



## TEST REPORT

**Application No.:** GZEM2011016810CR  
**Applicant:** Guilin Gemred Sensor Technology Co., Ltd  
**Address of Applicant:** No. D-08, Information Industrial Park, Chaoyang Road Qixing District, Guilin City, Guangxi Zhuang Autonomous Region  
**Manufacturer:** The same as applicant  
**Address of Manufacturer:** The same as applicant  
**Factory:** The same as applicant  
**Address of Factory:** The same as applicant  
**Equipment Under Test (EUT):**  
**FCC ID: 2AGE384103**  
**EUT Name:** Digital Body Tape Measure  
**Model No.:** 84103  
**Trade Mark:** Gemred  
**Standard(s):** 47 CFR Part 15, Subpart C 15.247  
**Date of Receipt:** 2020-11-26  
**Date of Test:** 2020-12-14 to 2020-12-15  
**Date of Issue:** 2021-01-27

|                     |              |
|---------------------|--------------|
| <b>Test Result:</b> | <b>Pass*</b> |
|---------------------|--------------|

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

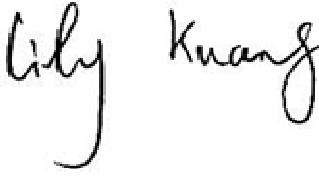
Kobe Jian

EMC Laboratory Manager



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| Revision Record |         |            |          |          |
|-----------------|---------|------------|----------|----------|
| Version         | Chapter | Date       | Modifier | Remark   |
| 01              |         | 2021-01-27 |          | Original |
|                 |         |            |          |          |
|                 |         |            |          |          |
|                 |         |            |          |          |

|                                 |                                                                                                                     |                                  |  |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------------|--|
| <b>Authorized for issue by:</b> |                                                                                                                     |                                  |  |
| <b>Tested By</b>                | <br>Lily_Kuang /Project Engineer | 2020-12-14 to 2020-12-15<br>Date |  |
| <b>Checked By</b>               | <br>Ricky_Liu/Reviewer           | 2021-01-27<br>Date               |  |



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## 2 Test Summary

| Radio Spectrum Technical Requirement |                                  |        |                                              |        |
|--------------------------------------|----------------------------------|--------|----------------------------------------------|--------|
| Item                                 | Standard                         | Method | Requirement                                  | Result |
| Antenna Requirement                  | 47 CFR Part 15, Subpart C 15.247 | N/A    | 47 CFR Part 15, Subpart C 15.203 & 15.247(c) | Pass   |

| Radio Spectrum Matter Part                            |                                  |                                        |                                           |        |
|-------------------------------------------------------|----------------------------------|----------------------------------------|-------------------------------------------|--------|
| Item                                                  | Standard                         | Method                                 | Requirement                               | Result |
| Minimum 6dB Bandwidth                                 | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.8.1      | 47 CFR Part 15, Subpart C 15.247a(2)      | Pass   |
| Conducted Peak Output Power                           | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.9.1      | 47 CFR Part 15, Subpart C 15.247(b)(3)    | Pass   |
| Power Spectrum Density                                | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.10.2     | 47 CFR Part 15, Subpart C 15.247(e)       | Pass   |
| Conducted Band Edges Measurement                      | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.13.3.2   | 47 CFR Part 15, Subpart C 15.247(d)       | Pass   |
| Conducted Spurious Emissions                          | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.11       | 47 CFR Part 15, Subpart C 15.247(d)       | Pass   |
| Radiated Emissions which fall in the restricted bands | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.10.5      | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass   |
| Radiated Spurious Emissions                           | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.4,6.5,6.6 | 47 CFR Part 15, Subpart C 15.205 & 15.209 | Pass   |



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## 4 General Information

### 4.1 Details of E.U.T.

Power Supply: DC 3V  
 Test Voltage: DC 3V  
 Antenna Gain: 0dBi declared by applicant  
 Antenna Type: Integrated antenna  
 Channel Spacing: 2MHz  
 Modulation Type: GFSK  
 Number of Channels: 40  
 Operation Frequency: 2402MHz to 2480MHz  
 Hardware Version: GR4103 GNB  
 Firmware Version: V1.2  
 S/N: RP-20200601  
 Test Software Version: BT\_Tool V1.1  
 Function: Digital Body Tape Measure with BLE function  
 Power setting level: -2 dBm for BLE can not be changed by user  
 BT Version: BT5.0\_1M only

### 4.2 Description of Support Units

| Description   | Manufacturer | Model No. | Serial No.        |
|---------------|--------------|-----------|-------------------|
| Notebook      | IBM          | T30       | S/N78-3VMLX 06/01 |
| BT test board | SGS EMC      | RF 07     | RF 07             |

### 4.3 Measurement Uncertainty

| No. | Item                            | Measurement Uncertainty   |
|-----|---------------------------------|---------------------------|
| 1   | Radio Frequency                 | $\pm 5.5 \times 10^{-8}$  |
| 2   | Duty cycle                      | $\pm 0.57\%$              |
| 3   | Occupied Bandwidth              | $\pm 3\%$                 |
| 4   | RF Conducted power              | 0.68dB                    |
| 5   | RF Power Density                | 1.50dB                    |
| 6   | Conducted Spurious Emissions    | 1.04dB                    |
| 7   | RF Radiated Power               | 4.5dB (below 1GHz)        |
|     |                                 | 4.8dB (above 1GHz)        |
| 8   | Radiated Spurious Emission Test | 4.5dB (30MHz-1GHz)        |
|     |                                 | 4.8dB (1GHz-18GHz)        |
| 9   | Temperature                     | $\pm 0.4^{\circ}\text{C}$ |
| 10  | Humidity                        | $\pm 1.3\%$               |
| 11  | Supply Voltages                 | $\pm 1.5\%$               |
| 12  | Time                            | $\pm 3\%$                 |



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#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
 198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
 Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.



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## 4.5 Test Facility

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

### ● NVLAP (Lab Code: 200611-0)

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

### ● ACMA

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

### ● SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

### ● CNAS (Lab Code: L0167)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

### ● FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

### ● FCC Recognized Accredited Test Firm(Registration No.: 486818)

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

### ● Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

### ● VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-10449 and T-11179 respectively.

### ● CBTL (Lab Code: TL129)

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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**4.6 Deviation from Standards**

None

**4.7 Abnormalities from Standard Conditions**

None

**4.8 Duty cycle of the EUT**

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percent.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

1. Set span = Zero
2. RBW=8MHz
3. VBW=8MHz
4. Detector=Peak

| Mode | Channel(MHz) | Duty Cycle(%) | Correction Factor(dB)* |
|------|--------------|---------------|------------------------|
| BLE  | 2402         | 67.41         | 1.71                   |
|      | 2440         | 67.60         | 1.70                   |
|      | 2480         | 67.60         | 1.70                   |

\*Correction Factor(dB) =  $10 \log(1/\text{Duty Cycle})$

Please refer to appendix 15.247 for details.



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## 5 Equipment List

| Minimum 6dB Bandwidth  |                     |          |              |            |              |
|------------------------|---------------------|----------|--------------|------------|--------------|
| Equipment              | Manufacturer        | Model No | Inventory No | Cal Date   | Cal Due Date |
| EXA Signal Analyzer    | AgilentTechnologies | N9010A   | EMC2138      | 2020-09-17 | 2021-09-16   |
| 6dB Attenuator         | HP                  | 8491A    | EMC2062      | 2020-04-15 | 2022-04-14   |
| Test Software JS1120-3 | HangTianXing        | V2.6     | GZE100-69    | N/A        | N/A          |
| MI CABLE               | SGS-EMC             | 0.8M     | EMC2136      | 2019-11-02 | 2021-11-01   |

| Conducted Peak Output Power |                     |          |              |            |              |
|-----------------------------|---------------------|----------|--------------|------------|--------------|
| Equipment                   | Manufacturer        | Model No | Inventory No | Cal Date   | Cal Due Date |
| EXA Signal Analyzer         | AgilentTechnologies | N9010A   | EMC2138      | 2020-09-17 | 2021-09-16   |
| 6dB Attenuator              | HP                  | 8491A    | EMC2062      | 2020-04-15 | 2022-04-14   |
| Test Software JS1120-3      | HangTianXing        | V2.6     | GZE100-69    | N/A        | N/A          |
| MI CABLE                    | SGS-EMC             | 0.8M     | EMC2136      | 2019-11-02 | 2021-11-01   |

| Power Spectrum Density |                     |          |              |            |              |
|------------------------|---------------------|----------|--------------|------------|--------------|
| Equipment              | Manufacturer        | Model No | Inventory No | Cal Date   | Cal Due Date |
| EXA Signal Analyzer    | AgilentTechnologies | N9010A   | EMC2138      | 2020-09-17 | 2021-09-16   |
| 6dB Attenuator         | HP                  | 8491A    | EMC2062      | 2020-04-15 | 2022-04-14   |
| Test Software JS1120-3 | HangTianXing        | V2.6     | GZE100-69    | N/A        | N/A          |
| MI CABLE               | SGS-EMC             | 0.8M     | EMC2136      | 2019-11-02 | 2021-11-01   |

| Conducted Band Edges Measurement |                     |          |              |            |              |
|----------------------------------|---------------------|----------|--------------|------------|--------------|
| Equipment                        | Manufacturer        | Model No | Inventory No | Cal Date   | Cal Due Date |
| EXA Signal Analyzer              | AgilentTechnologies | N9010A   | EMC2138      | 2020-09-17 | 2021-09-16   |
| 6dB Attenuator                   | HP                  | 8491A    | EMC2062      | 2020-04-15 | 2022-04-14   |
| Test Software JS1120-3           | HangTianXing        | V2.6     | GZE100-69    | N/A        | N/A          |
| MI CABLE                         | SGS-EMC             | 0.8M     | EMC2136      | 2019-11-02 | 2021-11-01   |

| Conducted Spurious Emissions |                     |          |              |            |              |
|------------------------------|---------------------|----------|--------------|------------|--------------|
| Equipment                    | Manufacturer        | Model No | Inventory No | Cal Date   | Cal Due Date |
| EXA Signal Analyzer          | AgilentTechnologies | N9010A   | EMC2138      | 2020-09-17 | 2021-09-16   |
| 6dB Attenuator               | HP                  | 8491A    | EMC2062      | 2020-04-15 | 2022-04-14   |
| Test Software JS1120-3       | HangTianXing        | V2.6     | GZE100-69    | N/A        | N/A          |
| MI CABLE                     | SGS-EMC             | 0.8M     | EMC2136      | 2019-11-02 | 2021-11-01   |



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| Radiated Emissions which fall in the restricted bands |                             |               |              |            |              |
|-------------------------------------------------------|-----------------------------|---------------|--------------|------------|--------------|
| Equipment                                             | Manufacturer                | Model No      | Inventory No | Cal Date   | Cal Due Date |
| EMI Test Receiver                                     | Rohde & Schwarz             | ESIB26        | EMC0522      | 2020-01-10 | 2021-01-09   |
| EMI Test Receiver                                     | Rohde & Schwarz             | ESCI          | EMC0056      | 2020-01-10 | 2021-01-09   |
| Chamber cable                                         | HangTianXing                | N/A           | EMC0542      | 2019-06-28 | 2021-06-27   |
| Trilog Broadband Antenna 25MHz-1GHz                   | SCHWARZBECKME SS-ELEKTRONIK | VULB 9168     | EMC2174      | 2018-09-06 | 2021-09-05   |
| Bi-log Type Antenna                                   | Schaffner Chase             | CBL6143       | EMC0519      | 2020-06-08 | 2023-06-07   |
| Horn Antenna                                          | SCHWARZBECKME SS-ELEKTRONIK | BBHA 9120D    | EMC2016      | 2019-09-25 | 2022-09-24   |
| Horn Antenna 1GHz-18GHz                               | Rohde & Schwarz             | HF906         | EMC0518      | 2018-09-02 | 2021-09-01   |
| 1GHz-26.5 GHz Pre-Amplifier                           | Agilent                     | 8449B         | EMC0521      | 2020-01-10 | 2021-01-09   |
| Amplifier                                             | HP                          | 8447F         | EMC2065      | 2020-05-26 | 2021-05-25   |
| Pre-Amplifier MH648A                                  | ANRITSU CORP                | MH648A        | EMC2086      | 2020-11-13 | 2021-11-12   |
| Active Loop Antenna                                   | EMCO                        | 6502          | EMC0523      | 2018-03-05 | 2021-03-04   |
| High Pass Filter(915MHz)                              | FSY MICROWAVE               | HM1465-9SS    | EMC2079      | 2020-01-10 | 2021-01-09   |
| 2.4GHz Filter                                         | Micro-Tronics               | BRM 50702     | EMC2069      | 2020-01-10 | 2021-01-09   |
| 10m Semi-Anechoic Chamber                             | ETS                         | N/A           | EMC0530      | 2019-10-20 | 2022-10-19   |
| 966 Anechoic Chamber                                  | C.R.T                       | 9m x 6m x 6m  | EMC2142      | 2017-12-19 | 2020-12-18   |
| MXE EMI Receiver                                      | Keysight                    | N9038A        | EMC2139      | 2020-11-13 | 2021-11-12   |
| EXA Signal Analyzer                                   | Keysight                    | N9010A        | EMC2138      | 2020-09-17 | 2021-09-16   |
| Trilog Broadband Antenna 30MHz-1GHz                   | SCHWARZBECKME SS-ELEKTRONIK | VULB 9168     | SEM003-18    | 2019-02-22 | 2022-02-22   |
| Test Software E3                                      | Audix                       | Ver.6.120110a | GZE100-61    | N/A        | N/A          |



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| Radiated Spurious Emissions         |                             |               |              |            |              |
|-------------------------------------|-----------------------------|---------------|--------------|------------|--------------|
| Equipment                           | Manufacturer                | Model No      | Inventory No | Cal Date   | Cal Due Date |
| EMI Test Receiver                   | Rohde & Schwarz             | ESIB26        | EMC0522      | 2020-01-10 | 2021-01-09   |
| EMI Test Receiver                   | Rohde & Schwarz             | ESCI          | EMC0056      | 2020-01-10 | 2021-01-09   |
| Chamber cable                       | HangTianXing                | N/A           | EMC0542      | 2019-06-28 | 2021-06-27   |
| Trilog Broadband Antenna 25MHz-1GHz | SCHWARZBECKME SS-ELEKTRONIK | VULB 9168     | EMC2174      | 2018-09-06 | 2021-09-05   |
| Bi-log Type Antenna                 | Schaffner Chase             | CBL6143       | EMC0519      | 2020-06-08 | 2023-06-07   |
| Horn Antenna                        | SCHWARZBECKME SS-ELEKTRONIK | BBHA 9120D    | EMC2016      | 2019-09-25 | 2022-09-24   |
| Horn Antenna 1GHz-18GHz             | Rohde & Schwarz             | HF906         | EMC0518      | 2018-09-02 | 2021-09-01   |
| 1GHz-26.5 GHz Pre-Amplifier         | Agilent                     | 8449B         | EMC0521      | 2020-01-10 | 2021-01-09   |
| Amplifier                           | HP                          | 8447F         | EMC2065      | 2020-05-26 | 2021-05-25   |
| Pre-Amplifier MH648A                | ANRITSU CORP                | MH648A        | EMC2086      | 2020-11-13 | 2021-11-12   |
| Active Loop Antenna                 | EMCO                        | 6502          | EMC0523      | 2018-03-05 | 2021-03-04   |
| High Pass Filter(915MHz)            | FSY MICROWAVE               | HM1465-9SS    | EMC2079      | 2020-01-10 | 2021-01-09   |
| 2.4GHz Filter                       | Micro-Tronics               | BRM 50702     | EMC2069      | 2020-01-10 | 2021-01-09   |
| 10m Semi-Anechoic Chamber           | ETS                         | N/A           | EMC0530      | 2019-10-20 | 2022-10-19   |
| 966 Anechoic Chamber                | C.R.T                       | 9m x 6m x 6m  | EMC2142      | 2017-12-19 | 2020-12-18   |
| MXE EMI Receiver                    | Keysight                    | N9038A        | EMC2139      | 2020-11-13 | 2021-11-12   |
| EXA Signal Analyzer                 | Keysight                    | N9010A        | EMC2138      | 2020-09-17 | 2021-09-16   |
| Trilog Broadband Antenna 30MHz-1GHz | SCHWARZBECKME SS-ELEKTRONIK | VULB 9168     | SEM003-18    | 2019-02-22 | 2022-02-22   |
| Test Software E3                    | Audix                       | Ver.6.120110a | GZE100-61    | N/A        | N/A          |

| General used equipment |              |          |              |            |              |
|------------------------|--------------|----------|--------------|------------|--------------|
| Equipment              | Manufacturer | Model No | Inventory No | Cal Date   | Cal Due Date |
| DMM                    | Fluke        | 73       | EMC0006      | 2020-07-09 | 2021-07-08   |



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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 & 15.247(c)

#### 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi. Please refer to appendix A for details.



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## 7 Radio Spectrum Matter Test Results

### 7.1 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)  
 Test Method: ANSI C63.10 (2013) Section 11.8.1  
 Limit:  $\geq 500$  kHz

