
Test Method: ANSI C63.10 (2013) Section 6.9

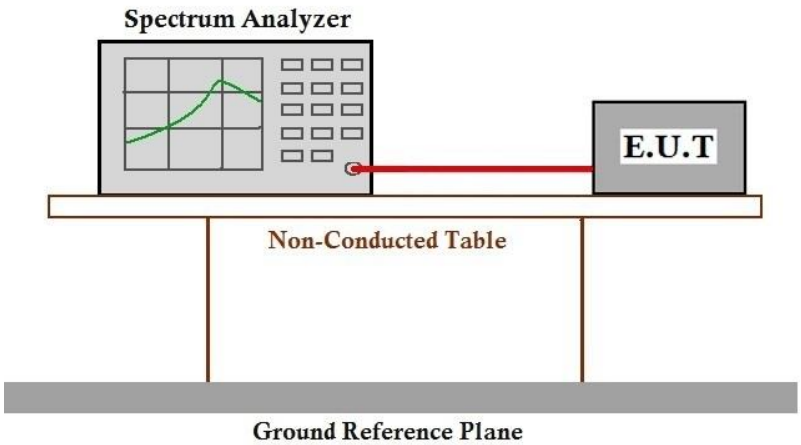
### 7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 24.7 °C Humidity: 56.4 % RH Atmospheric Pressure: 1005 mbar

### 7.1.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 00 | TX mode_Keep the EUT in transmitting with modulation mode. |

### 7.1.3 Test Setup Diagram




### 7.1.4 Measurement Procedure and Data

| Test channel | 20dB bandwidth (MHz) | Results |
|---|---|---|
| Lowest | 1.206 | Pass |
| Middle | 1.210 | Pass |
| Highest | 1.207 | Pass |

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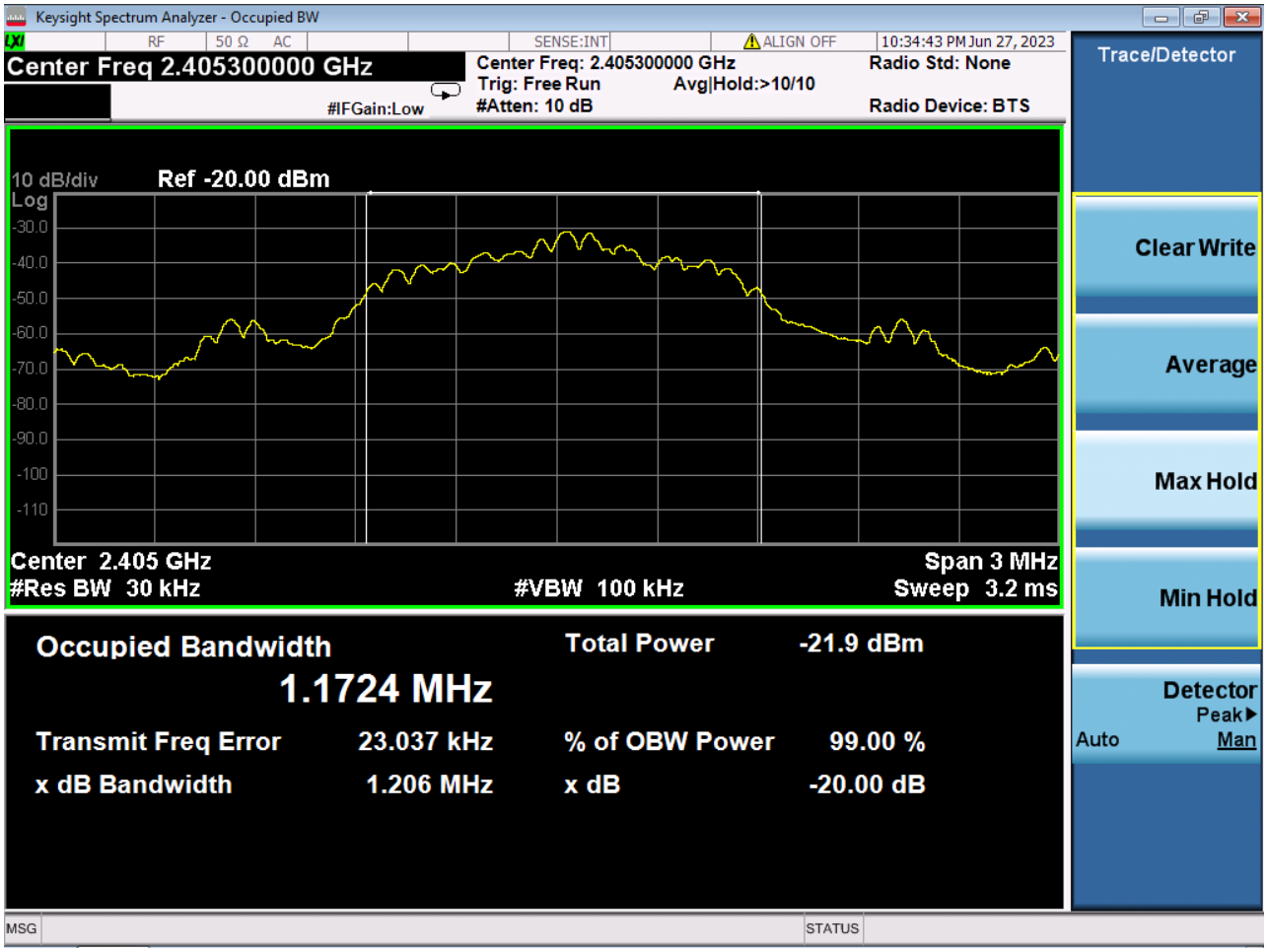


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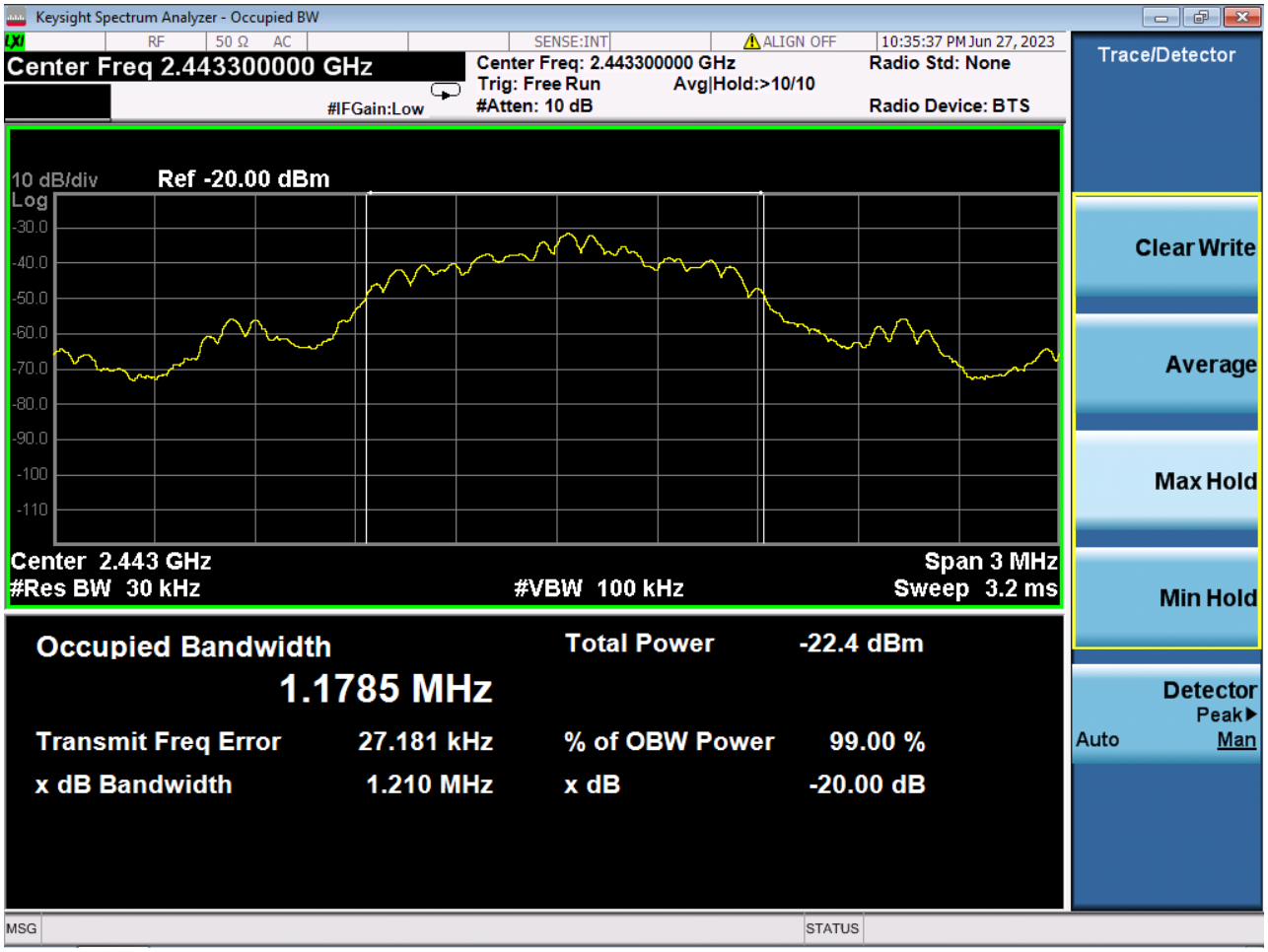


