

## TEST REPORT

**Application No.:** SZEM1912021582CR  
**Applicant:** Mattel Asia Pacific Sourcing Ltd.  
**Address of Applicant:** 13/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui, Kowloon, HongKong  
**Manufacturer:** Mattel Asia Pacific Sourcing Ltd.  
**Address of Manufacturer:** 13/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui, Kowloon, HongKong  
**Equipment Under Test (EUT):**  
**EUT Name:** Fisher-Price® Linkimals™ Counting Koala  
**Model No.:** FYK60, GRG60, GRG61, GRG62, GRG63, GRG64, GRG65, GRG66, GRG67, GRG68, GRG69, GRG70, GRW44, GTL44, GVN29, GVN30, GXR20, GXR21, GXR22, GXR23, GXR24 ♣  
 ♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.  
**Trade mark:** Fisher Price  
**FCC ID:** PIY-FYK60-20-A5T  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
**Date of Receipt:** 2019-12-26  
**Date of Test:** 2020-01-03 to 2020-01-06  
**Date of Issue:** 2020-01-09

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

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

*Keny Xu*

Keny Xu  
 EMC Laboratory Manager



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| Revision Record |         |            |          |          |
|-----------------|---------|------------|----------|----------|
| Version         | Chapter | Date       | Modifier | Remark   |
| 01              |         | 2020-01-09 |          | Original |
|                 |         |            |          |          |
|                 |         |            |          |          |

|                                 |  |                                                                                     |  |
|---------------------------------|--|-------------------------------------------------------------------------------------|--|
| <b>Authorized for issue by:</b> |  |                                                                                     |  |
|                                 |  |    |  |
|                                 |  | <hr/> <b>Peter Geng /Project Engineer</b>                                           |  |
|                                 |  |  |  |
|                                 |  | <hr/> <b>Eric Fu /Reviewer</b>                                                      |  |



## 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)) | 47 CFR Part 15, Subpart C 15.249 | ANSI C63.10 (2013) Section 6.5&6.6     | 47 CFR Part 15, Subpart C 15.249(a)                   | Pass   |
| Restricted Band Around Fundamental Frequency         | 47 CFR Part 15, Subpart C 15.249 | ANSI C63.10 (2013) Section 6.4&6.5&6.6 | 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209 | Pass   |
| Radiated Emissions                                   | 47 CFR Part 15, Subpart C 15.249 | ANSI C63.10 (2013) Section 6.4&6.5&6.6 | 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)     | Pass   |

### Declaration of EUT Family Grouping:

Model No.: FYK60, GRG60, GRG61, GRG62, GRG63, GRG64, GRG65, GRG66, GRG67, GRG68, GRG69, GRG70, GRW44, GTL44, GVN29, GVN30, GXR20, GXR21, GXR22, GXR23, GXR24

Only the model FYK60 was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for the above models, with only difference on model name and IC language



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### 3 Contents

|                                                                | Page |
|----------------------------------------------------------------|------|
| 1 COVER PAGE .....                                             | 1    |
| 2 TEST SUMMARY .....                                           | 3    |
| 3 CONTENTS .....                                               | 4    |
| 4 GENERAL INFORMATION .....                                    | 5    |
| 4.1 DETAILS OF E.U.T. ....                                     | 5    |
| 4.2 DESCRIPTION OF SUPPORT UNITS .....                         | 5    |
| 4.3 MEASUREMENT UNCERTAINTY .....                              | 5    |
| 4.4 TEST LOCATION .....                                        | 6    |
| 4.5 TEST FACILITY .....                                        | 6    |
| 4.6 DEVIATION FROM STANDARDS .....                             | 6    |
| 4.7 ABNORMALITIES FROM STANDARD CONDITIONS .....               | 6    |
| 5 EQUIPMENT LIST .....                                         | 7    |
| 6 RADIO SPECTRUM TECHNICAL REQUIREMENT .....                   | 9    |
| 6.1 ANTENNA REQUIREMENT .....                                  | 9    |
| 6.1.1 Test Requirement: .....                                  | 9    |
| 6.1.2 Conclusion .....                                         | 9    |
| 7 RADIO SPECTRUM MATTER TEST RESULTS .....                     | 10   |
| 7.1 20dB BANDWIDTH .....                                       | 10   |
| 7.1.1 E.U.T. Operation .....                                   | 10   |
| 7.1.2 Test Setup Diagram .....                                 | 10   |
| 7.1.3 Measurement Procedure and Data .....                     | 10   |
| 7.2 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.249(A)) ..... | 14   |
| 7.2.1 E.U.T. Operation .....                                   | 15   |
| 7.2.2 Test Setup Diagram .....                                 | 15   |
| 7.2.3 Measurement Procedure and Data .....                     | 16   |
| 7.3 RESTRICTED BAND AROUND FUNDAMENTAL FREQUENCY .....         | 23   |
| 7.3.1 E.U.T. Operation .....                                   | 24   |
| 7.3.2 Test Setup Diagram .....                                 | 24   |
| 7.3.3 Measurement Procedure and Data .....                     | 25   |
| 7.4 RADIATED EMISSIONS .....                                   | 30   |
| 7.4.1 E.U.T. Operation .....                                   | 31   |
| 7.4.2 Test Setup Diagram .....                                 | 31   |
| 7.4.3 Measurement Procedure and Data .....                     | 32   |
| 8 PHOTOGRAPHS .....                                            | 41   |
| 8.1 TEST SETUP .....                                           | 41   |
| 8.2 EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS) .....              | 41   |