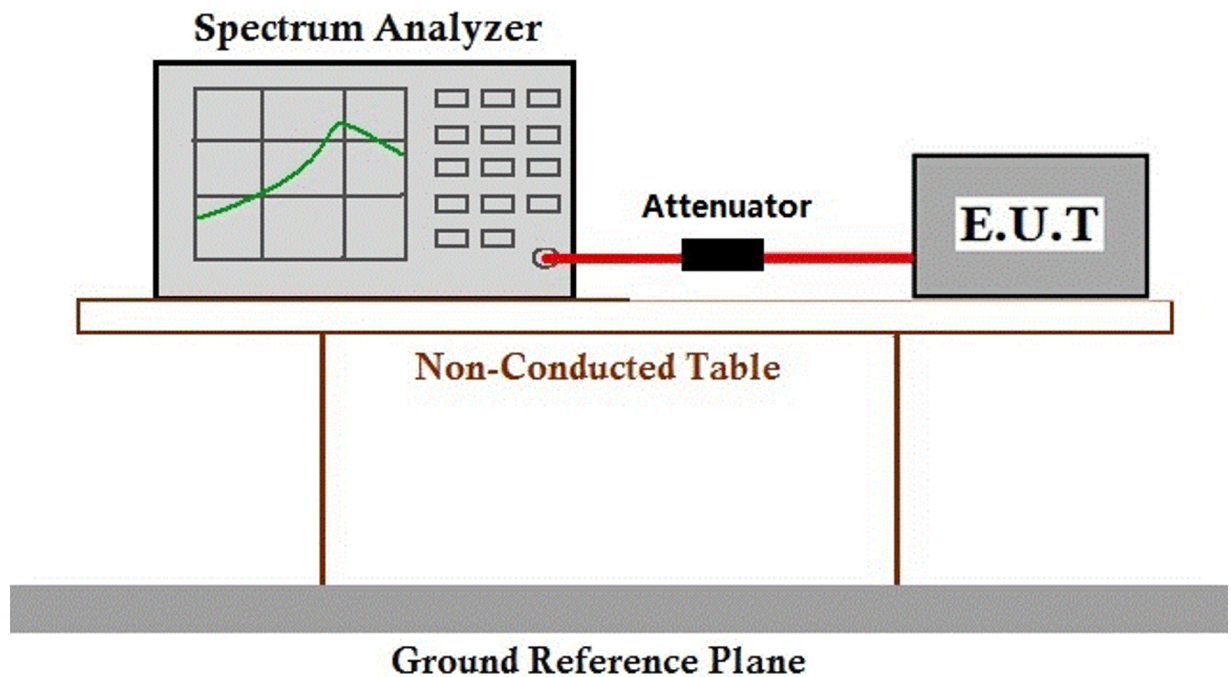
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 53.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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**7.2 Conducted Peak Output Power**

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

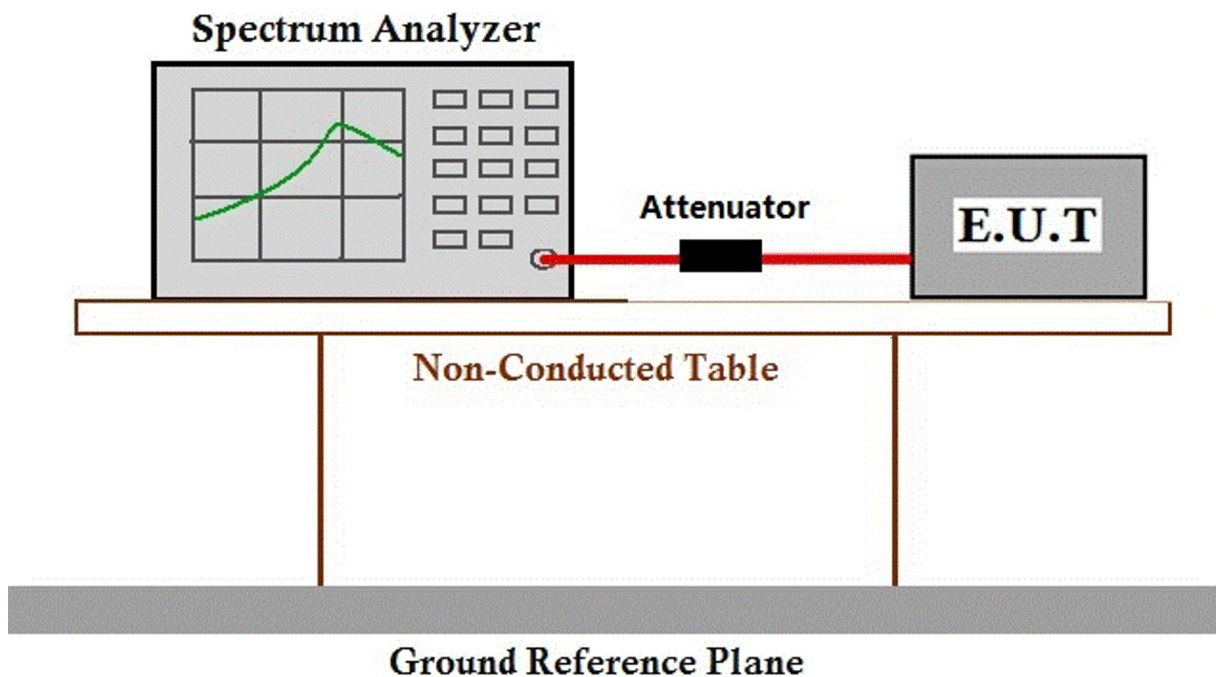
| Frequency range(MHz) | Output power of the intentional radiator(watt)         |
|----------------------|--------------------------------------------------------|
| 902-928              | 1 for $\geq 50$ hopping channels                       |
|                      | 0.25 for $25 \leq$ hopping channels $< 50$             |
|                      | 1 for digital modulation                               |
| 2400-2483.5          | 1 for $\geq 75$ non-overlapping hopping channels       |
|                      | 0.125 for all other frequency hopping systems          |
|                      | 1 for digital modulation                               |
| 5725-5850            | 1 for frequency hopping systems and digital modulation |

**7.2.1 E.U.T. Operation**

Operating Environment:

Temperature: 22.6 °C Humidity: 53.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

**7.2.2 Test Setup Diagram****7.2.3 Measurement Procedure and Data**

The detailed test data see: Appendix 15.247



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### 7.3 Power Spectrum Density

Test Requirement: 47 CFR Part 15, Subpart C 15.247(e)  
 Test Method: ANSI C63.10 (2013) Section 11.10.2  
 Limit:  $\leq 8\text{dBm}$  in any 3 kHz band during any time interval of continuous transmission

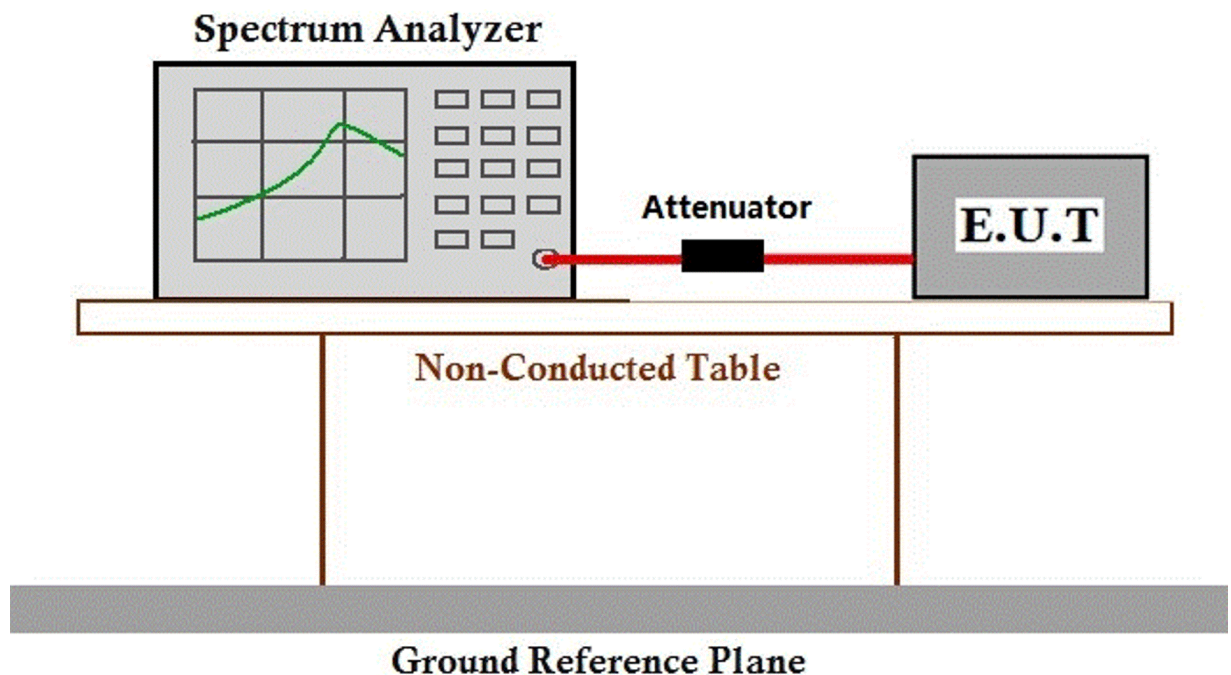
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 53.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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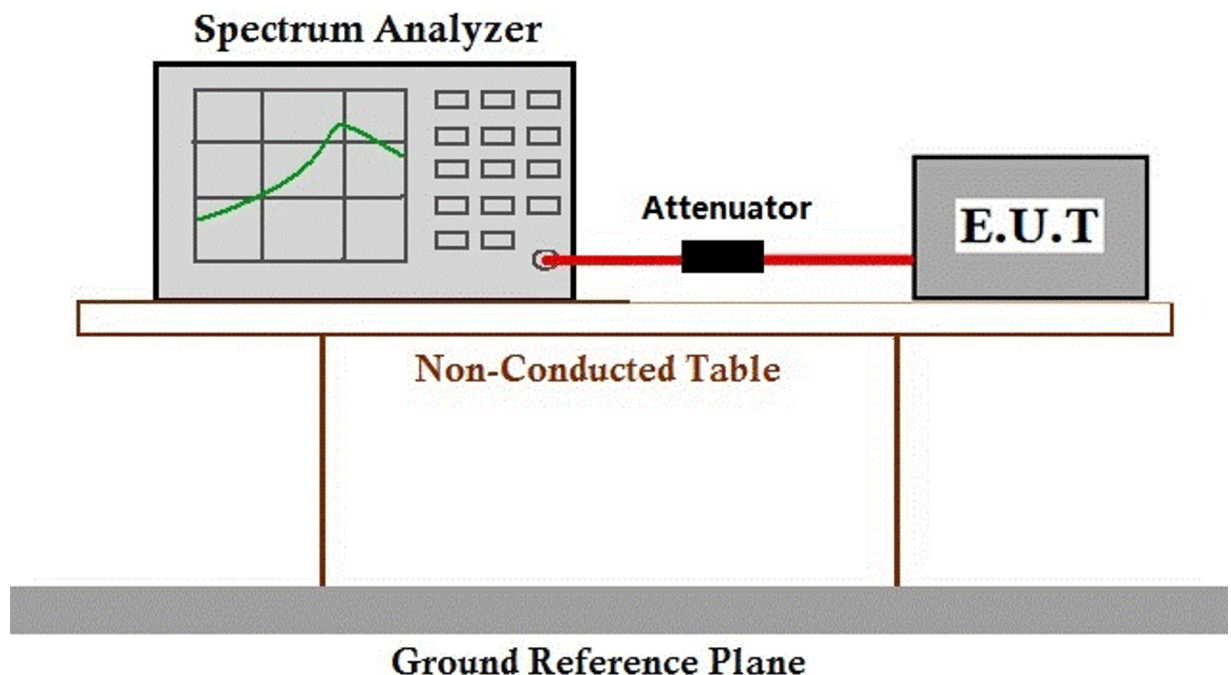
## 7.4 Conducted Band Edges Measurement

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement | 47 CFR Part 15, Subpart C 15.247(d)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Test Method:     | ANSI C63.10 (2013) Section 11.13.3.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Limit:           | 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)) |

### 7.4.1 E.U.T. Operation

|                        |                                                                                 |           |           |                       |           |
|------------------------|---------------------------------------------------------------------------------|-----------|-----------|-----------------------|-----------|
| Operating Environment: |                                                                                 |           |           |                       |           |
| Temperature:           | 22.6 °C                                                                         | Humidity: | 53.3 % RH | Atmospheric Pressure: | 1020 mbar |
| Test Mode:             | a: TX mode Keep the EUT in continuously transmitting mode with GFSK modulation. |           |           |                       |           |

### 7.4.2 Test Setup Diagram



### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



## 7.5 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.11

Limit: 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))

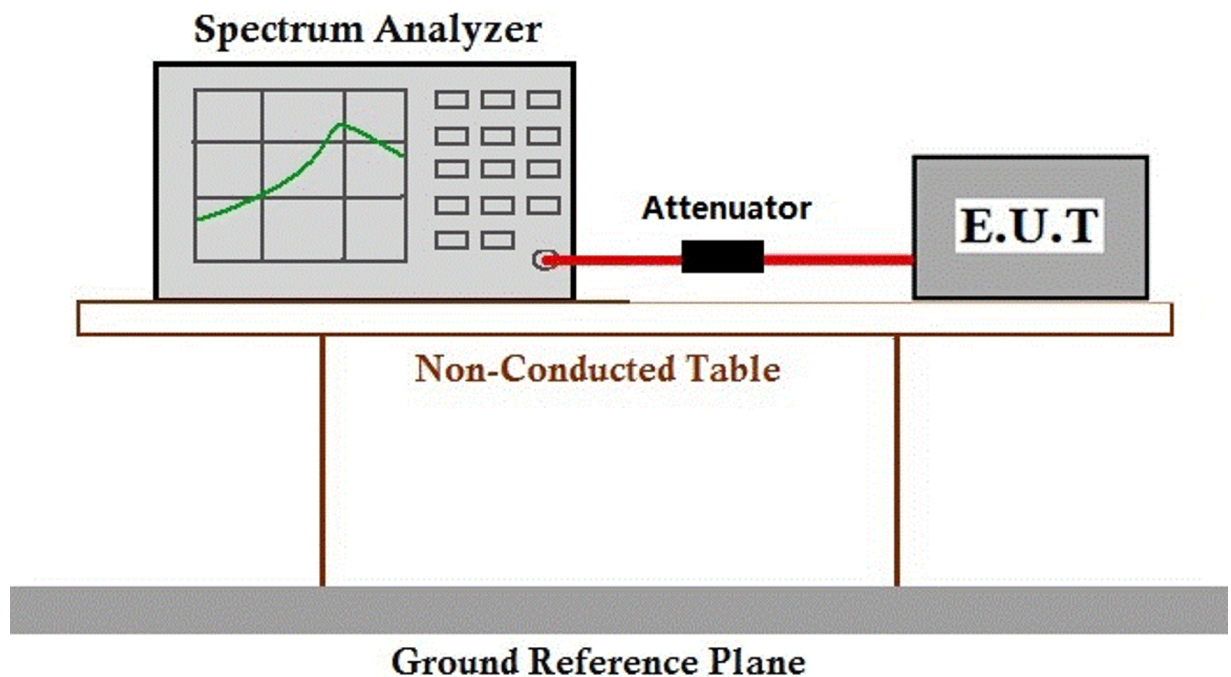
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22.6 °C Humidity: 53.3 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247



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## 7.6 Radiated Emissions which fall in the restricted bands

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

| Frequency(MHz) | Field strength<br>(microvolts/meter) | Measurement distance<br>(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                                |
| Above 960      | 500                                  | 3                                |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

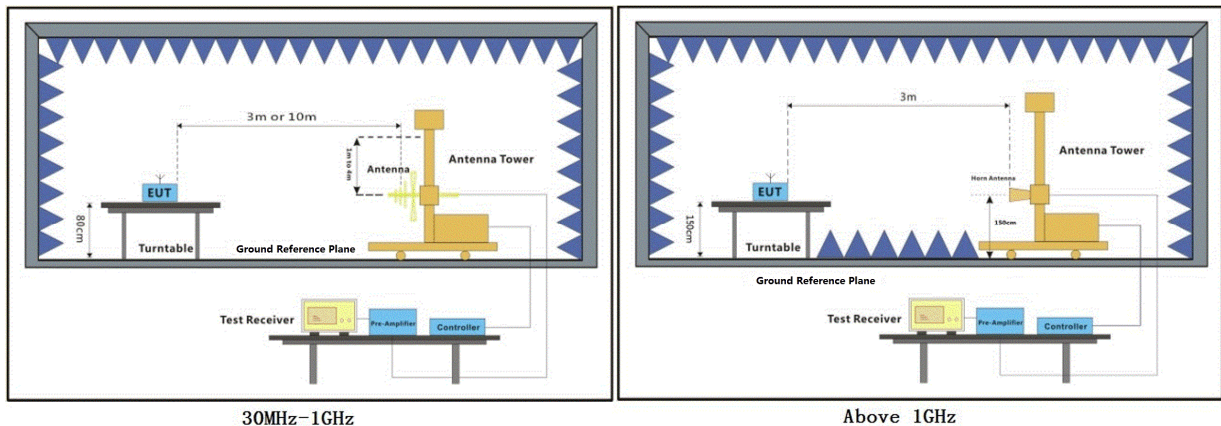
### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22.8 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

### 7.6.2 Test Setup Diagram



30MHz-1GHz

Above 1GHz



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### 7.6.3 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 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: 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.