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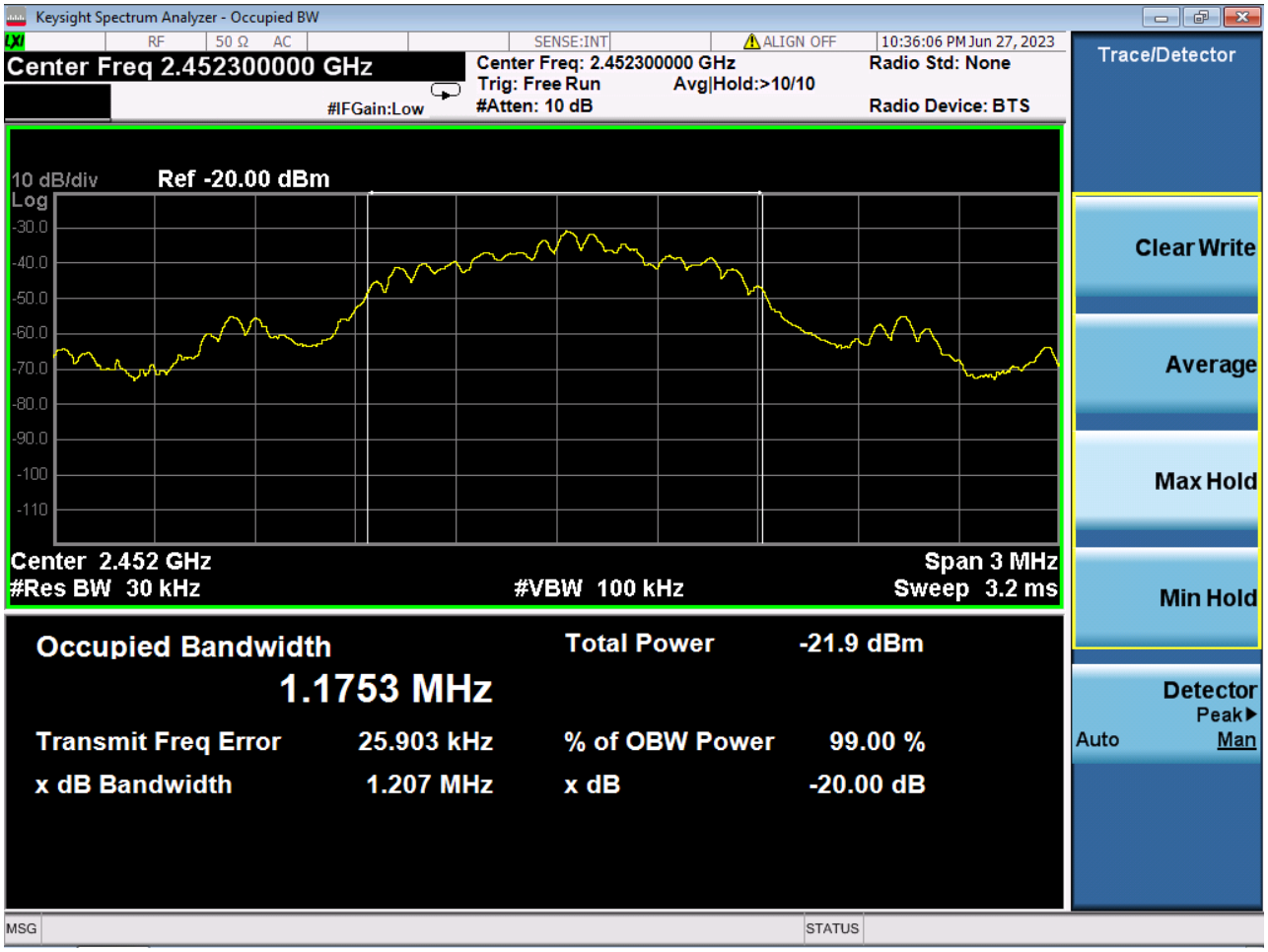


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## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)
Test Method: ANSI C63.10 (2013) Section 6.5&6.6
Measurement Distance: 3m

Limit:

| Fundamental frequency(MHz) | Field strength of fundamental(millivolts/meter) | Field strength of harmonics(microvolts/meter) |
|---|---|---|
| 902-928 | 50 | 500 |
| 2400-2483.5 | 50 | 500 |
| 5725-5875 | 50 | 500 |
| 24000-24250 | 250 | 2500 |
| Remark: The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.<br>For fundamental frequency in “902-928MHz”, the field strength of fundamental is based on Quasi-Peak. | | |

### 7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 23.6 °C Humidity: 60.9 % RH Atmospheric Pressure: 1005 mbar

### 7.2.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 00 | TX mode_Keep the EUT in transmitting with modulation mode. |

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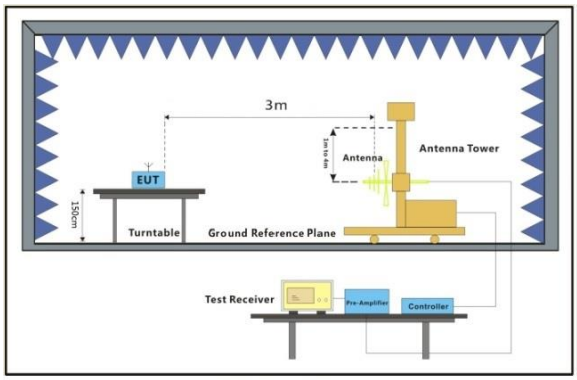
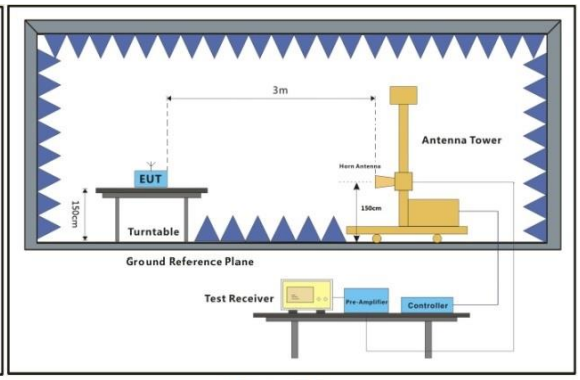
### 7.2.3 Test Setup Diagram




30MHz-1GHz




Above 1GHz

### 7.2.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c.The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h.Test the EUT in the lowest channel, the middle channel, the Highest channel.