## 4 General Information

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

|                      |                                  |
|----------------------|----------------------------------|
| Power Supply:        | DC 4.5V by 3x1.5V "AA" batteries |
| Operation Frequency: | 2409MHz, 2428MHz, 2471MHz        |
| Modulation Type:     | GFSK                             |
| Number of Channels:  | 3                                |
| Antenna Type:        | Integral antenna                 |
| Antenna Gain:        | 3.42 dBi                         |

### 4.2 Description of Support Units

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

| No. | Item                            | Measurement Uncertainty         |
|-----|---------------------------------|---------------------------------|
| 1   | Radio Frequency                 | $\pm 7.25 \times 10^{-8}$       |
| 2   | Duty cycle                      | $\pm 0.37\%$                    |
| 3   | Occupied Bandwidth              | $\pm 3\%$                       |
| 4   | Radiated Spurious emission test | $\pm 4.5\text{dB}$ (Below 1GHz) |
|     |                                 | $\pm 4.8\text{dB}$ (Above 1GHz) |
| 5   | Temperature test                | $\pm 1^{\circ}\text{C}$         |
| 6   | Humidity test                   | $\pm 3\%$                       |
| 7   | Supply voltages                 | $\pm 1.5\%$                     |
| 8   | Time                            | $\pm 3\%$                       |

#### 4.4 Test Location

All tests were performed at:

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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**

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. 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: CN1178**

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

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **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

## 5 Equipment List

| 20dB Bandwidth                          |                        |                         |              |            |              |
|-----------------------------------------|------------------------|-------------------------|--------------|------------|--------------|
| Equipment                               | Manufacturer           | Model No                | Inventory No | Cal Date   | Cal Due Date |
| Shielding Room                          | SAEMC                  | MSR733                  | SEM001-09    | 2019-06-13 | 2022-06-12   |
| DC Power Supply                         | Zhao Xin               | KXN-6020D               | SEM011-08    | 2019-09-24 | 2020-09-23   |
| Spectrum Analyzer                       | Rohde & Schwarz        | FSP                     | SEM004-06    | 2019-09-24 | 2020-09-23   |
| Measurement Software                    | JS Tonscend            | JS1120-2<br>BT/WIFI V2. | N/A          | N/A        | N/A          |
| Coaxial Cable                           | SGS                    | N/A                     | SEM031-02    | 2019-07-11 | 2020-07-10   |
| Attenuator                              | Weinschel Associates   | WA41                    | SEM021-09    | N/A        | N/A          |
| Signal Generator                        | KEYSIGHT               | N5173B                  | SEM006-05    | 2019-09-24 | 2020-09-23   |
| Power Meter                             | Rohde & Schwarz        | NRVS                    | SEM014-02    | 2019-09-24 | 2020-09-23   |
| Electric and Magnetic<br>Field Analyzer | Narda                  | NBM-<br>550/EHP-50F     | EMC2143      | 2018-02-07 | 2020-02-06   |
| Electric Field Probe<br>(100KHz-3GHz)   | WANDEL &<br>GOLTERMANN | EMR-20                  | EMC0907      | 2019-05-21 | 2020-05-20   |
| EMF Tester                              | Narda                  | ELT-400                 | SZE039-4     | 2019-07-08 | 2020-07-07   |