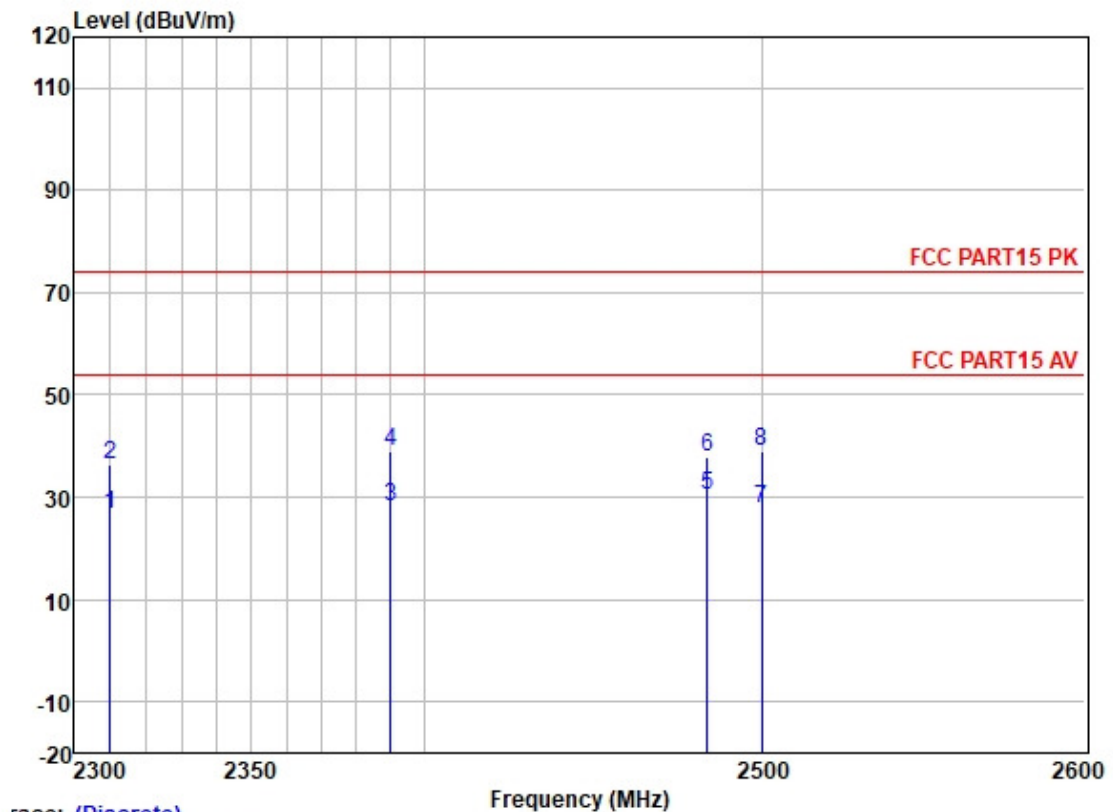
Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor



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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

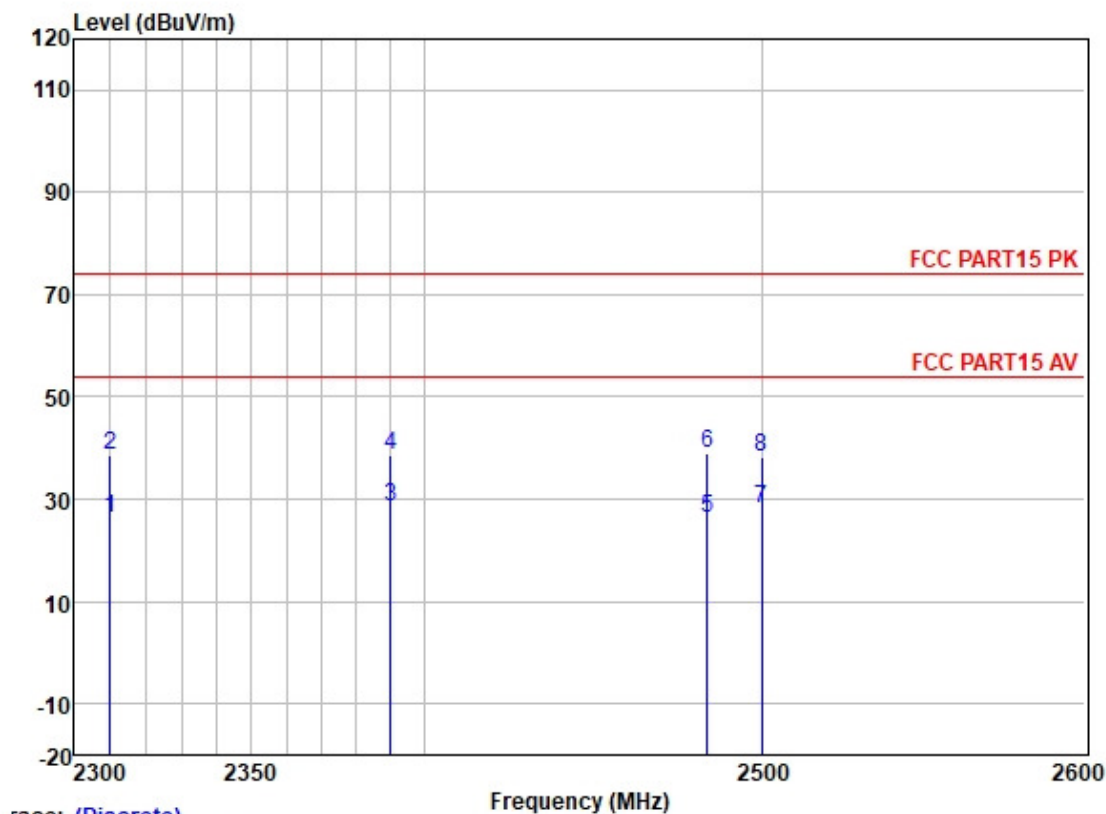
|   | Freq     | ReadAntenna | Cable | Preamp |       | Limit  | Over   |           |                    |
|---|----------|-------------|-------|--------|-------|--------|--------|-----------|--------------------|
|   | Level    | Factor      | Loss  | Factor | Level | Line   | Limit  | Pol/Phase | Remark             |
|   | MHz      | dBuV        | dB/m  | dB     | dB    | dBuV/m | dBuV/m | dB        |                    |
| 1 | 2310.000 | 33.98       | 27.15 | 3.32   | 37.62 | 26.83  | 54.00  | -27.17    | HORIZONTAL Average |
| 2 | 2310.000 | 43.44       | 27.15 | 3.32   | 37.62 | 36.29  | 74.00  | -37.71    | HORIZONTAL Peak    |
| 3 | 2390.000 | 35.02       | 27.33 | 3.48   | 37.59 | 28.24  | 54.00  | -25.76    | HORIZONTAL Average |
| 4 | 2390.000 | 45.77       | 27.33 | 3.48   | 37.59 | 38.99  | 74.00  | -35.01    | HORIZONTAL Peak    |
| 5 | 2483.500 | 36.82       | 27.48 | 3.53   | 37.57 | 30.26  | 54.00  | -23.74    | HORIZONTAL Average |
| 6 | 2483.500 | 44.52       | 27.48 | 3.53   | 37.57 | 37.96  | 74.00  | -36.04    | HORIZONTAL Peak    |
| 7 | 2500.000 | 34.63       | 27.50 | 3.40   | 37.56 | 27.97  | 54.00  | -26.03    | HORIZONTAL Average |
| 8 | 2500.000 | 45.57       | 27.50 | 3.40   | 37.56 | 38.91  | 74.00  | -35.09    | HORIZONTAL Peak    |



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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

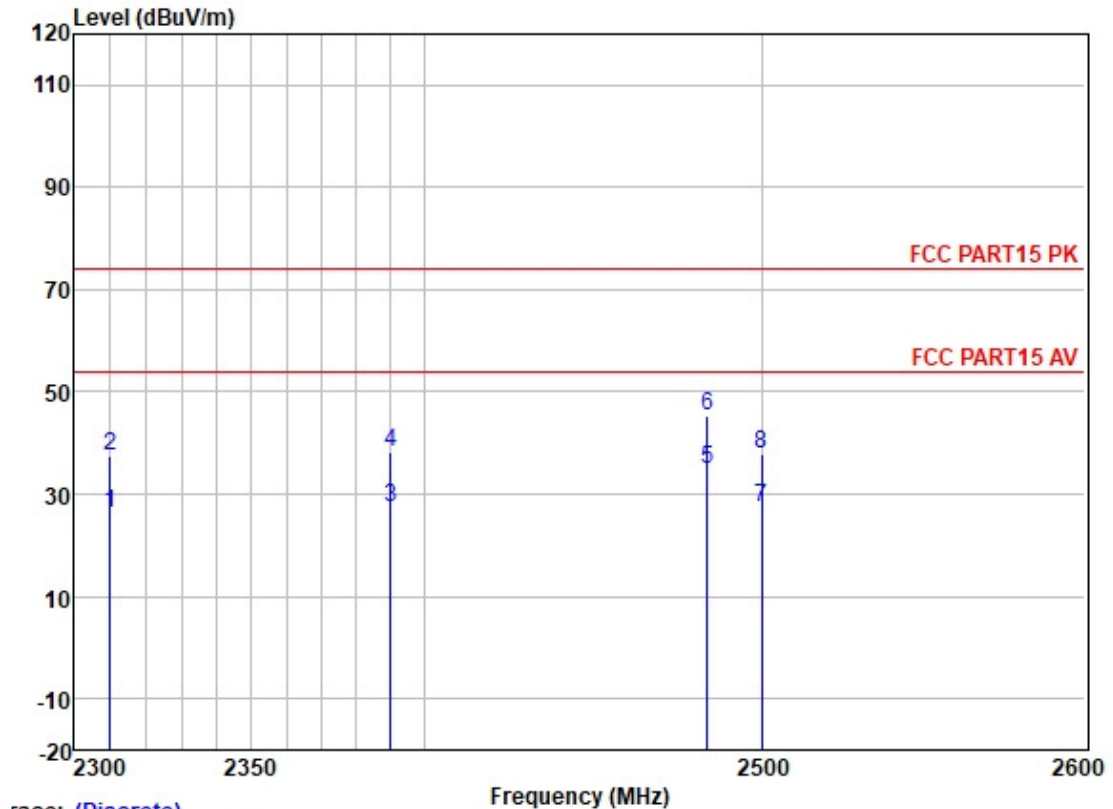
|   | Freq     | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   | Pol/Phase | Remark           |
|---|----------|-------------|--------|--------|--------|--------|--------|-----------|------------------|
|   | MHz      | Level       | Factor | Loss   | Factor | Line   | Limit  |           |                  |
|   | MHz      | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                  |
| 1 | 2310.000 | 33.28       | 27.15  | 3.32   | 37.62  | 26.13  | 54.00  | -27.87    | VERTICAL Average |
| 2 | 2310.000 | 45.77       | 27.15  | 3.32   | 37.62  | 38.62  | 74.00  | -35.38    | VERTICAL Peak    |
| 3 | 2390.000 | 35.26       | 27.33  | 3.48   | 37.59  | 28.48  | 54.00  | -25.52    | VERTICAL Average |
| 4 | 2390.000 | 45.44       | 27.33  | 3.48   | 37.59  | 38.66  | 74.00  | -35.34    | VERTICAL Peak    |
| 5 | 2483.500 | 32.91       | 27.48  | 3.53   | 37.57  | 26.35  | 54.00  | -27.65    | VERTICAL Average |
| 6 | 2483.500 | 45.63       | 27.48  | 3.53   | 37.57  | 39.07  | 74.00  | -34.93    | VERTICAL Peak    |
| 7 | 2500.000 | 34.96       | 27.50  | 3.40   | 37.56  | 28.30  | 54.00  | -25.70    | VERTICAL Average |
| 8 | 2500.000 | 44.84       | 27.50  | 3.40   | 37.56  | 38.18  | 74.00  | -35.82    | VERTICAL Peak    |



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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

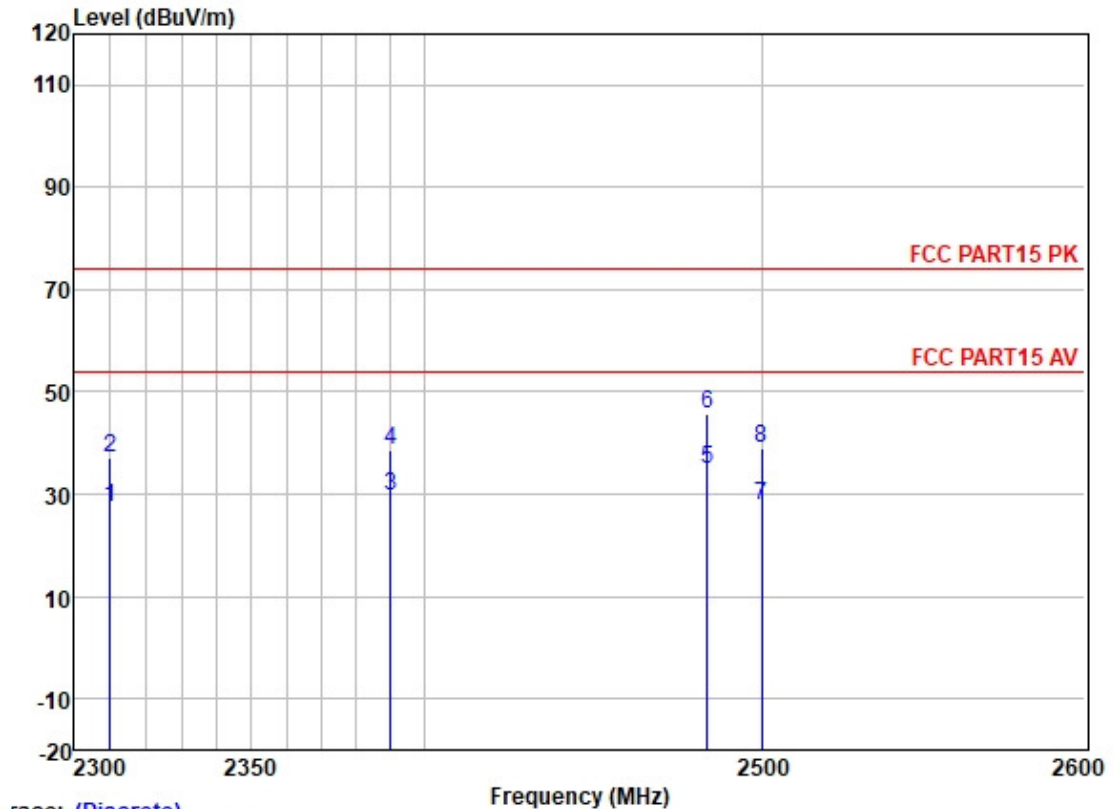
|   | Freq     | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   |           |                    |
|---|----------|-------------|--------|--------|--------|--------|--------|-----------|--------------------|
|   | MHz      | Level       | Factor | Loss   | Factor | Line   | Limit  | Pol/Phase | Remark             |
|   | MHz      | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                    |
| 1 | 2310.000 | 33.51       | 27.15  | 3.32   | 37.62  | 26.36  | 54.00  | -27.64    | HORIZONTAL Average |
| 2 | 2310.000 | 44.76       | 27.15  | 3.32   | 37.62  | 37.61  | 74.00  | -36.39    | HORIZONTAL Peak    |
| 3 | 2390.000 | 34.31       | 27.33  | 3.48   | 37.59  | 27.53  | 54.00  | -26.47    | HORIZONTAL Average |
| 4 | 2390.000 | 44.95       | 27.33  | 3.48   | 37.59  | 38.17  | 74.00  | -35.83    | HORIZONTAL Peak    |
| 5 | 2483.500 | 41.41       | 27.48  | 3.53   | 37.57  | 34.85  | 54.00  | -19.15    | HORIZONTAL Average |
| 6 | 2483.500 | 51.95       | 27.48  | 3.53   | 37.57  | 45.39  | 74.00  | -28.61    | HORIZONTAL Peak    |
| 7 | 2500.000 | 34.05       | 27.50  | 3.40   | 37.56  | 27.39  | 54.00  | -26.61    | HORIZONTAL Average |
| 8 | 2500.000 | 44.52       | 27.50  | 3.40   | 37.56  | 37.86  | 74.00  | -36.14    | HORIZONTAL Peak    |



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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

|   | Freq     | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   |           |          |
|---|----------|-------------|--------|--------|--------|--------|--------|-----------|----------|
|   | MHz      | Level       | Factor | Loss   | Factor | Line   | Limit  | Pol/Phase | Remark   |
|   | MHz      | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |          |
| 1 | 2310.000 | 34.54       | 27.15  | 3.32   | 37.62  | 27.39  | 54.00  | -26.61    | VERTICAL |
| 2 | 2310.000 | 44.36       | 27.15  | 3.32   | 37.62  | 37.21  | 74.00  | -36.79    | VERTICAL |
| 3 | 2390.000 | 36.30       | 27.33  | 3.48   | 37.59  | 29.52  | 54.00  | -24.48    | VERTICAL |
| 4 | 2390.000 | 45.50       | 27.33  | 3.48   | 37.59  | 38.72  | 74.00  | -35.28    | VERTICAL |
| 5 | 2483.500 | 41.37       | 27.48  | 3.53   | 37.57  | 34.81  | 54.00  | -19.19    | VERTICAL |
| 6 | 2483.500 | 52.41       | 27.48  | 3.53   | 37.57  | 45.85  | 74.00  | -28.15    | VERTICAL |
| 7 | 2500.000 | 34.49       | 27.50  | 3.40   | 37.56  | 27.83  | 54.00  | -26.17    | VERTICAL |
| 8 | 2500.000 | 45.79       | 27.50  | 3.40   | 37.56  | 39.13  | 74.00  | -34.87    | VERTICAL |



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## 7.7 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength<br>(microvolts/meter) | Measurement distance<br>(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                                |
| Above 960      | 500                                  | 3                                |

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.



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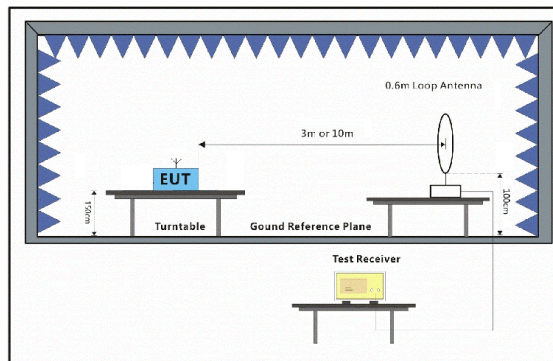
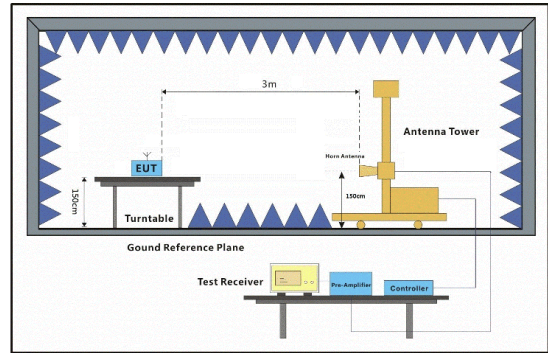
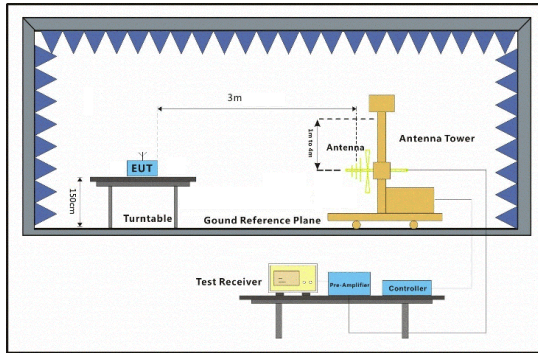
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.8 °C Humidity: 59 % RH Atmospheric Pressure: 1020 mbar

Test Mode: a: TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation.