i.The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j.Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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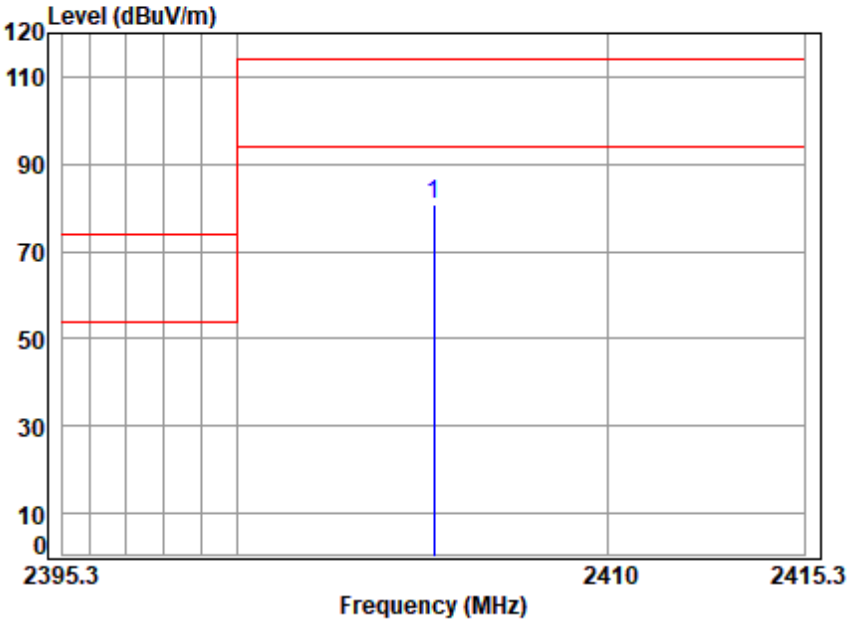
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2405.3 Field strength

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2405.300 | 4.18 | 28.91 | 35.64 | 83.37 | 80.82 | 114.00 | -33.18 | peak |

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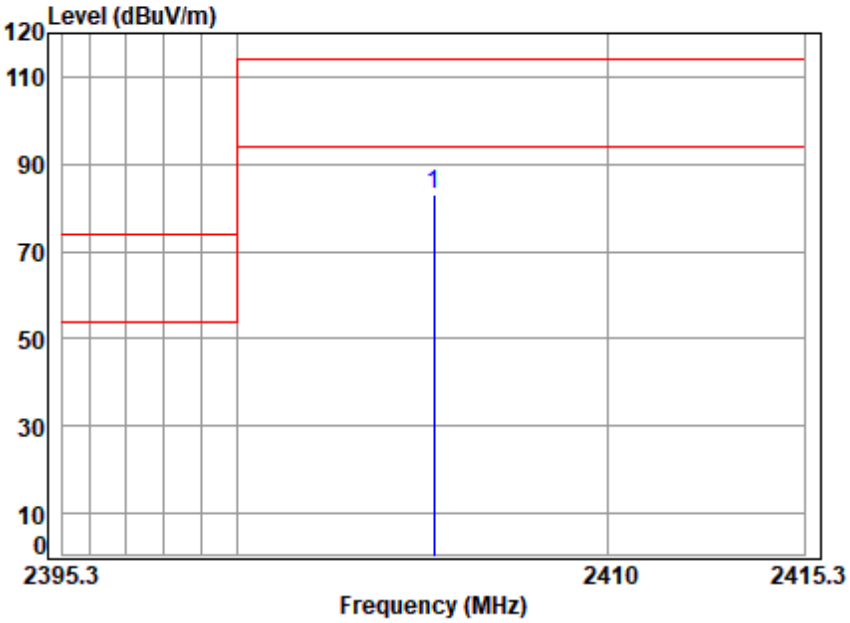
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2405.3 Field strength

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2405.300 | 4.18 | 28.91 | 35.64 | 85.69 | 83.14 | 114.00 | -30.86 | peak |

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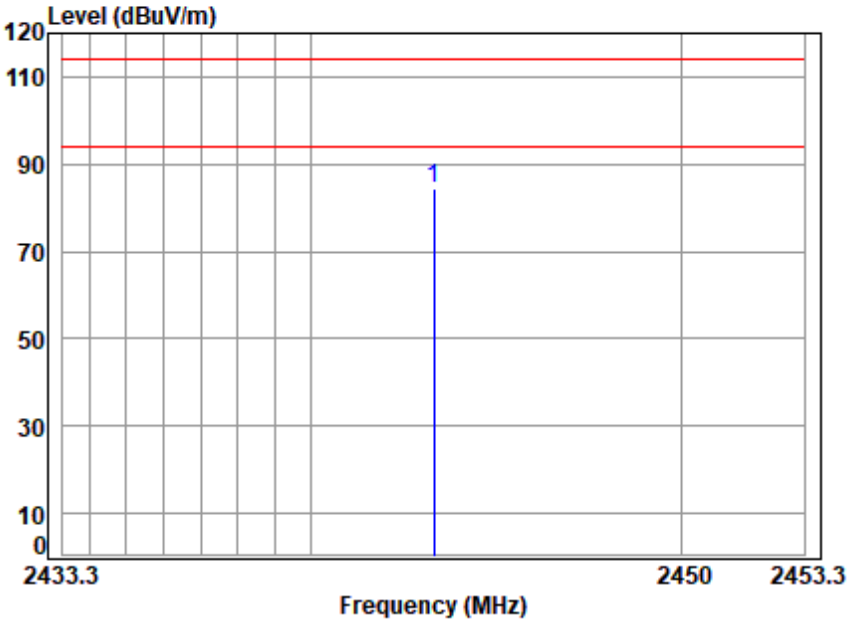
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2443.3 Field strength

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2443.300 | 4.22 | 28.99 | 35.62 | 86.62 | 84.21 | 114.00 | -29.79 | peak |

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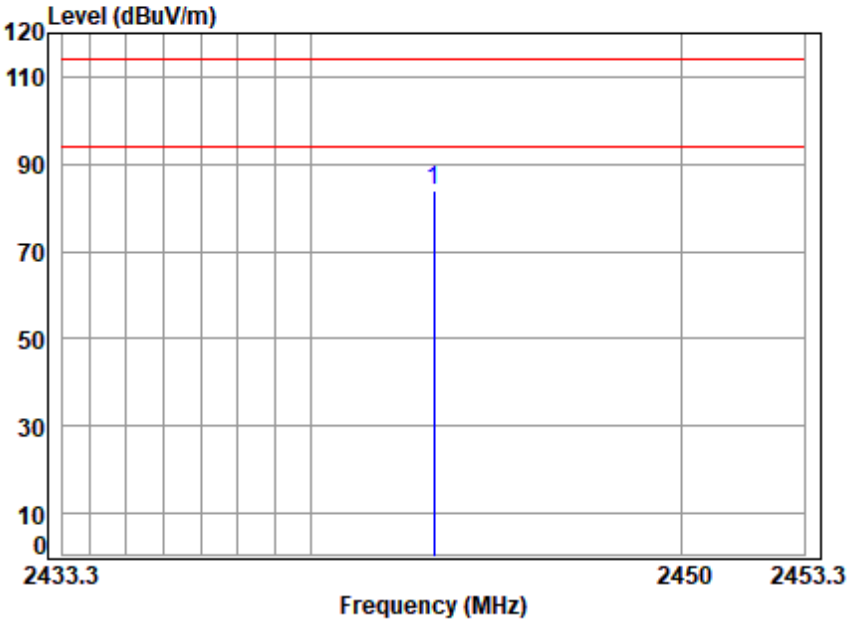
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2443.3 Field strength

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2443.300 | 4.22 | 28.99 | 35.62 | 86.53 | 84.12 | 114.00 | -29.88 | peak |