### 7.7.2 Test Setup Diagram



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 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

### 7.7.3 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.

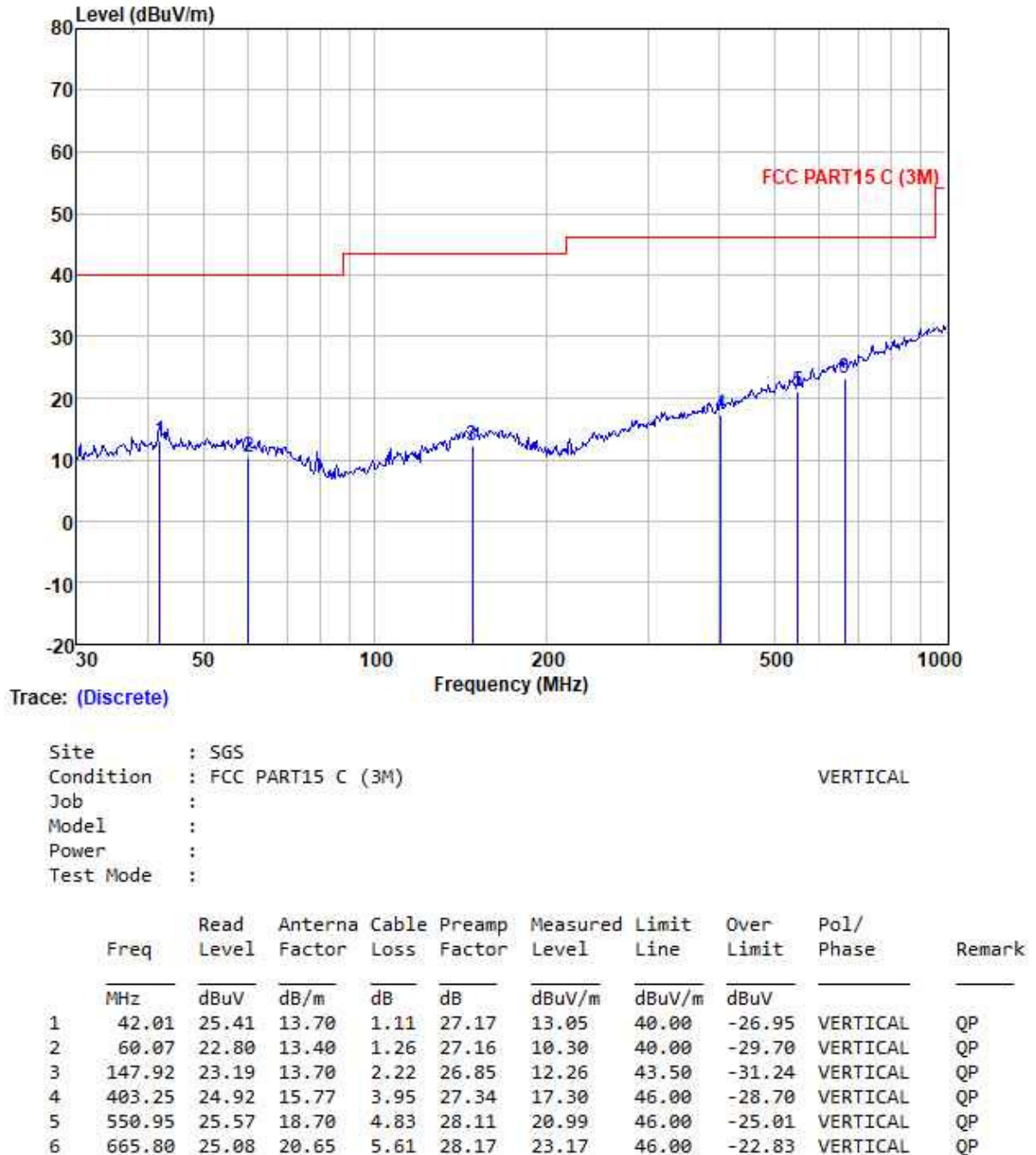
#### Remark:

- 1) For emission below 1GHz, 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 25GHz, the disturbance above 18GHz and 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.
- 4) 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



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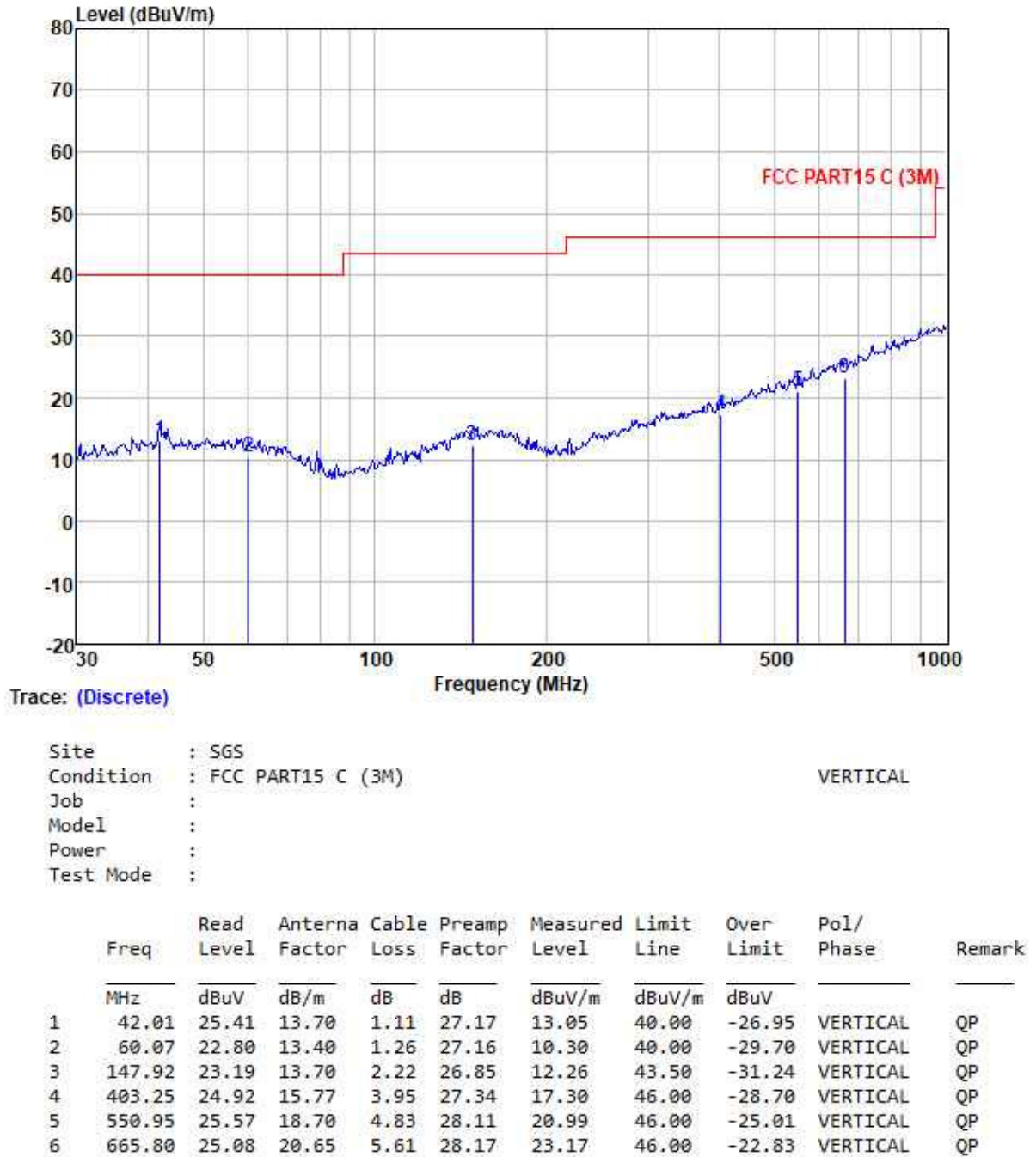
Mode:b; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



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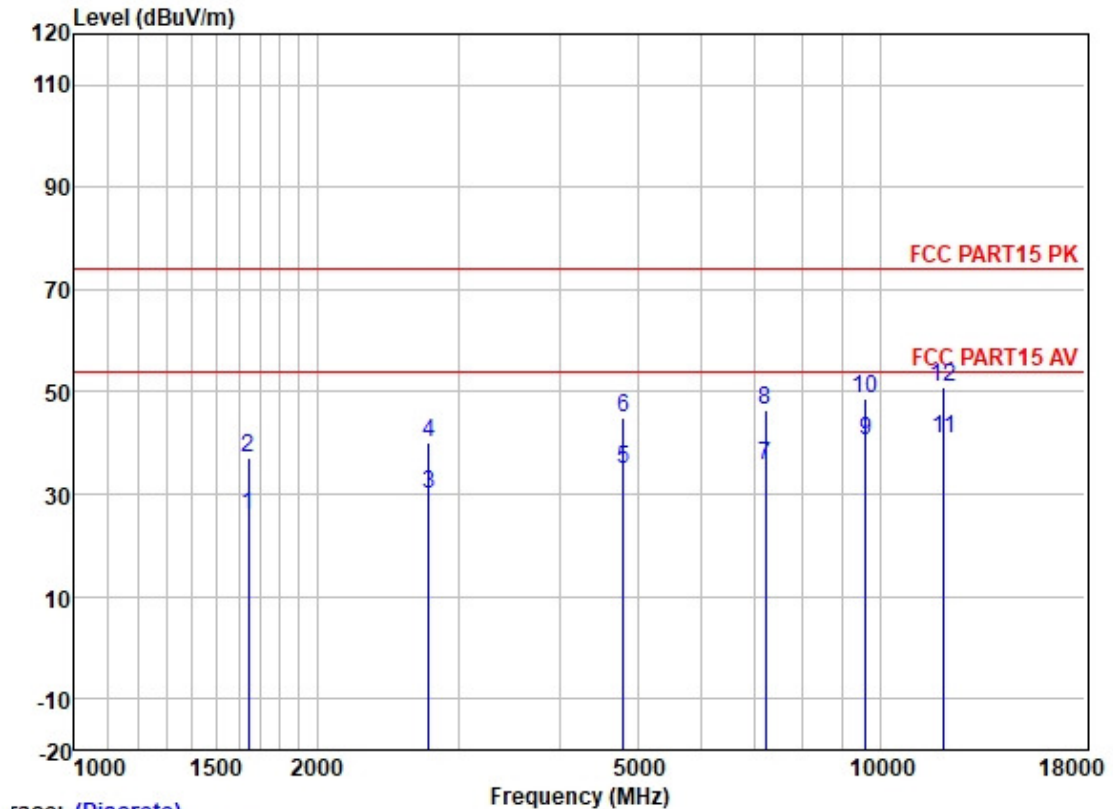
Mode:b; Polarization: Vertical; Modulation:GFSK; ; Channel:Low



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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

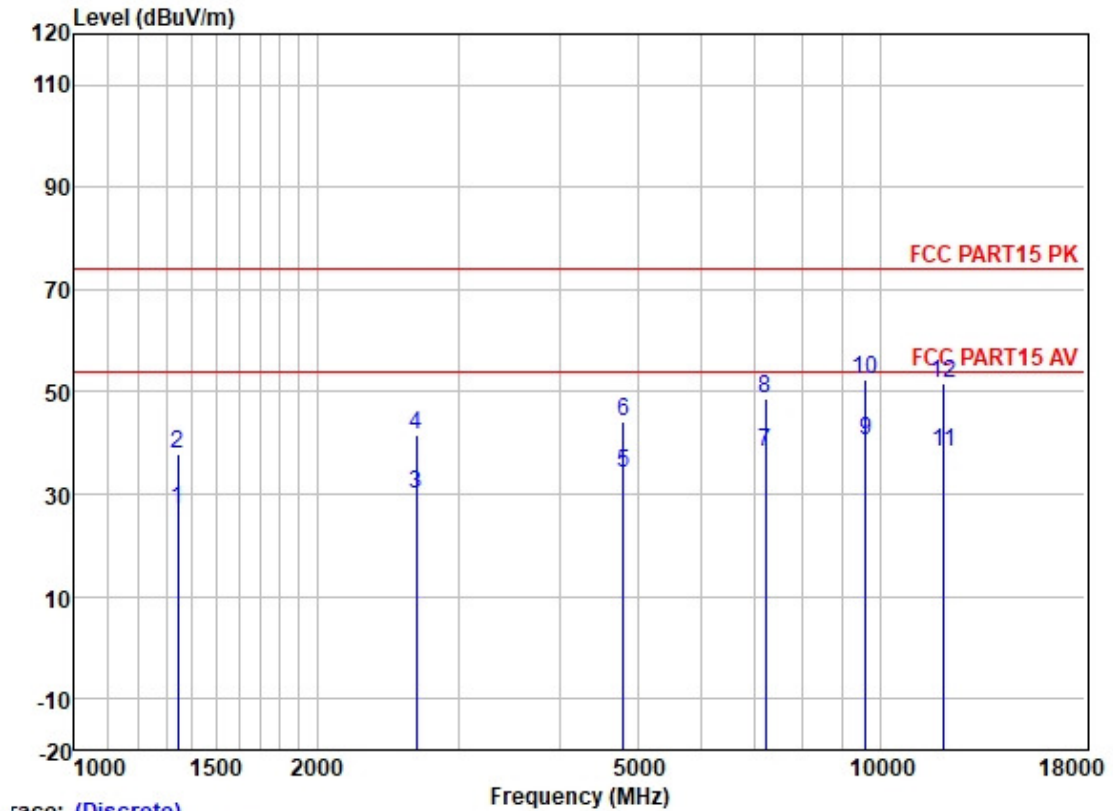
|    | Freq      | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   |           |                    |
|----|-----------|-------------|--------|--------|--------|--------|--------|-----------|--------------------|
|    | MHz       | Level       | Factor | Loss   | Factor | Line   | Limit  | Pol/Phase | Remark             |
|    | MHz       | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                    |
| 1  | 1644.019  | 35.29       | 25.63  | 2.80   | 37.93  | 25.79  | 54.00  | -28.21    | HORIZONTAL Average |
| 2  | 1644.019  | 46.49       | 25.63  | 2.80   | 37.93  | 36.99  | 74.00  | -37.01    | HORIZONTAL Peak    |
| 3  | 2750.080  | 35.71       | 28.01  | 3.65   | 37.44  | 29.93  | 54.00  | -24.07    | HORIZONTAL Average |
| 4  | 2750.080  | 45.75       | 28.01  | 3.65   | 37.44  | 39.97  | 74.00  | -34.03    | HORIZONTAL Peak    |
| 5  | 4804.245  | 35.04       | 31.42  | 5.40   | 36.83  | 35.03  | 54.00  | -18.97    | HORIZONTAL Average |
| 6  | 4804.245  | 45.11       | 31.42  | 5.40   | 36.83  | 45.10  | 74.00  | -28.90    | HORIZONTAL Peak    |
| 7  | 7206.890  | 31.53       | 35.54  | 5.98   | 37.38  | 35.67  | 54.00  | -18.33    | HORIZONTAL Average |
| 8  | 7206.890  | 42.30       | 35.54  | 5.98   | 37.38  | 46.44  | 74.00  | -27.56    | HORIZONTAL Peak    |
| 9  | 9608.860  | 32.37       | 38.37  | 7.07   | 37.42  | 40.39  | 54.00  | -13.61    | HORIZONTAL Average |
| 10 | 9608.860  | 40.70       | 38.37  | 7.07   | 37.42  | 48.72  | 74.00  | -25.28    | HORIZONTAL Peak    |
| 11 | 12010.850 | 30.80       | 38.90  | 8.19   | 37.10  | 40.79  | 54.00  | -13.21    | HORIZONTAL Average |
| 12 | 12010.850 | 40.81       | 38.90  | 8.19   | 37.10  | 50.80  | 74.00  | -23.20    | HORIZONTAL Peak    |



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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

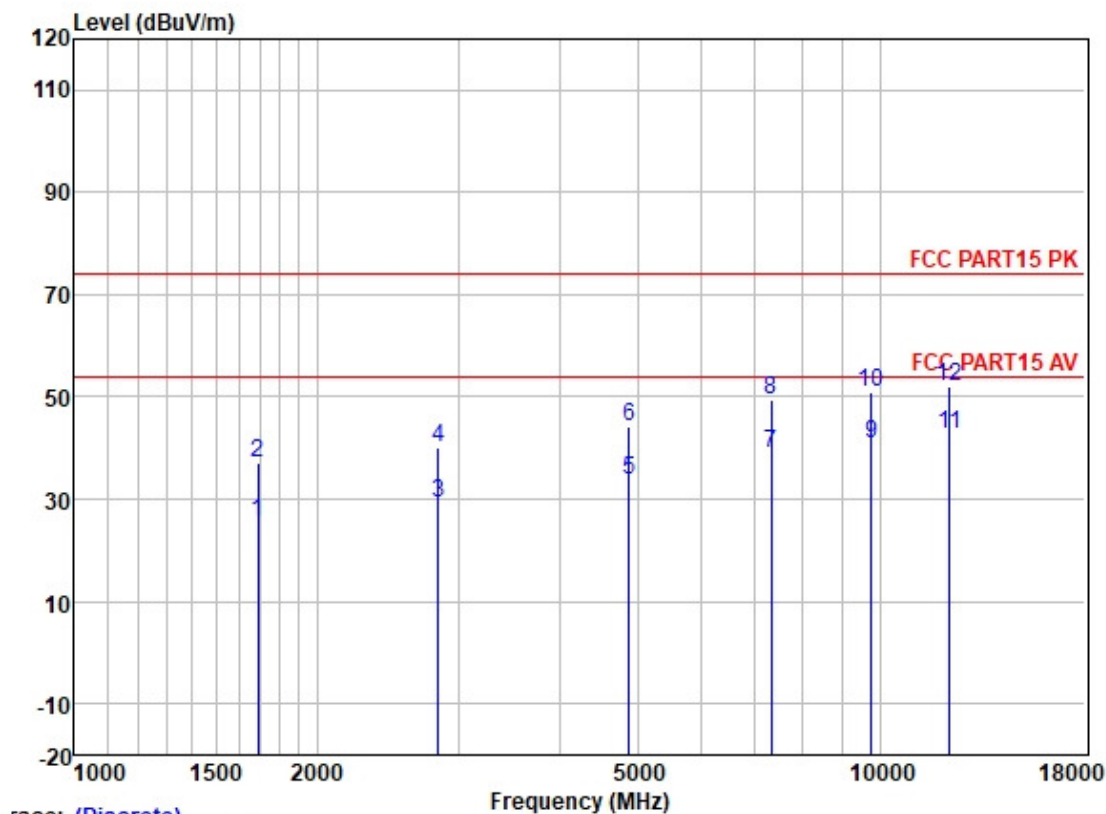
|    | Freq      | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   | Pol/Phase | Remark           |
|----|-----------|-------------|--------|--------|--------|--------|--------|-----------|------------------|
|    | MHz       | Level       | Factor | Loss   | Factor | Line   | Limit  |           |                  |
|    | MHz       | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                  |
| 1  | 1342.882  | 37.53       | 25.30  | 2.60   | 38.27  | 27.16  | 54.00  | -26.84    | VERTICAL Average |
| 2  | 1342.882  | 48.37       | 25.30  | 2.60   | 38.27  | 38.00  | 74.00  | -36.00    | VERTICAL Peak    |
| 3  | 2656.331  | 36.18       | 27.73  | 3.55   | 37.49  | 29.97  | 54.00  | -24.03    | VERTICAL Average |
| 4  | 2656.331  | 47.73       | 27.73  | 3.55   | 37.49  | 41.52  | 74.00  | -32.48    | VERTICAL Peak    |
| 5  | 4804.888  | 34.32       | 31.42  | 5.40   | 36.83  | 34.31  | 54.00  | -19.69    | VERTICAL Average |
| 6  | 4804.888  | 44.38       | 31.42  | 5.40   | 36.83  | 44.37  | 74.00  | -29.63    | VERTICAL Peak    |
| 7  | 7206.461  | 34.15       | 35.54  | 5.98   | 37.38  | 38.29  | 54.00  | -15.71    | VERTICAL Average |
| 8  | 7206.461  | 44.43       | 35.54  | 5.98   | 37.38  | 48.57  | 74.00  | -25.43    | VERTICAL Peak    |
| 9  | 9608.717  | 32.37       | 38.37  | 7.07   | 37.42  | 40.39  | 54.00  | -13.61    | VERTICAL Average |
| 10 | 9608.717  | 44.48       | 38.37  | 7.07   | 37.42  | 52.50  | 74.00  | -21.50    | VERTICAL Peak    |
| 11 | 12010.100 | 28.12       | 38.90  | 8.19   | 37.10  | 38.11  | 54.00  | -15.89    | VERTICAL Average |
| 12 | 12010.100 | 41.66       | 38.90  | 8.19   | 37.10  | 51.65  | 74.00  | -22.35    | VERTICAL Peak    |



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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

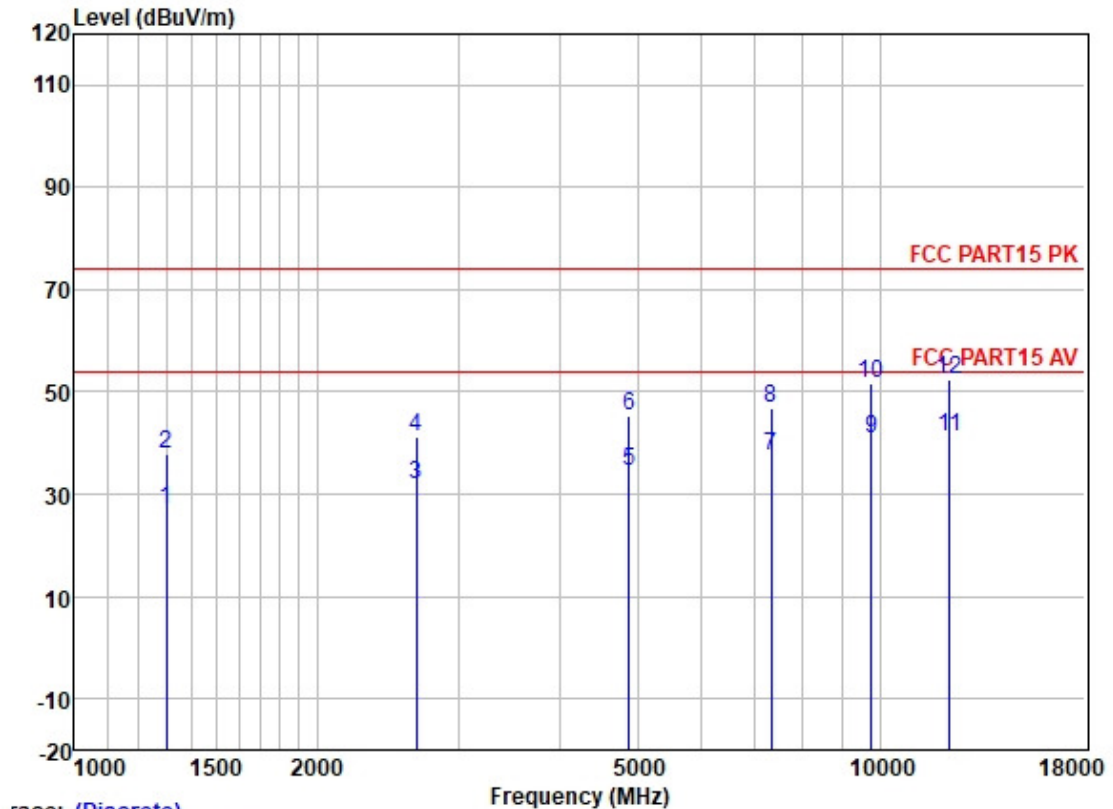
|    | Freq      | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   |           |                    |
|----|-----------|-------------|--------|--------|--------|--------|--------|-----------|--------------------|
|    | MHz       | Level       | Factor | Loss   | Factor | Line   | Limit  | Pol/Phase | Remark             |
|    | MHz       | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                    |
| 1  | 1692.231  | 35.09       | 25.70  | 2.80   | 37.89  | 25.70  | 54.00  | -28.30    | HORIZONTAL Average |
| 2  | 1692.231  | 46.37       | 25.70  | 2.80   | 37.89  | 36.98  | 74.00  | -37.02    | HORIZONTAL Peak    |
| 3  | 2830.728  | 34.64       | 28.20  | 3.70   | 37.40  | 29.14  | 54.00  | -24.86    | HORIZONTAL Average |
| 4  | 2830.728  | 45.56       | 28.20  | 3.70   | 37.40  | 40.06  | 74.00  | -33.94    | HORIZONTAL Peak    |
| 5  | 4884.181  | 33.48       | 31.56  | 5.52   | 36.84  | 33.72  | 54.00  | -20.28    | HORIZONTAL Average |
| 6  | 4884.181  | 43.85       | 31.56  | 5.52   | 36.84  | 44.09  | 74.00  | -29.91    | HORIZONTAL Peak    |
| 7  | 7326.038  | 34.24       | 36.00  | 6.13   | 37.43  | 38.94  | 54.00  | -15.06    | HORIZONTAL Average |
| 8  | 7326.038  | 44.68       | 36.00  | 6.13   | 37.43  | 49.38  | 74.00  | -24.62    | HORIZONTAL Peak    |
| 9  | 9768.603  | 32.73       | 38.53  | 7.01   | 37.41  | 40.86  | 54.00  | -13.14    | HORIZONTAL Average |
| 10 | 9768.603  | 42.96       | 38.53  | 7.01   | 37.41  | 51.09  | 74.00  | -22.91    | HORIZONTAL Peak    |
| 11 | 12210.310 | 32.94       | 38.74  | 8.08   | 37.00  | 42.76  | 54.00  | -11.24    | HORIZONTAL Average |
| 12 | 12210.310 | 42.41       | 38.74  | 8.08   | 37.00  | 52.23  | 74.00  | -21.77    | HORIZONTAL Peak    |



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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

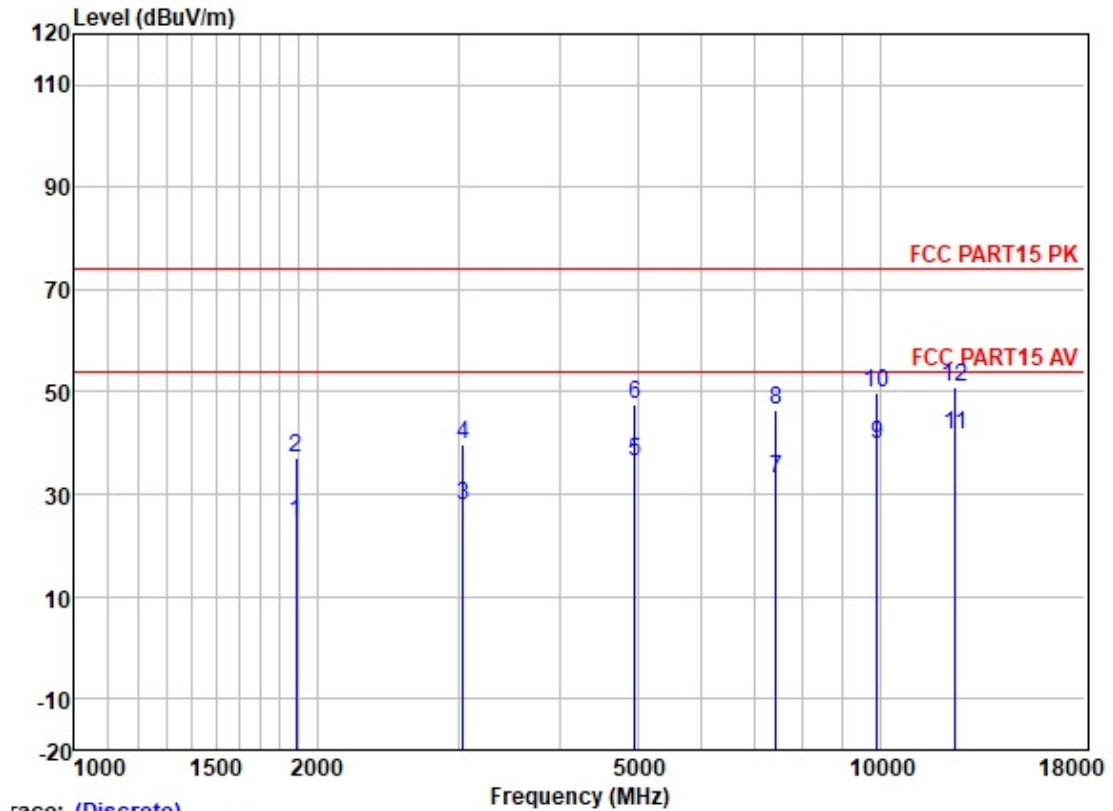
|    | Freq      | ReadAntenna<br>Level Factor | Cable Preamp<br>Loss Factor | Limit<br>Line | Over<br>Limit | Pol/Phase | Remark |        |          |         |
|----|-----------|-----------------------------|-----------------------------|---------------|---------------|-----------|--------|--------|----------|---------|
|    | MHz       | dBuV                        | dB/m                        | dB            | dB            | dBuV/m    | dBuV/m | dB     |          |         |
| 1  | 1300.858  | 37.56                       | 25.20                       | 2.60          | 38.31         | 27.05     | 54.00  | -26.95 | VERTICAL | Average |
| 2  | 1300.858  | 48.34                       | 25.20                       | 2.60          | 38.31         | 37.83     | 74.00  | -36.17 | VERTICAL | Peak    |
| 3  | 2656.331  | 37.95                       | 27.73                       | 3.55          | 37.49         | 31.74     | 54.00  | -22.26 | VERTICAL | Average |
| 4  | 2656.331  | 47.32                       | 27.73                       | 3.55          | 37.49         | 41.11     | 74.00  | -32.89 | VERTICAL | Peak    |
| 5  | 4884.993  | 34.42                       | 31.56                       | 5.52          | 36.84         | 34.66     | 54.00  | -19.34 | VERTICAL | Average |
| 6  | 4884.993  | 45.27                       | 31.56                       | 5.52          | 36.84         | 45.51     | 74.00  | -28.49 | VERTICAL | Peak    |
| 7  | 7326.999  | 32.75                       | 36.00                       | 6.13          | 37.43         | 37.45     | 54.00  | -16.55 | VERTICAL | Average |
| 8  | 7326.999  | 42.03                       | 36.00                       | 6.13          | 37.43         | 46.73     | 74.00  | -27.27 | VERTICAL | Peak    |
| 9  | 9768.230  | 32.81                       | 38.53                       | 7.01          | 37.41         | 40.94     | 54.00  | -13.06 | VERTICAL | Average |
| 10 | 9768.230  | 43.42                       | 38.53                       | 7.01          | 37.41         | 51.55     | 74.00  | -22.45 | VERTICAL | Peak    |
| 11 | 12210.700 | 31.58                       | 38.74                       | 8.08          | 37.00         | 41.40     | 54.00  | -12.60 | VERTICAL | Average |
| 12 | 12210.700 | 42.48                       | 38.74                       | 8.08          | 37.00         | 52.30     | 74.00  | -21.70 | VERTICAL | Peak    |



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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

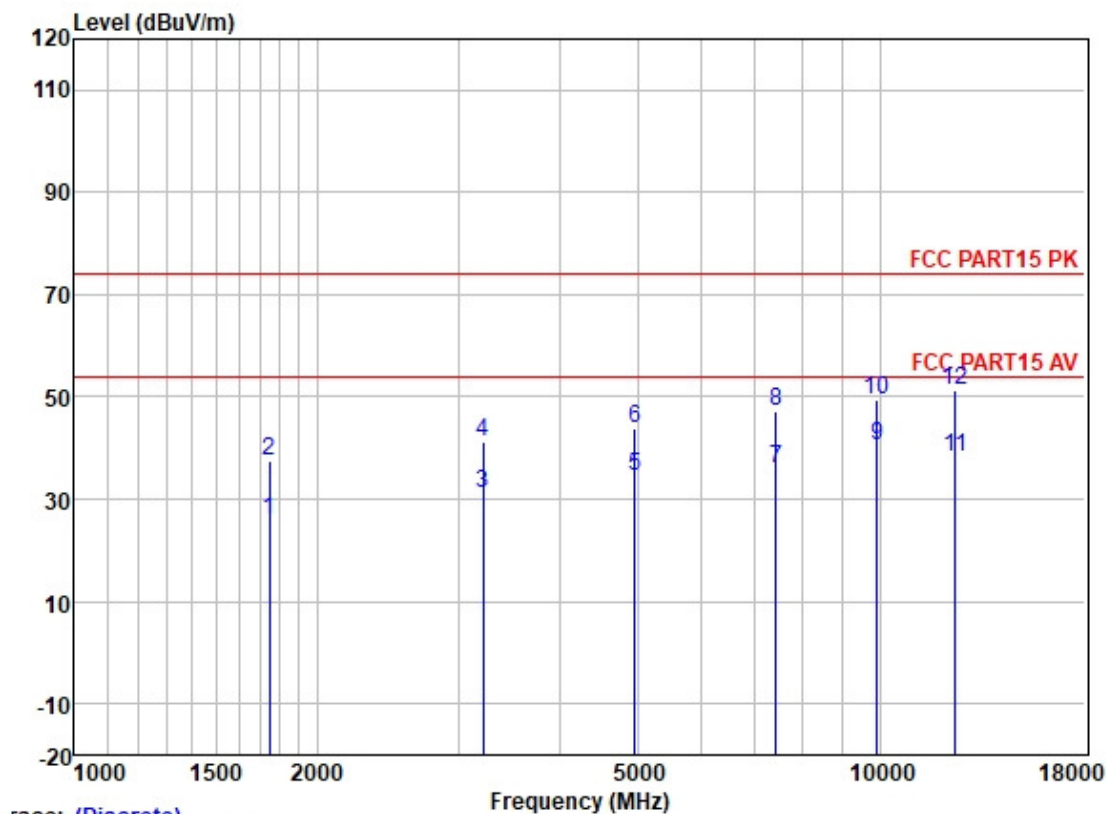
|    | Freq      | ReadAntenna | Cable  | Preamp | Level  | Limit  | Over   | Pol/Phase | Remark             |
|----|-----------|-------------|--------|--------|--------|--------|--------|-----------|--------------------|
|    | MHz       | Level       | Factor | Loss   | Factor | Line   | Limit  |           |                    |
|    | MHz       | dBuV        | dB/m   | dB     | dB     | dBuV/m | dBuV/m | dB        |                    |
| 1  | 1883.236  | 33.08       | 26.03  | 2.91   | 37.77  | 24.25  | 54.00  | -29.75    | HORIZONTAL Average |
| 2  | 1883.236  | 46.03       | 26.03  | 2.91   | 37.77  | 37.20  | 74.00  | -36.80    | HORIZONTAL Peak    |
| 3  | 3034.063  | 32.83       | 28.42  | 3.83   | 37.22  | 27.86  | 54.00  | -26.14    | HORIZONTAL Average |
| 4  | 3034.063  | 44.81       | 28.42  | 3.83   | 37.22  | 39.84  | 74.00  | -34.16    | HORIZONTAL Peak    |
| 5  | 4960.993  | 35.83       | 31.65  | 5.65   | 36.84  | 36.29  | 54.00  | -17.71    | HORIZONTAL Average |
| 6  | 4960.993  | 47.05       | 31.65  | 5.65   | 36.84  | 47.51  | 74.00  | -26.49    | HORIZONTAL Peak    |
| 7  | 7440.375  | 28.12       | 36.27  | 6.22   | 37.47  | 33.14  | 54.00  | -20.86    | HORIZONTAL Average |
| 8  | 7440.375  | 41.59       | 36.27  | 6.22   | 37.47  | 46.61  | 74.00  | -27.39    | HORIZONTAL Peak    |
| 9  | 9920.214  | 31.39       | 38.65  | 6.96   | 37.40  | 39.60  | 54.00  | -14.40    | HORIZONTAL Average |
| 10 | 9920.214  | 41.70       | 38.65  | 6.96   | 37.40  | 49.91  | 74.00  | -24.09    | HORIZONTAL Peak    |
| 11 | 12400.510 | 32.09       | 38.57  | 7.97   | 36.88  | 41.75  | 54.00  | -12.25    | HORIZONTAL Average |
| 12 | 12400.510 | 41.42       | 38.57  | 7.97   | 36.88  | 51.08  | 74.00  | -22.92    | HORIZONTAL Peak    |