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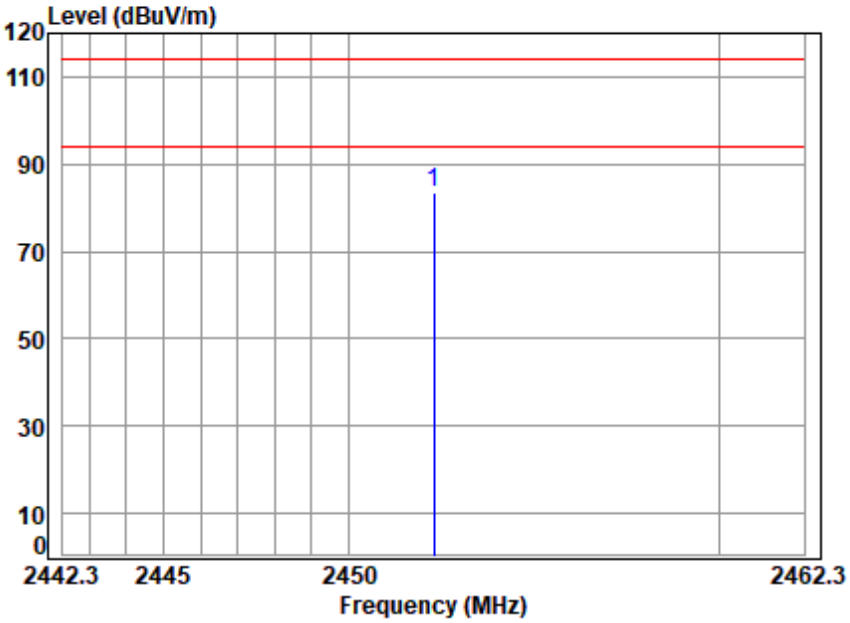
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2452.3 Field strength

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2452.300 | 4.23 | 29.01 | 35.62 | 85.92 | 83.54 | 114.00 | -30.46 | peak |

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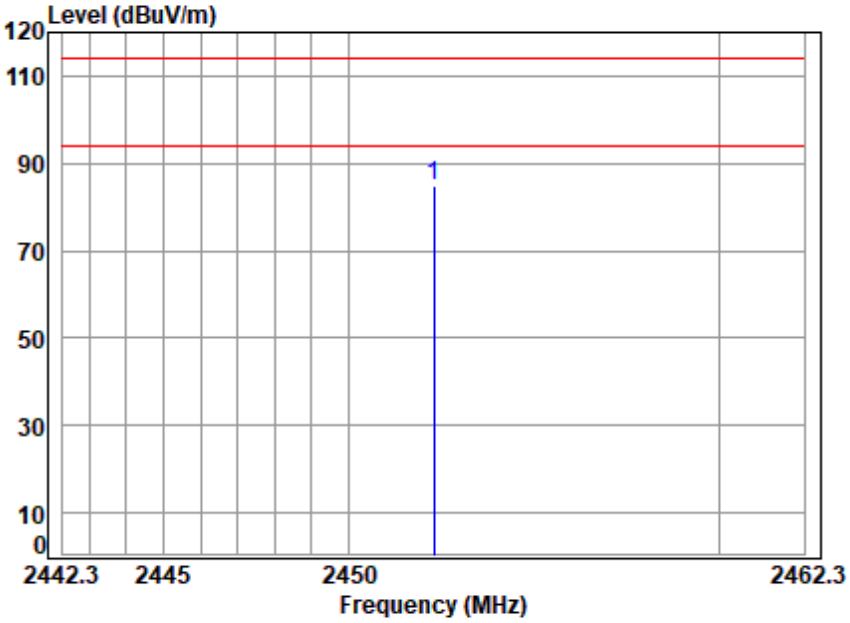
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High




```
Site      : chamber
Condition: 3m VERTICAL
Job No    : 01911AT
Mode      : 2452.3 Field strength
```

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 q | 2452.300 | 4.23 | 29.01 | 35.62 | 87.45 | 85.07 | 114.00 | -28.93 | peak |

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2） The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the above measurement data were shown in the report

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## 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m

Limit:

| Frequency | Limit (dBuV/m @3m) | Remark |
|---|---|---|
| 30MHz-88MHz | 40.0 | Quasi-peak Value |
| 88MHz-216MHz | 43.5 | Quasi-peak Value |
| 216MHz-960MHz | 46.0 | Quasi-peak Value |
| 960MHz-1GHz | 54.0 | Quasi-peak Value |
| Above 1GHz | 54.0 | Average Value |
| Above 1GHz | 74.0 | Peak Value |
| Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209,whichever is the lesser attenuation. | | |

### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 60.7 % RH Atmospheric Pressure: 1005 mbar

### 7.3.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 00 | TX mode_Keep the EUT in transmitting with modulation mode. |

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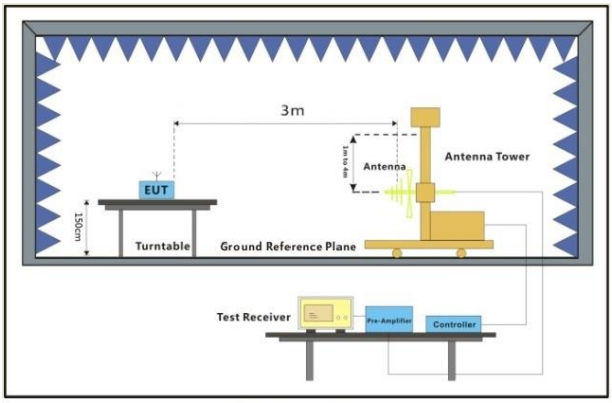
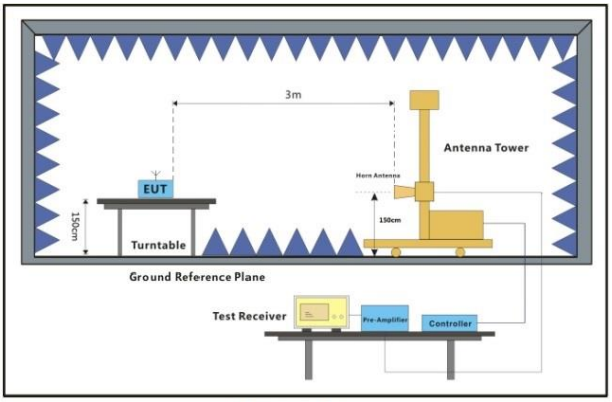
### 7.3.3 Test Setup Diagram




30MHz-1GHz




Above 1GHz

### 7.3.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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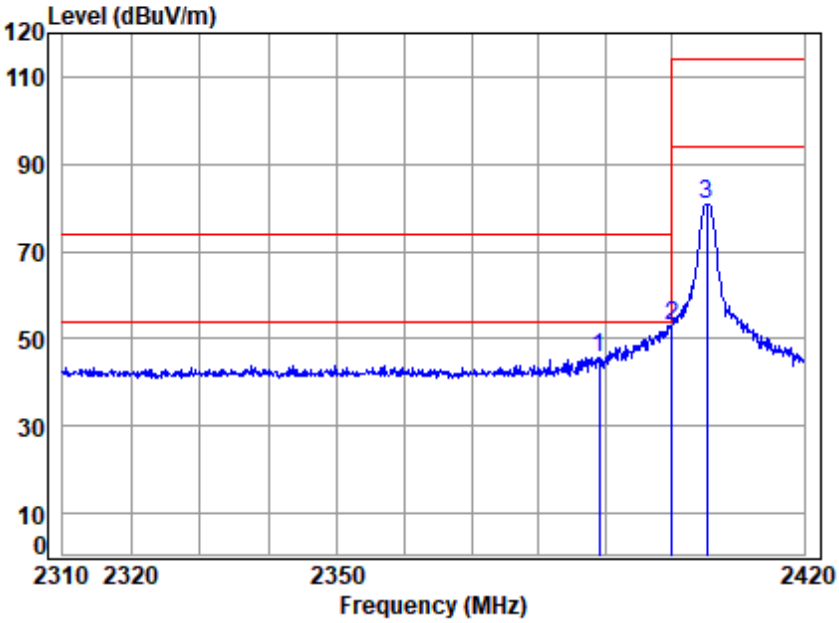
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2405.3 Band edge

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2389.127 | 4.16 | 28.88 | 35.64 | 48.45 | 45.85 | 74.00 | -28.15 | Peak |
| 2 q | 2400.000 | 4.18 | 28.90 | 35.64 | 55.72 | 53.16 | 74.00 | -20.84 | peak |
| 3 | 2405.300 | 4.18 | 28.91 | 35.64 | 83.41 | 80.86 | 114.00 | -33.14 | peak |

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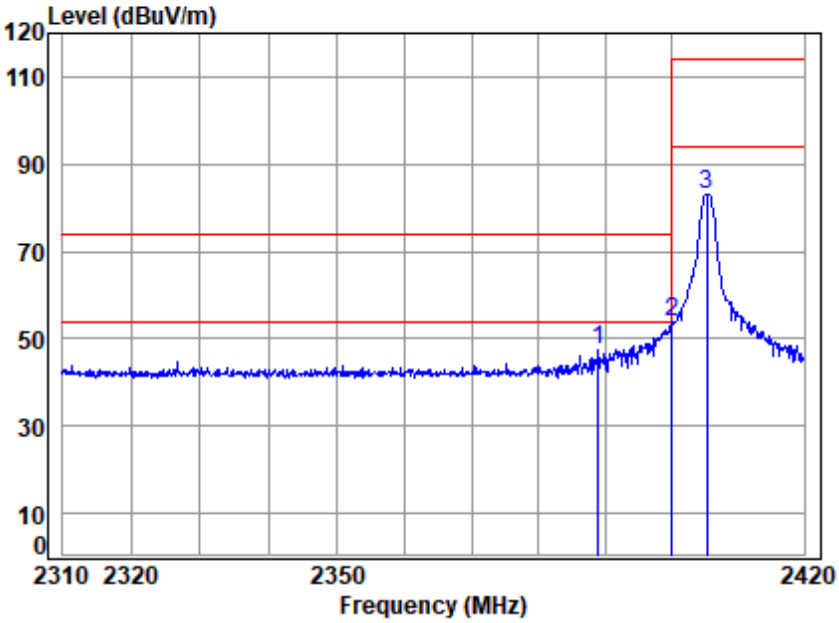
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2405.3 Band edge

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2388.905 | 4.16 | 28.88 | 35.64 | 49.90 | 47.30 | 74.00 | -26.70 | Peak |
| 2 q | 2400.000 | 4.18 | 28.90 | 35.64 | 56.18 | 53.62 | 74.00 | -20.38 | peak |
| 3 | 2405.300 | 4.18 | 28.91 | 35.64 | 85.70 | 83.15 | 114.00 | -30.85 | peak |

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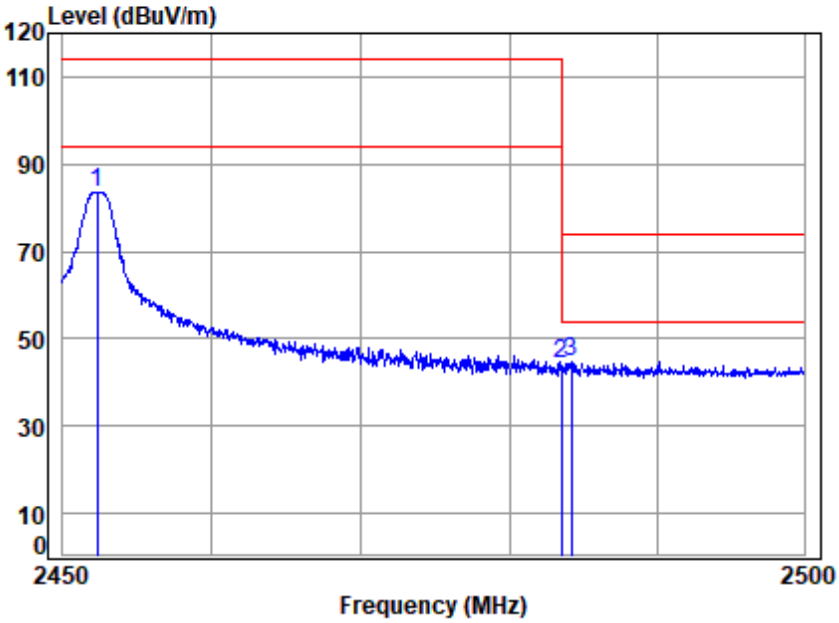
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2452.3 Band edge

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2452.300 | 4.23 | 29.01 | 35.62 | 85.96 | 83.58 | 114.00 | -30.42 | Peak |
| 2 | 2483.500 | 4.27 | 29.07 | 35.61 | 46.59 | 44.32 | 74.00 | -29.68 | peak |
| 3 q | 2484.191 | 4.27 | 29.07 | 35.61 | 46.84 | 44.57 | 74.00 | -29.43 | Peak |

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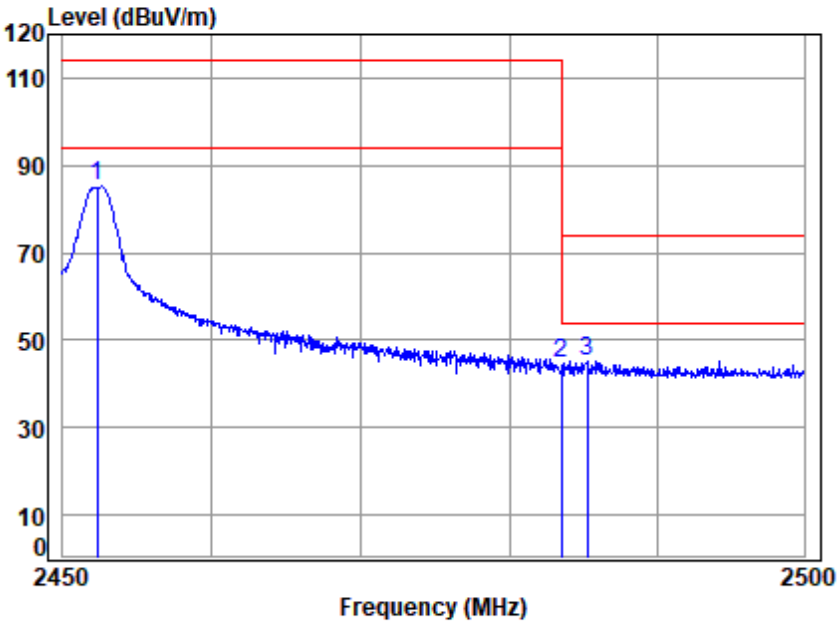
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2452.3 Band edge

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2452.300 | 4.23 | 29.01 | 35.62 | 87.50 | 85.12 | 114.00 | -28.88 | Peak |
| 2 | 2483.500 | 4.27 | 29.07 | 35.61 | 47.04 | 44.77 | 74.00 | -29.23 | peak |
| 3 q | 2485.245 | 4.27 | 29.07 | 35.61 | 47.66 | 45.39 | 74.00 | -28.61 | Peak |

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2） The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the above measurement data were shown in the report.

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## 7.4 Radiated Emissions Below 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| 960-1000 | 500 | 3 |

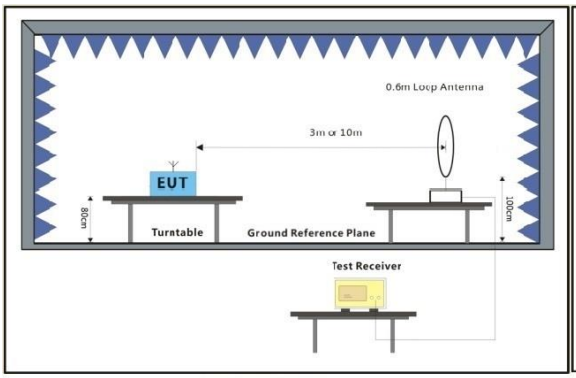
### 7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 23.5 °C Humidity: 52.6 % RH Atmospheric Pressure: 1005 mbar

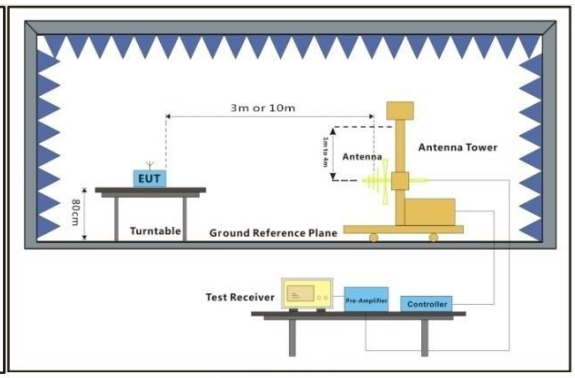
### 7.4.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 00 | TX mode_Keep the EUT in transmitting with modulation mode. |

### 7.4.3 Test Setup Diagram




Below 30MHz




30MHz-1GHz

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### 7.4.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

3) Scan from 9kHz to 1 GHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

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Inspection & Testing Services
SGS-CSTC Standards Technical Services Co.,Ltd. Shenzhen Branch Testing Center LLC Laboratory.