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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

|    | Freq      | ReadAntenna | Cable | Preamp |       | Limit  | Over   |           |          |         |
|----|-----------|-------------|-------|--------|-------|--------|--------|-----------|----------|---------|
|    | Level     | Factor      | Loss  | Factor | Level | Line   | Limit  | Pol/Phase | Remark   |         |
|    | MHz       | dBuV        | dB/m  | dB     | dB    | dBuV/m | dBuV/m | dB        |          |         |
| 1  | 1746.898  | 34.89       | 25.84 | 2.89   | 37.85 | 25.77  | 54.00  | -28.23    | VERTICAL | Average |
| 2  | 1746.898  | 46.45       | 25.84 | 2.89   | 37.85 | 37.33  | 74.00  | -36.67    | VERTICAL | Peak    |
| 3  | 3214.623  | 35.74       | 28.61 | 4.01   | 37.07 | 31.29  | 54.00  | -22.71    | VERTICAL | Average |
| 4  | 3214.623  | 45.62       | 28.61 | 4.01   | 37.07 | 41.17  | 74.00  | -32.83    | VERTICAL | Peak    |
| 5  | 4960.058  | 34.17       | 31.65 | 5.65   | 36.84 | 34.63  | 54.00  | -19.37    | VERTICAL | Average |
| 6  | 4960.058  | 43.57       | 31.65 | 5.65   | 36.84 | 44.03  | 74.00  | -29.97    | VERTICAL | Peak    |
| 7  | 7440.542  | 30.83       | 36.27 | 6.22   | 37.47 | 35.85  | 54.00  | -18.15    | VERTICAL | Average |
| 8  | 7440.542  | 42.05       | 36.27 | 6.22   | 37.47 | 47.07  | 74.00  | -26.93    | VERTICAL | Peak    |
| 9  | 9920.456  | 32.22       | 38.65 | 6.96   | 37.40 | 40.43  | 54.00  | -13.57    | VERTICAL | Average |
| 10 | 9920.456  | 41.19       | 38.65 | 6.96   | 37.40 | 49.40  | 74.00  | -24.60    | VERTICAL | Peak    |
| 11 | 12400.820 | 28.46       | 38.57 | 7.97   | 36.88 | 38.12  | 54.00  | -15.88    | VERTICAL | Average |
| 12 | 12400.820 | 41.79       | 38.57 | 7.97   | 36.88 | 51.45  | 74.00  | -22.55    | VERTICAL | Peak    |



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## 8 Appendix 15.247

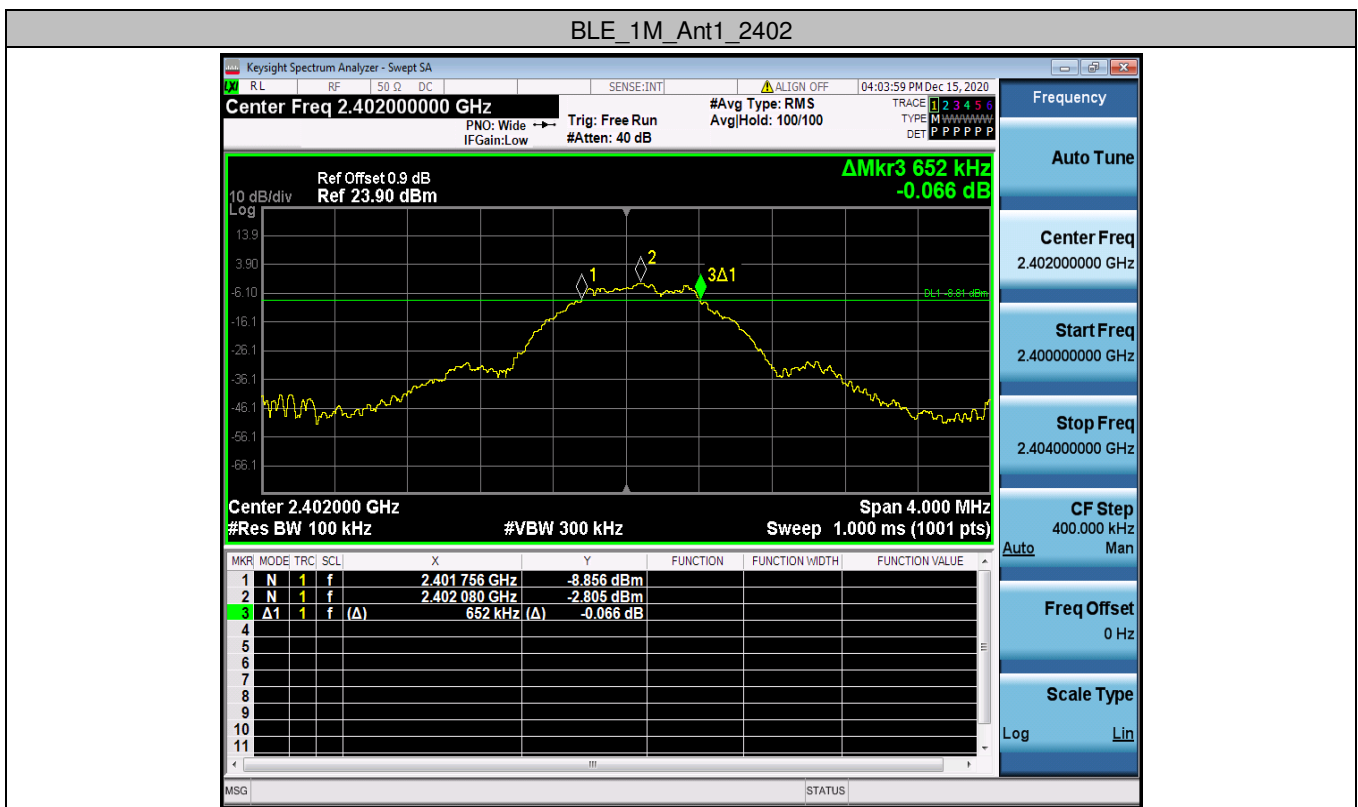
Cable Loss=0.9 dB for all the test data

### 8.1 Appendix A: DTS Bandwidth

#### 8.1.1 Test Result

| TestMode | Antenna | Channel | DTS BW [MHz] | FL[MHz]  | FH[MHz]  | Limit[MHz] | Verdict |
|----------|---------|---------|--------------|----------|----------|------------|---------|
| BLE_1M   | Ant1    | 2402    | 0.652        | 2401.756 | 2402.408 | 0.5        | PASS    |
|          |         | 2442    | 0.676        | 2441.740 | 2442.416 | 0.5        | PASS    |
|          |         | 2480    | 0.660        | 2479.748 | 2480.408 | 0.5        | PASS    |

#### 8.1.2 Test Graphs



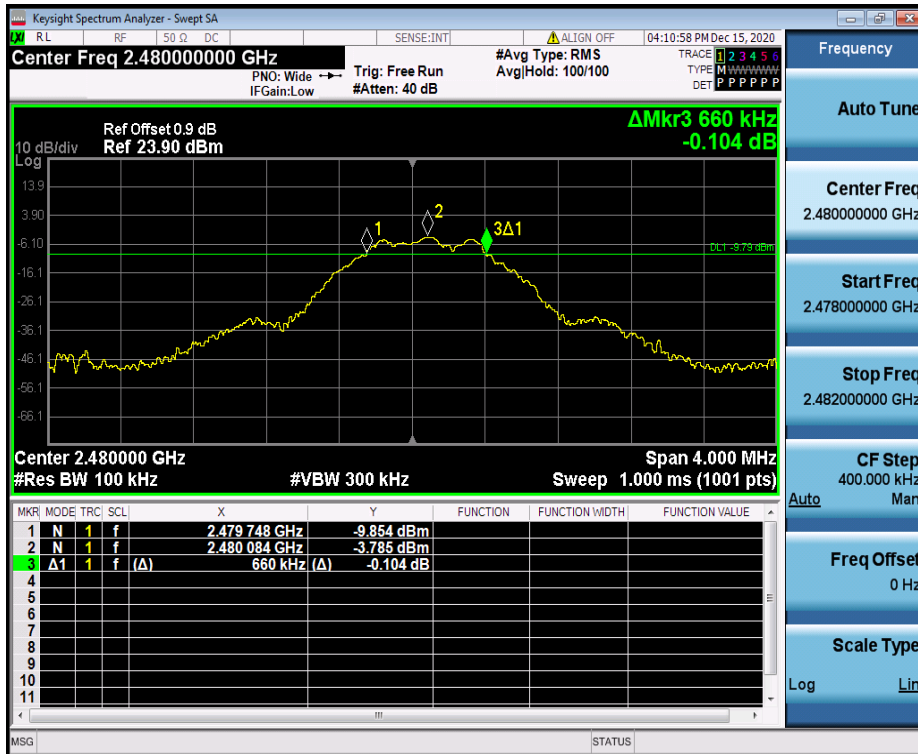
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BLE\_1M\_Ant1\_2480



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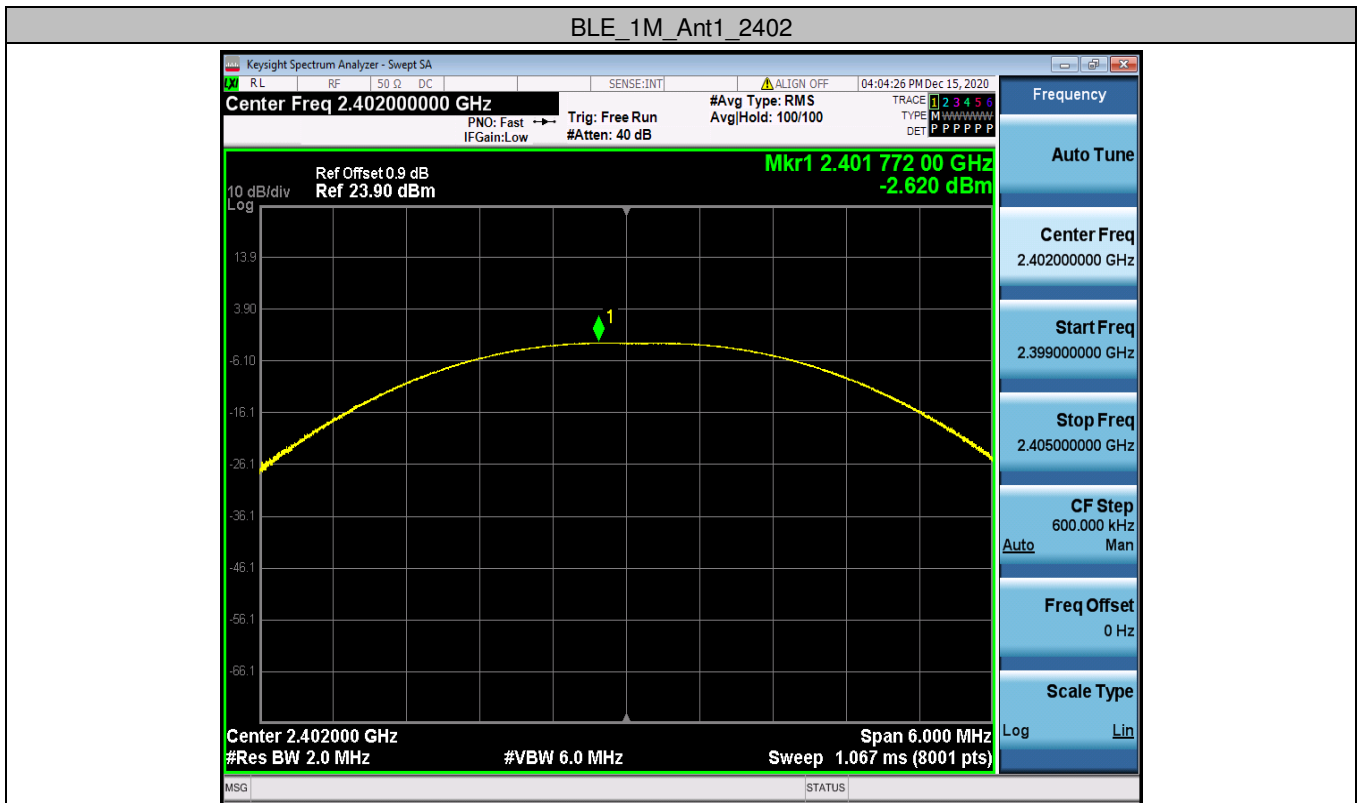
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## 8.2 Appendix B: Maximum conducted output power

### 8.2.1 Test Result

| TestMode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402    | -2.62       | <=30       | PASS    |
|          |         | 2442    | -3.08       | <=30       | PASS    |
|          |         | 2480    | -3.56       | <=30       | PASS    |