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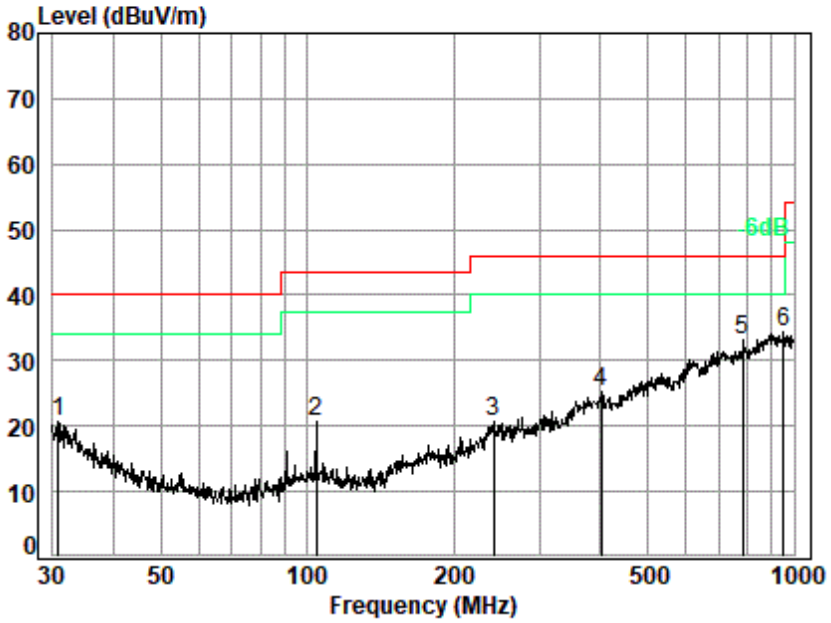
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low




Site : chamber
Condition: 3m HORIZONTAL
Job No. : 01911AT
Test Mode: 00

| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 30.85 | 20.93 | 0.63 | 27.23 | 26.32 | 20.65 | 40.00 | -19.35 | QP |
| 2 | 104.17 | 12.96 | 1.16 | 26.98 | 33.49 | 20.63 | 43.50 | -22.87 | QP |
| 3 | 241.68 | 17.85 | 1.87 | 26.43 | 27.28 | 20.57 | 46.00 | -25.43 | QP |
| 4 | 401.84 | 21.54 | 2.49 | 26.51 | 27.68 | 25.20 | 46.00 | -20.80 | QP |
| 5 | 785.09 | 26.90 | 3.63 | 26.36 | 29.12 | 33.29 | 46.00 | -12.71 | QP |
| 6 | 952.09 | 28.67 | 4.15 | 25.69 | 27.32 | 34.45 | 46.00 | -11.55 | QP |

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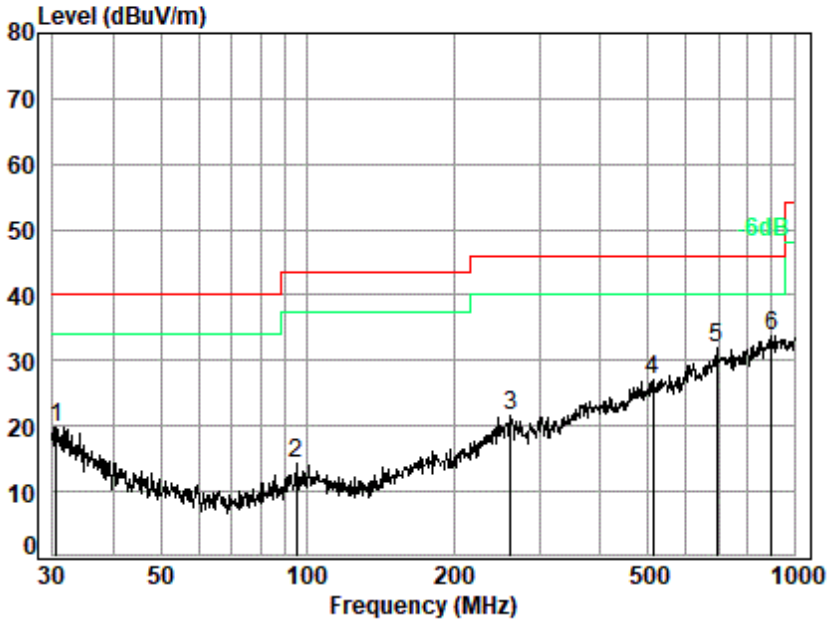
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low




Site : chamber
Condition: 3m VERTICAL
Job No. : 01911AT
Test Mode: 00

| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 30.53 | 21.13 | 0.63 | 27.23 | 25.36 | 19.89 | 40.00 | -20.11 | QP |
| 2 | 95.09 | 12.73 | 1.12 | 27.02 | 27.32 | 14.15 | 43.50 | -29.35 | QP |
| 3 | 261.98 | 17.86 | 1.96 | 26.35 | 28.02 | 21.49 | 46.00 | -24.51 | QP |
| 4 | 513.63 | 23.73 | 2.85 | 26.84 | 27.20 | 26.94 | 46.00 | -19.06 | QP |
| 5 | 694.42 | 26.36 | 3.41 | 26.72 | 28.98 | 32.03 | 46.00 | -13.97 | QP |
| 6 | 897.00 | 28.85 | 4.02 | 25.91 | 26.89 | 33.85 | 46.00 | -12.15 | QP |

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## 7.5 Radiated Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)
Test Method: ANSI C63.10 (2013) Section 6.6
Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength(microvolts/meter) | Measurement distance(meters) |
|---|---|---|
| Above 1000 | 500 | 3 |

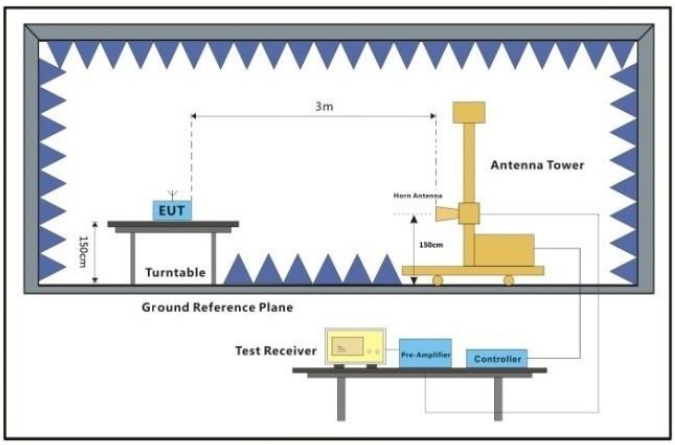
### 7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 23.4 °C Humidity: 60.6 % RH Atmospheric Pressure: 1005 mbar

### 7.5.2 Test Mode Description

| Pre-scan / Final test | Mode Code | Description |
|---|---|---|
| Final test | 00 | TX mode_Keep the EUT in transmitting with modulation mode. |

### 7.5.3 Test Setup Diagram




Above 1GHz

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### 7.5.4 Measurement Procedure and Data

a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middle channel, the Highest channel.

h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

i. Repeat above procedures until all frequencies measured was complete.

Remark:

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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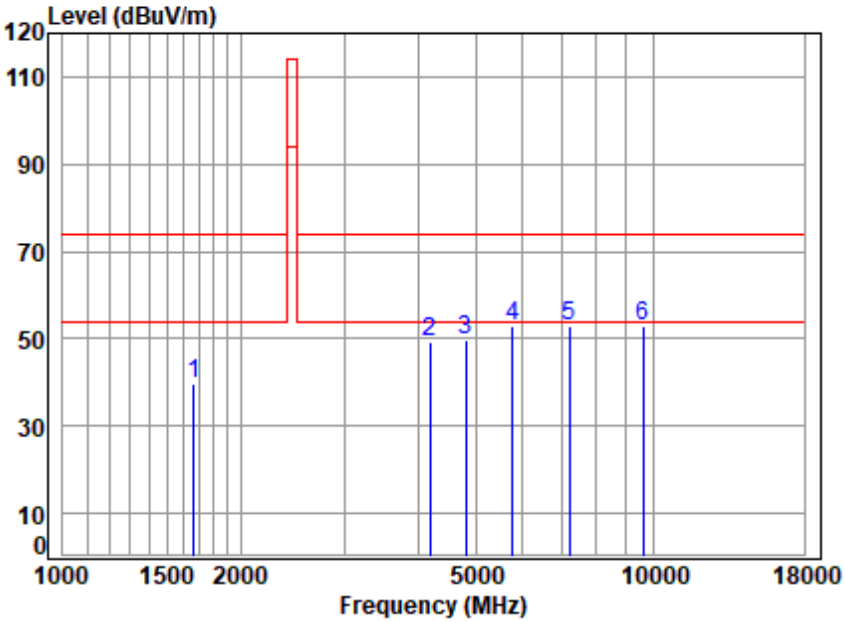
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2405.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1667.951 | 3.29 | 26.55 | 36.47 | 46.47 | 39.84 | 74.00 | -34.16 | peak |
| 2 | 4181.768 | 6.54 | 32.75 | 34.46 | 44.23 | 49.06 | 74.00 | -24.94 | peak |
| 3 | 4810.600 | 6.99 | 33.63 | 34.87 | 43.98 | 49.73 | 74.00 | -24.27 | peak |
| 4 | 5780.300 | 7.95 | 34.43 | 35.03 | 45.57 | 52.92 | 74.00 | -21.08 | peak |
| 5 | 7215.900 | 8.57 | 35.68 | 35.95 | 44.74 | 53.04 | 74.00 | -20.96 | peak |
| 6 q | 9621.200 | 10.47 | 37.35 | 35.55 | 40.87 | 53.14 | 74.00 | -20.86 | peak |

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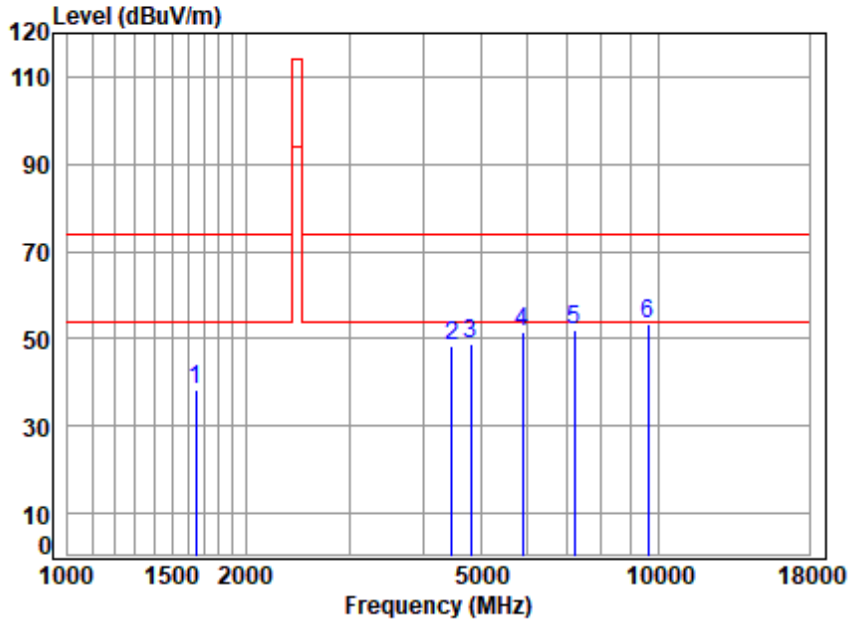
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2405.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1648.778 | 3.27 | 26.46 | 36.52 | 45.21 | 38.42 | 74.00 | -35.58 | peak |
| 2 | 4469.214 | 6.74 | 32.98 | 34.65 | 43.39 | 48.46 | 74.00 | -25.54 | peak |
| 3 | 4810.300 | 6.99 | 33.63 | 34.87 | 42.91 | 48.66 | 74.00 | -25.34 | peak |
| 4 | 5898.442 | 8.08 | 34.52 | 35.03 | 44.21 | 51.78 | 74.00 | -22.22 | peak |
| 5 | 7215.600 | 8.56 | 35.68 | 35.95 | 43.87 | 52.16 | 74.00 | -21.84 | peak |
| 6 q | 9621.200 | 10.47 | 37.35 | 35.55 | 41.17 | 53.44 | 74.00 | -20.56 | peak |

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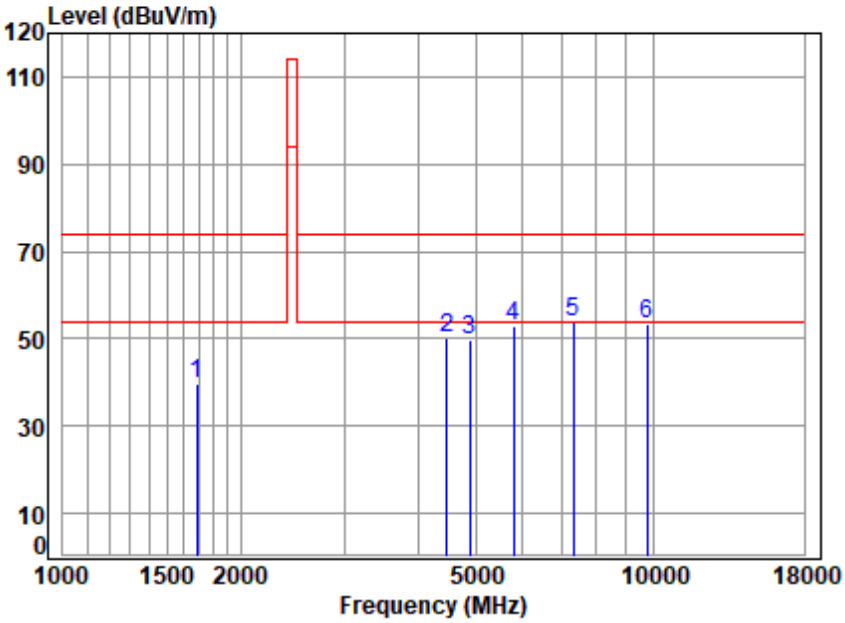
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2443.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1687.347 | 3.32 | 26.64 | 36.43 | 46.01 | 39.54 | 74.00 | -34.46 | peak |
| 2 | 4469.214 | 6.74 | 32.98 | 34.65 | 44.97 | 50.04 | 74.00 | -23.96 | peak |
| 3 | 4886.600 | 7.04 | 33.78 | 34.91 | 43.80 | 49.71 | 74.00 | -24.29 | peak |
| 4 | 5797.032 | 7.97 | 34.44 | 35.03 | 45.68 | 53.06 | 74.00 | -20.94 | peak |
| 5 q | 7329.900 | 8.67 | 35.77 | 35.97 | 45.28 | 53.75 | 74.00 | -20.25 | peak |
| 6 | 9773.200 | 10.52 | 37.41 | 35.56 | 40.82 | 53.19 | 74.00 | -20.81 | peak |