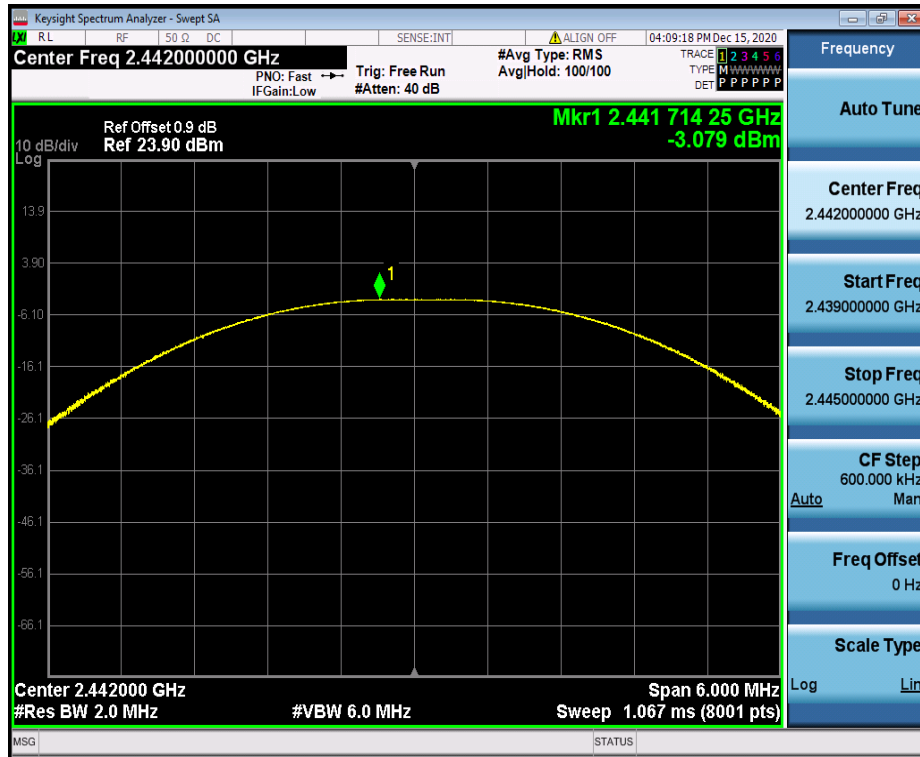
### 8.2.2 Test Graphs



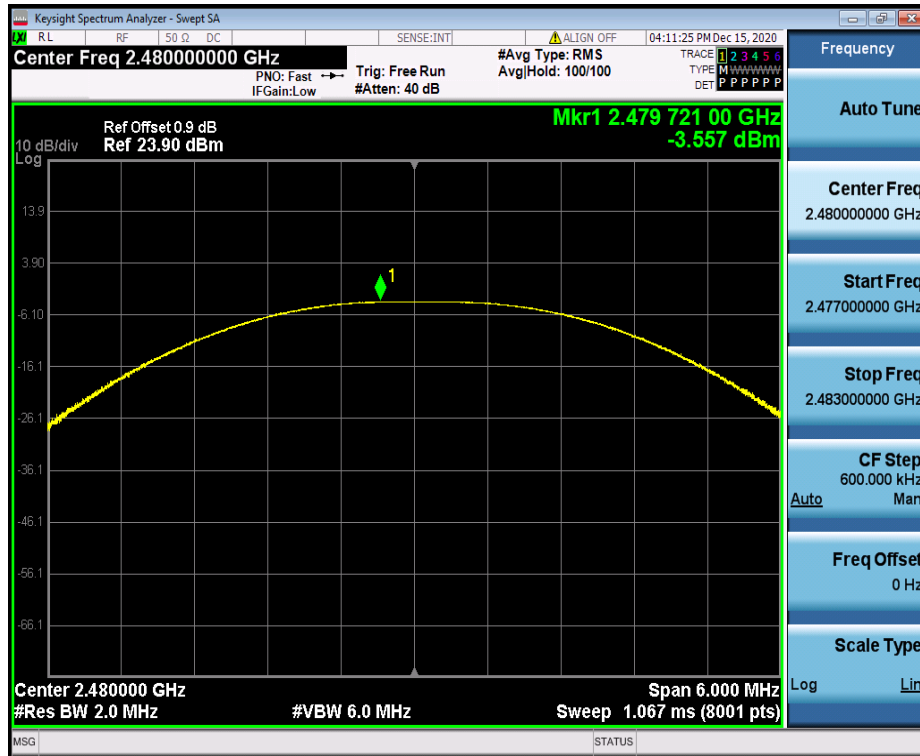
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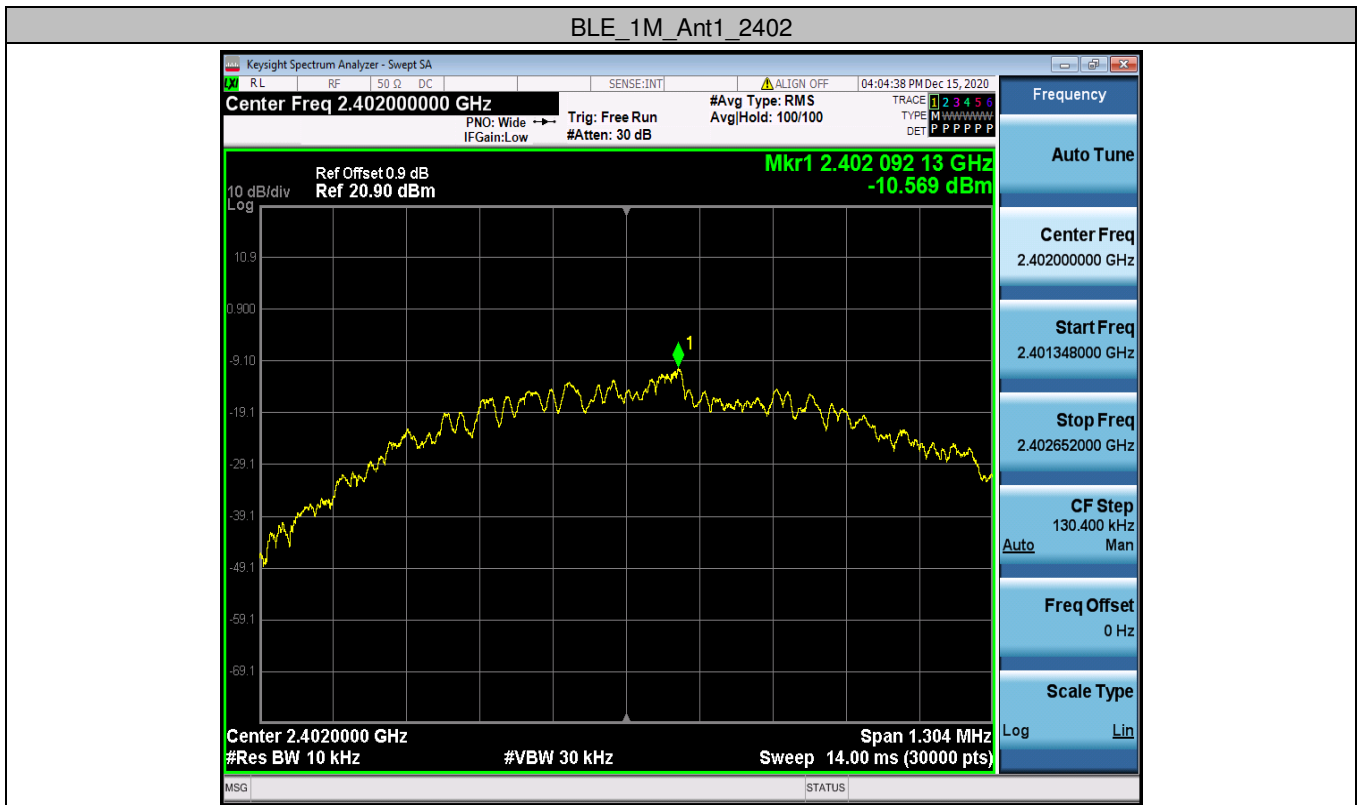
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## 8.3 Appendix C: Maximum power spectral density

### 8.3.1 Test Result

| TestMode | Antenna | Channel | Result[dBm/3-100kHz] | Limit[dBm/3kHz] | Verdict |
|----------|---------|---------|----------------------|-----------------|---------|
| BLE_1M   | Ant1    | 2402    | -10.57               | <=8             | PASS    |
|          |         | 2442    | -10.6                | <=8             | PASS    |
|          |         | 2480    | -9.92                | <=8             | PASS    |

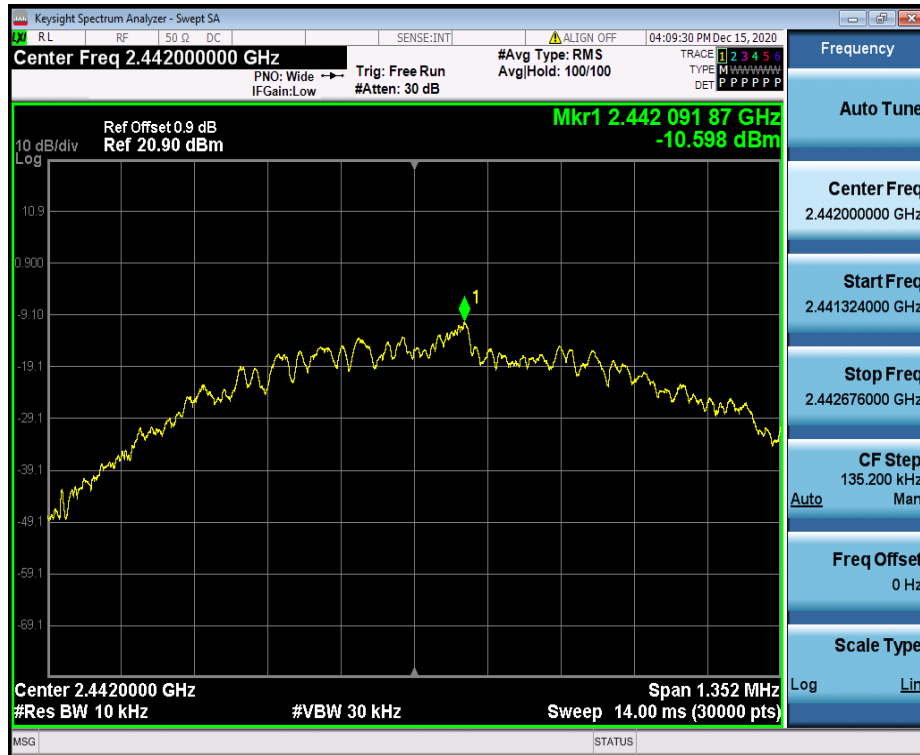
### 8.3.2 Test Graphs



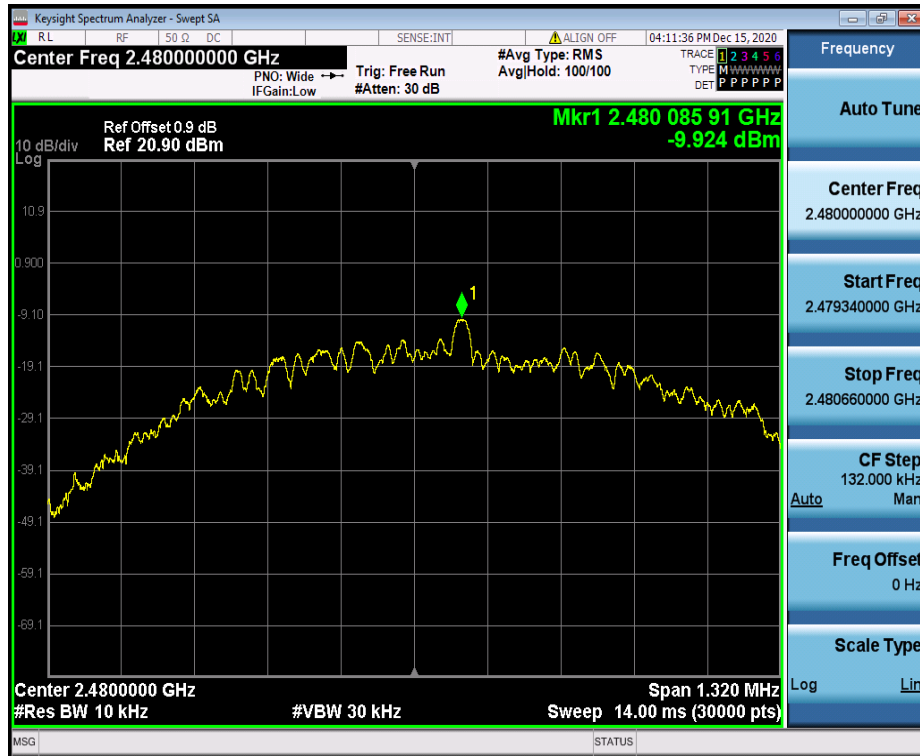
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## 8.4 Appendix D: Band edge measurements

### 8.4.1 Test Result

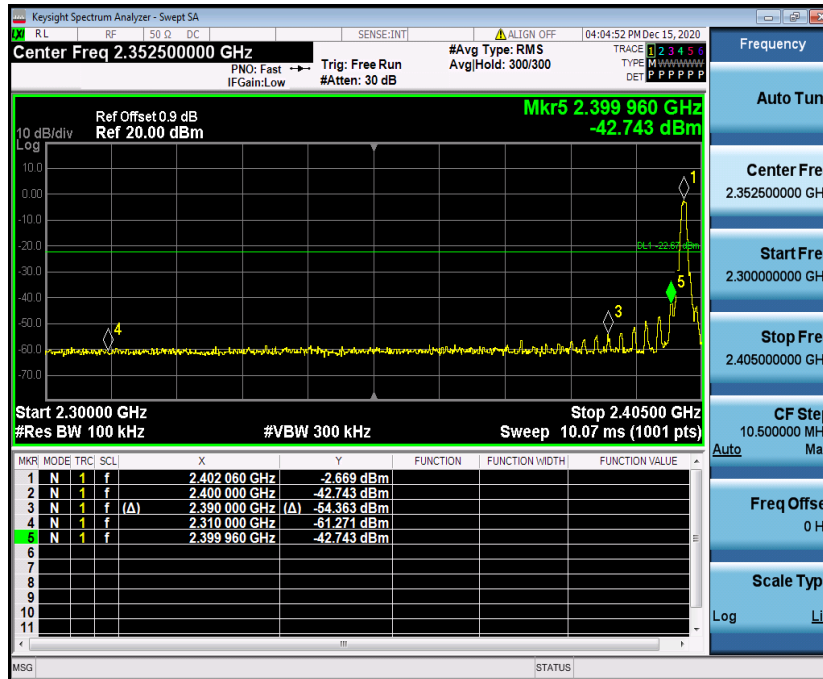
| TestMode | Antenna | ChName | Channel | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|--------|---------|---------------|-------------|------------|---------|
| BLE_1M   | Ant1    | Low    | 2402    | -2.67         | -42.74      | <=-22.67   | PASS    |
|          |         | High   | 2480    | -3.62         | -49.23      | <=-23.62   | PASS    |



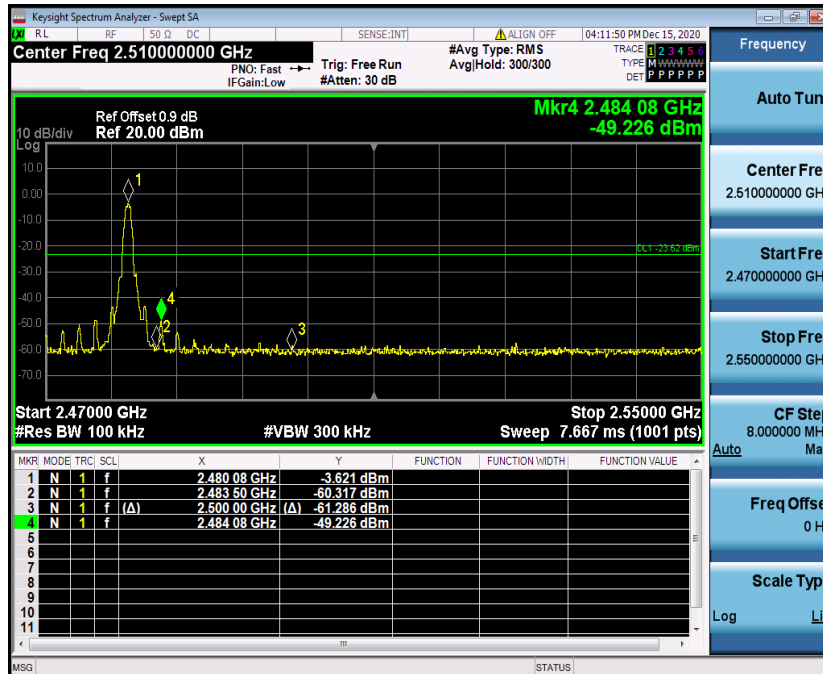
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## 8.4.2 Test Graphs

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BLE\_1M\_Ant1\_High\_2480



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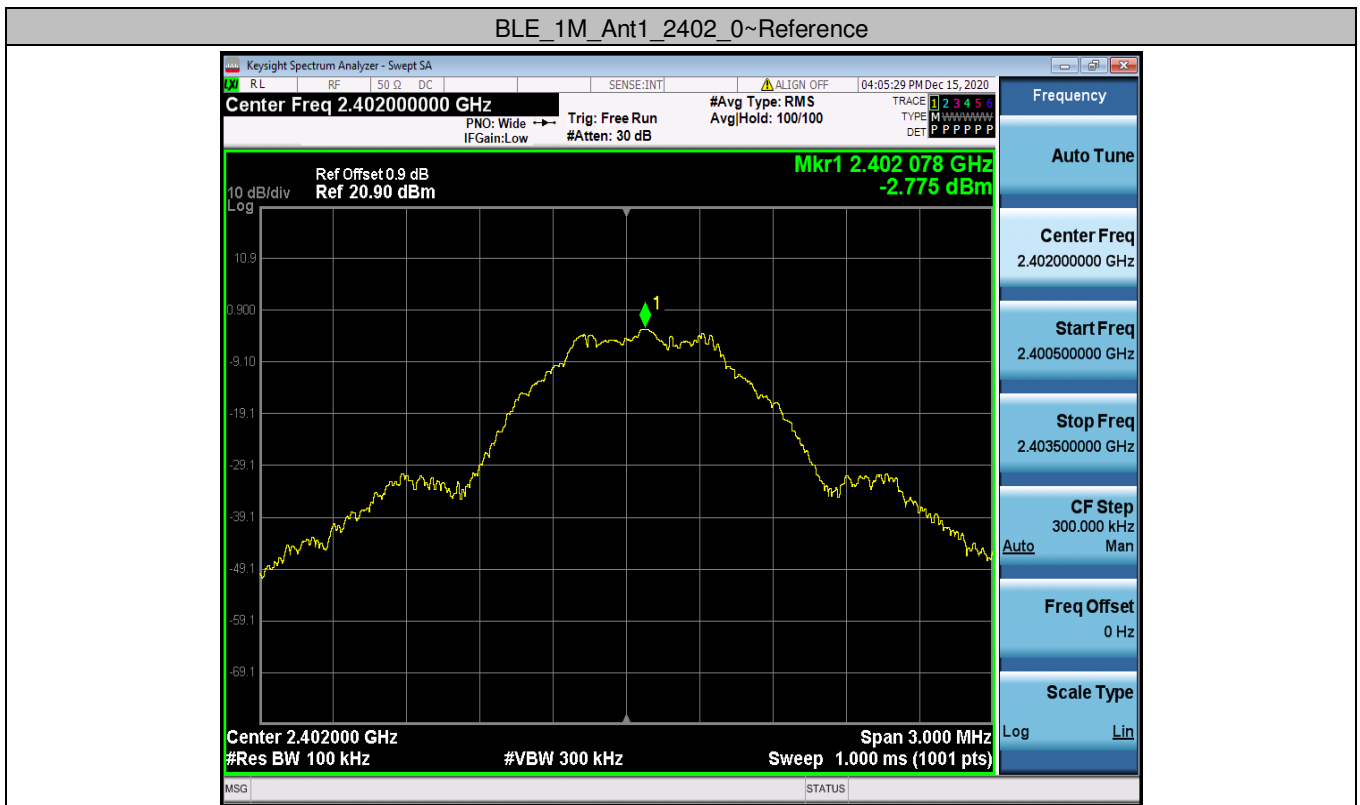
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## 8.5 Appendix E: Conducted Spurious Emission

### 8.5.1 Test Result

| TestMode | Antenna | Channel | FreqRange [MHz] | RefLevel [dBm] | Result[dBm] | Limit[dBm] | Verdict |
|----------|---------|---------|-----------------|----------------|-------------|------------|---------|
| BLE_1M   | Ant1    | 2402    | Reference       | -2.78          | -2.78       | ---        | PASS    |
|          |         |         | 30~1000         | 30~1000        | -70.26      | <=-22.775  | PASS    |
|          |         |         | 1000~26500      | 1000~26500     | -50.217     | <=-22.775  | PASS    |
|          |         | 2442    | Reference       | -3.24          | -3.24       | ---        | PASS    |
|          |         |         | 30~1000         | 30~1000        | -70.286     | <=-23.237  | PASS    |
|          |         |         | 1000~26500      | 1000~26500     | -48.843     | <=-23.237  | PASS    |
|          |         | 2480    | Reference       | -3.78          | -3.78       | ---        | PASS    |
|          |         |         | 30~1000         | 30~1000        | -70.161     | <=-23.775  | PASS    |
|          |         |         | 1000~26500      | 1000~26500     | -49.834     | <=-23.775  | PASS    |