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No.1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn
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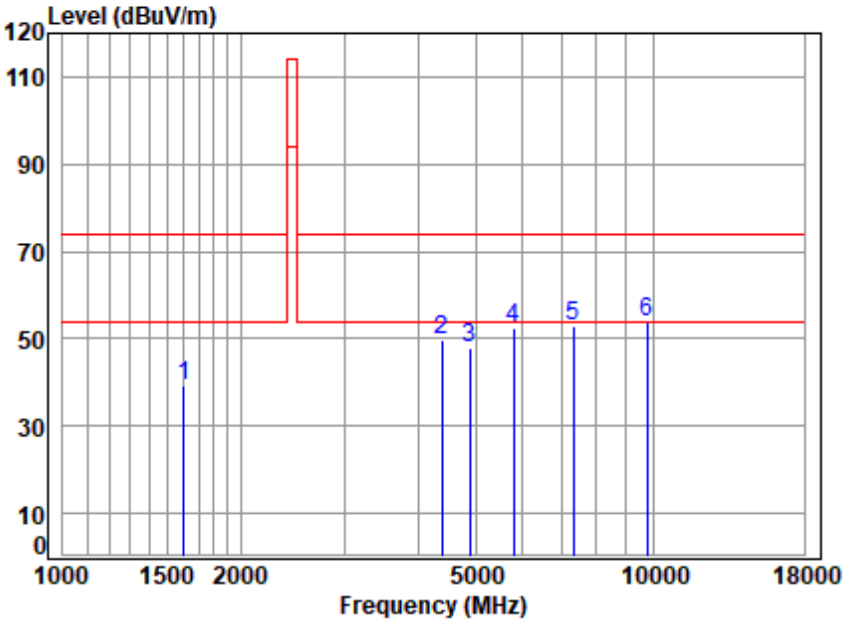
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2443.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1601.804 | 3.20 | 26.22 | 36.63 | 46.48 | 39.27 | 74.00 | -34.73 | peak |
| 2 | 4392.376 | 6.69 | 32.92 | 34.60 | 44.56 | 49.57 | 74.00 | -24.43 | peak |
| 3 | 4886.600 | 7.04 | 33.78 | 34.91 | 41.96 | 47.87 | 74.00 | -26.13 | peak |
| 4 | 5797.032 | 7.97 | 34.44 | 35.03 | 44.87 | 52.25 | 74.00 | -21.75 | peak |
| 5 | 7329.900 | 8.67 | 35.77 | 35.97 | 44.30 | 52.77 | 74.00 | -21.23 | peak |
| 6 q | 9773.200 | 10.52 | 37.41 | 35.56 | 41.42 | 53.79 | 74.00 | -20.21 | peak |

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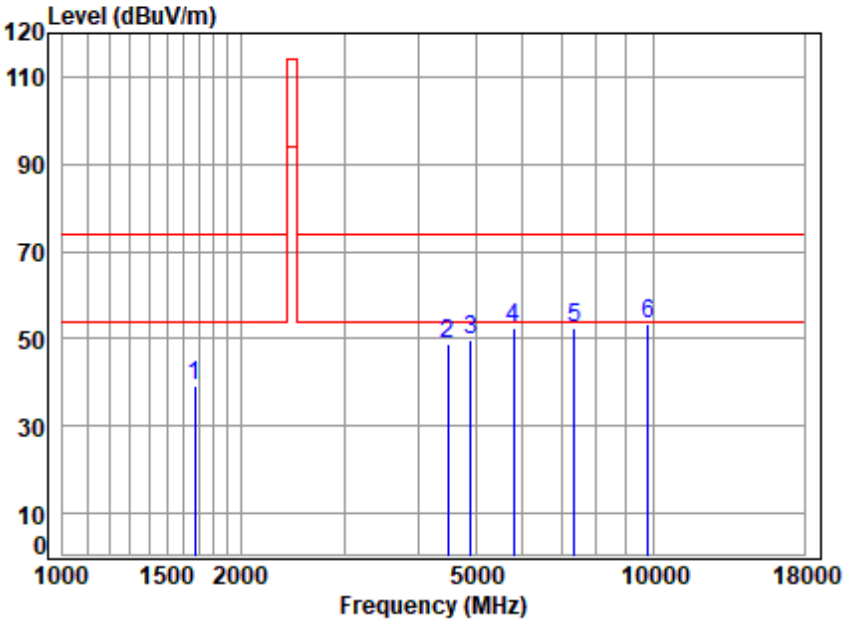
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High




Site : chamber
Condition: 3m HORIZONTAL
Job No : 01911AT
Mode : 2452.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1672.779 | 3.30 | 26.57 | 36.46 | 45.95 | 39.36 | 74.00 | -34.64 | peak |
| 2 | 4495.125 | 6.76 | 33.00 | 34.67 | 43.74 | 48.83 | 74.00 | -25.17 | peak |
| 3 | 4904.600 | 7.05 | 33.82 | 34.92 | 43.60 | 49.55 | 74.00 | -24.45 | peak |
| 4 | 5797.032 | 7.97 | 34.44 | 35.03 | 44.98 | 52.36 | 74.00 | -21.64 | peak |
| 5 | 7356.900 | 8.70 | 35.79 | 35.98 | 44.09 | 52.60 | 74.00 | -21.40 | peak |
| 6 q | 9809.200 | 10.53 | 37.42 | 35.57 | 40.79 | 53.17 | 74.00 | -20.83 | peak |

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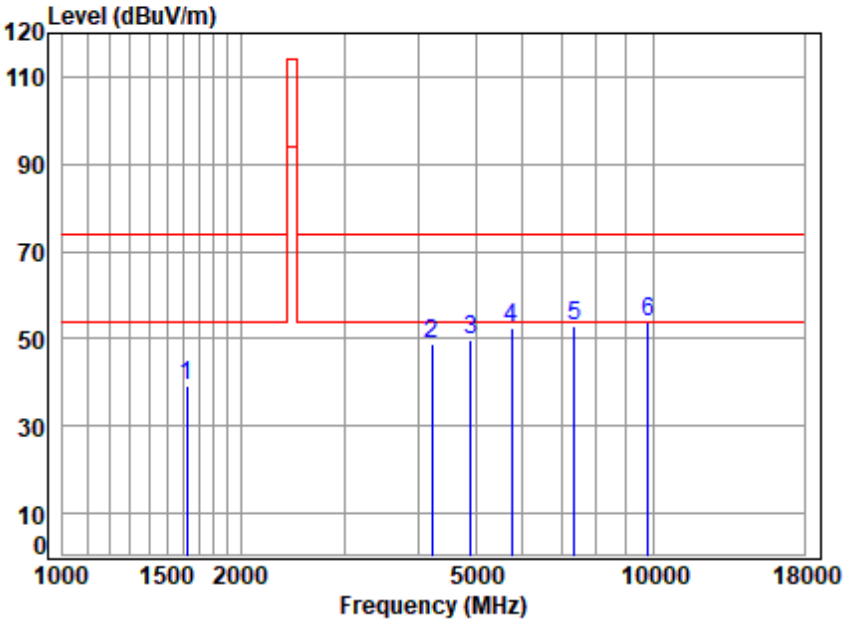
Member of the SGS Group (SGS SA)

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High




Site : chamber
Condition: 3m VERTICAL
Job No : 01911AT
Mode : 2452.3 TX RSE

| | Freq | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 1625.121 | 3.23 | 26.34 | 36.57 | 46.10 | 39.10 | 74.00 | -34.90 | peak |
| 2 | 4218.186 | 6.56 | 32.78 | 34.48 | 44.11 | 48.97 | 74.00 | -25.03 | peak |
| 3 | 4904.600 | 7.05 | 33.82 | 34.92 | 43.97 | 49.92 | 74.00 | -24.08 | peak |
| 4 | 5763.617 | 7.94 | 34.42 | 35.03 | 45.16 | 52.49 | 74.00 | -21.51 | peak |
| 5 | 7356.900 | 8.70 | 35.79 | 35.98 | 44.35 | 52.86 | 74.00 | -21.14 | peak |
| 6 q | 9809.200 | 10.53 | 37.42 | 35.57 | 41.30 | 53.68 | 74.00 | -20.32 | peak |

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# 8 Test Setup Photo

Refer to Setup Photo for SZCR2306001911AT

# 9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2306001911AT

- End of the Report -

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