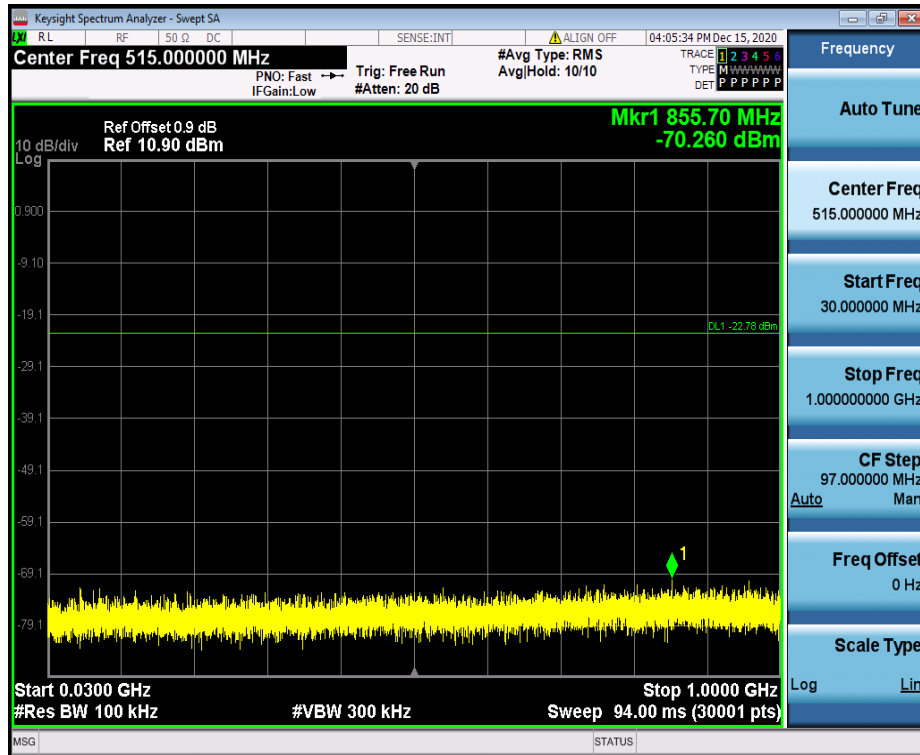
### 8.5.2 Test Graphs



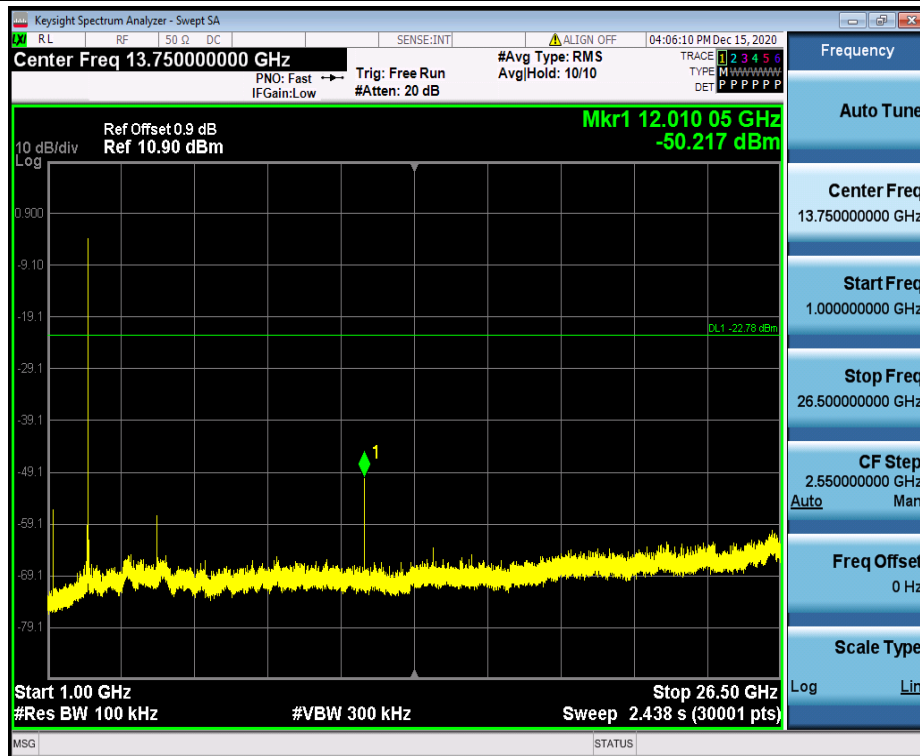
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BLE\_1M\_Ant1\_2402\_30~1000



BLE\_1M\_Ant1\_2402\_1000~26500



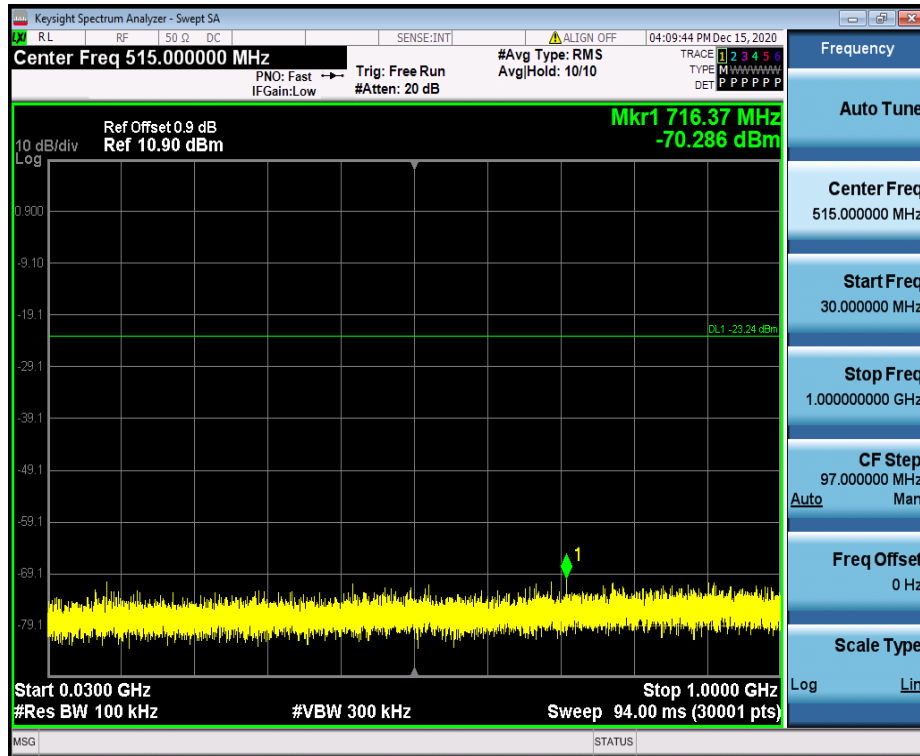
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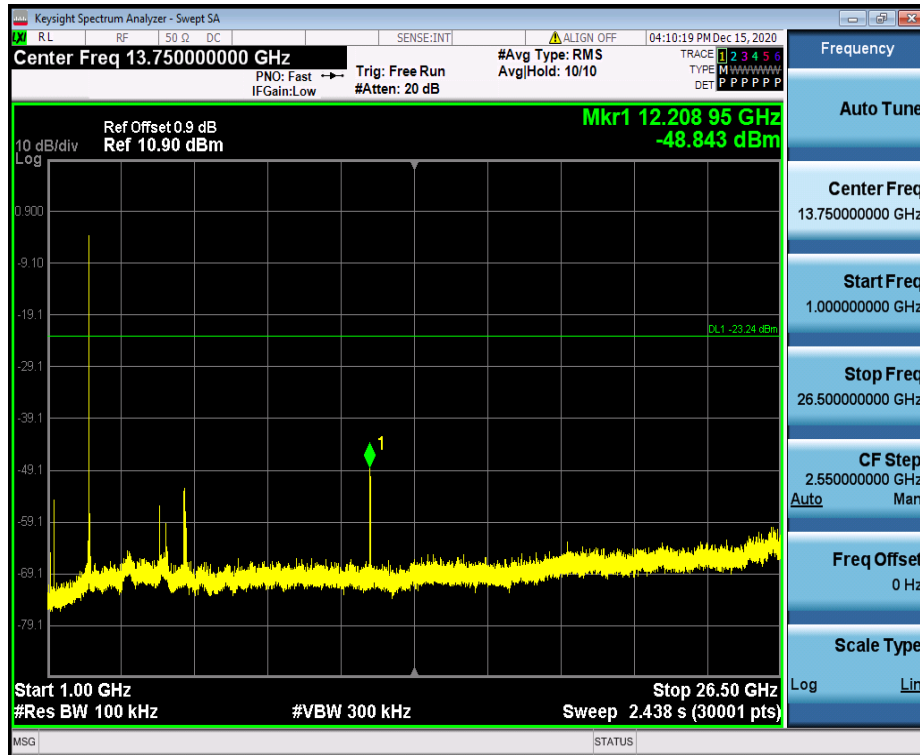
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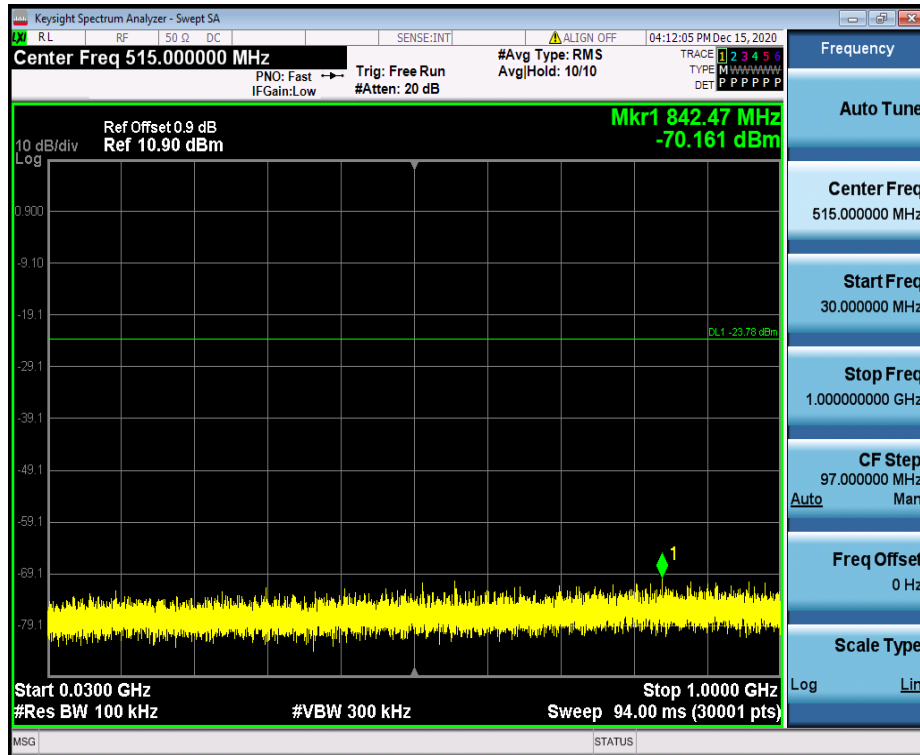
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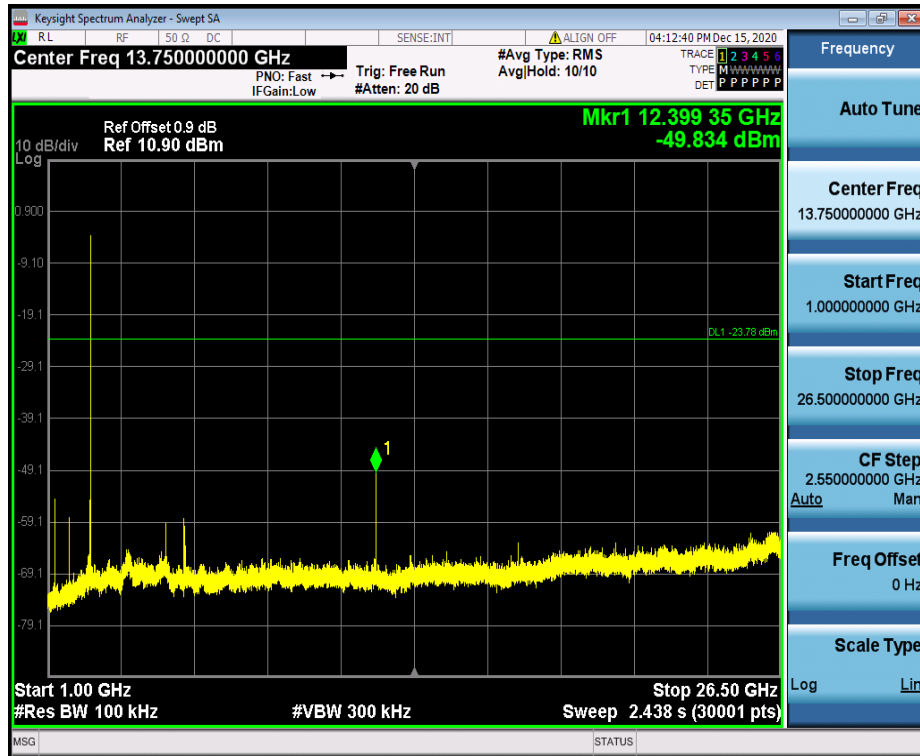
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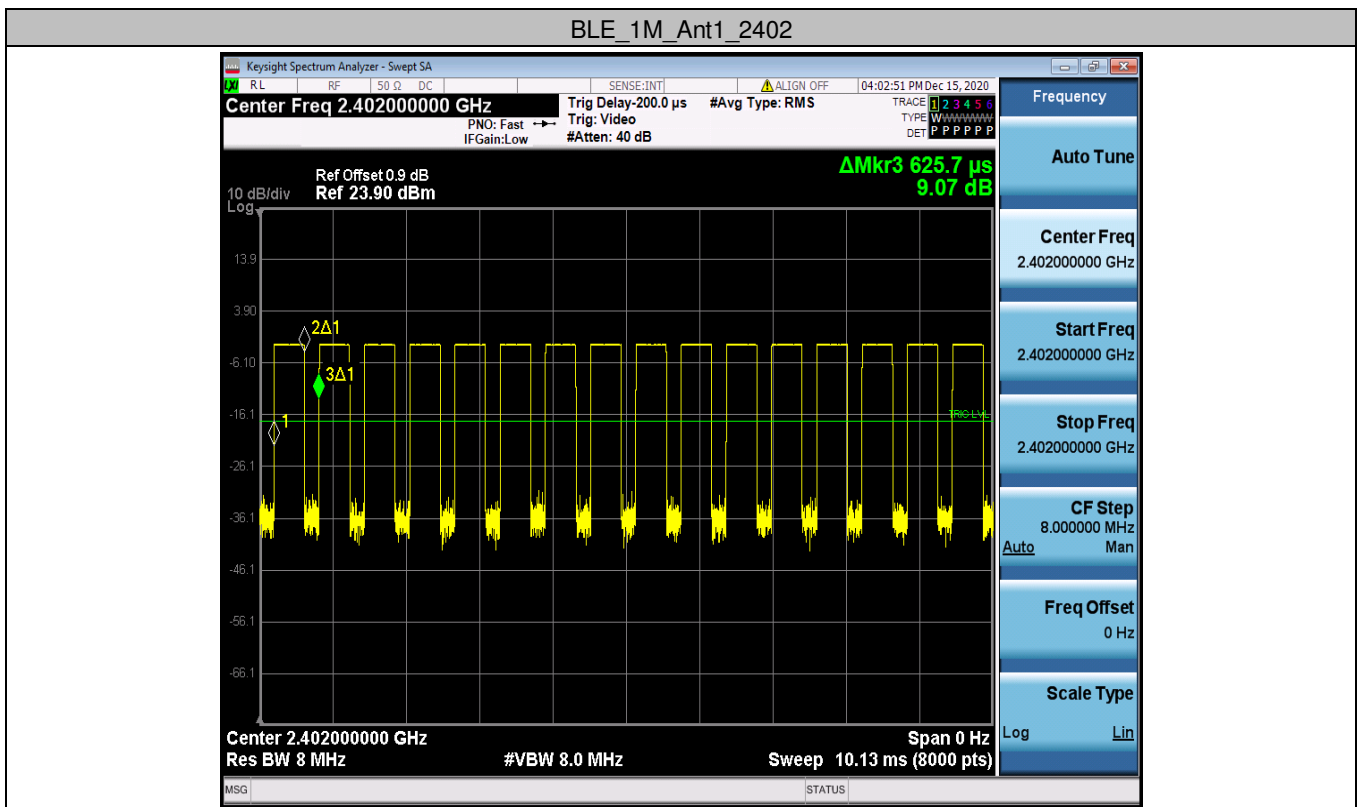
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## 8.6 Appendix F: Duty Cycle

### 8.6.1 Test Result

| TestMode | Antenna | Channel | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] |
|----------|---------|---------|----------------------------|--------------------------|----------------|
| BLE_1M   | Ant1    | 2402    | 0.42                       | 0.63                     | 67.41          |
|          |         | 2442    | 0.42                       | 0.63                     | 67.60          |
|          |         | 2480    | 0.42                       | 0.63                     | 67.60          |

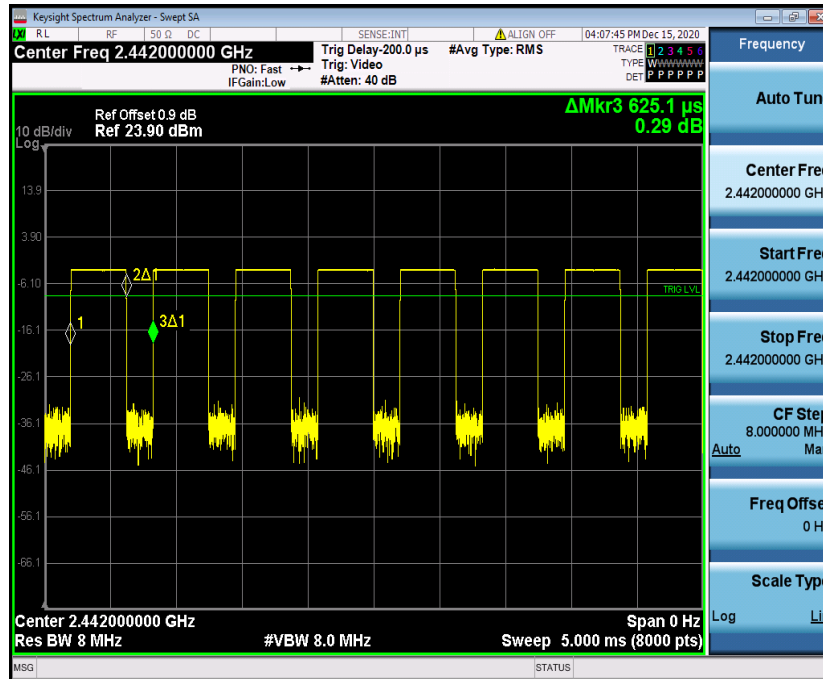
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