| Field Strength of the Fundamental Signal/ Restricted Band Around Fundamental Frequency/ Radiated Emissions(above 1GHz) |                                          |                 |              |            |              |
|------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|--------------|------------|--------------|
| Equipment                                                                                                              | Manufacturer                             | Model No        | Inventory No | Cal Date   | Cal Due Date |
| 3m Semi-Anechoic Chamber                                                                                               | AUDIX                                    | N/A             | SEM001-02    | 2018-03-13 | 2021-03-12   |
| Measurement Software                                                                                                   | AUDIX                                    | e3 V8.2014-6-27 | N/A          | N/A        | N/A          |
| Coaxial Cable                                                                                                          | SGS                                      | N/A             | SEM026-01    | 2019-07-11 | 2020-07-10   |
| EXA Spectrum Analyzer                                                                                                  | AgilentTechnologies Inc                  | N9010A          | SEM004-12    | 2019-04-12 | 2020-04-11   |
| Horn Antenna<br>(1-18GHz)                                                                                              | Rohde & Schwarz                          | HF907           | SEM003-07    | 2018-04-13 | 2021-04-12   |
| Horn Antenna<br>(15GHz-40GHz)                                                                                          | Schwarzbeck                              | BBHA 9170       | SEM003-15    | 2017-10-17 | 2020-10-16   |
| Pre-Amplifier<br>(0.1-26.5GHz)                                                                                         | Compliance<br>Directions Systems<br>Inc. | PAP-0126        | SEM004-11    | 2019-09-24 | 2020-09-23   |
| Pre-amplifier<br>(18-26GHz)                                                                                            | Rohde & Schwarz                          | CH14-H052       | SEM005-17    | 2019-04-01 | 2020-03-31   |
| Pre-amplifier<br>(26GHz-40GHz)                                                                                         | Compliance<br>Directions Systems<br>Inc. | PAP-2640-50     | SEM005-08    | 2019-04-01 | 2020-03-31   |
| DC Power Supply                                                                                                        | Zhao Xin                                 | KXN-6020D       | SEM011-08    | 2019-09-24 | 2020-09-23   |
| Active Loop Antenna                                                                                                    | ETS-Lindgren                             | 6502            | SEM003-08    | 2017-08-22 | 2020-08-21   |

| <b>Radiated Emissions (30MHz-1GHz)</b> |                      |                 |               |            |               |
|----------------------------------------|----------------------|-----------------|---------------|------------|---------------|
| Test Equipment                         | Manufacturer         | Model No.       | Inventory No. | Cal. Date  | Cal. Due date |
| 3m Semi-Anechoic Chamber               | ETS-LINDGREN         | N/A             | SEM001-01     | 2017-08-05 | 2020-08-04    |
| MXE EMI Receiver (20Hz-8.4GHz)         | Agilent Technologies | N9038A          | SEM004-05     | 2019-09-24 | 2020-09-23    |
| BiConiLog Antenna (26-3000MHz)         | ETS-LINDGREN         | 3142C           | SEM003-01     | 2017-06-27 | 2020-06-26    |
| Pre-amplifier (0.1-1300MHz)            | Agilent Technologies | 8447D           | SEM005-01     | 2019-04-01 | 2020-03-31    |
| Measurement Software                   | AUDIX                | e3 V8.2014-6-27 | N/A           | N/A        | N/A           |
| Coaxial Cable                          | SGS                  | N/A             | SEM025-01     | 2019-07-11 | 2020-07-10    |

| <b>General used equipment</b>   |                                           |          |              |            |              |
|---------------------------------|-------------------------------------------|----------|--------------|------------|--------------|
| Equipment                       | Manufacturer                              | Model No | Inventory No | Cal Date   | Cal Due Date |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory  | ZJ1-2B   | SEM002-03    | 2019-09-26 | 2020-09-25   |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory  | ZJ1-2B   | SEM002-04    | 2019-09-26 | 2020-09-25   |
| Humidity/ Temperature Indicator | Mingle                                    | N/A      | SEM002-08    | 2019-09-26 | 2020-09-25   |
| Barometer                       | Changchun Meteorological Industry Factory | DYM3     | SEM002-01    | 2019-04-04 | 2020-04-03   |



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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

Limit:

15.203 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.

#### 6.1.2 Conclusion

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.42dBi.

Antenna location: Refer to Internal photos



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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  
Limit: N/A

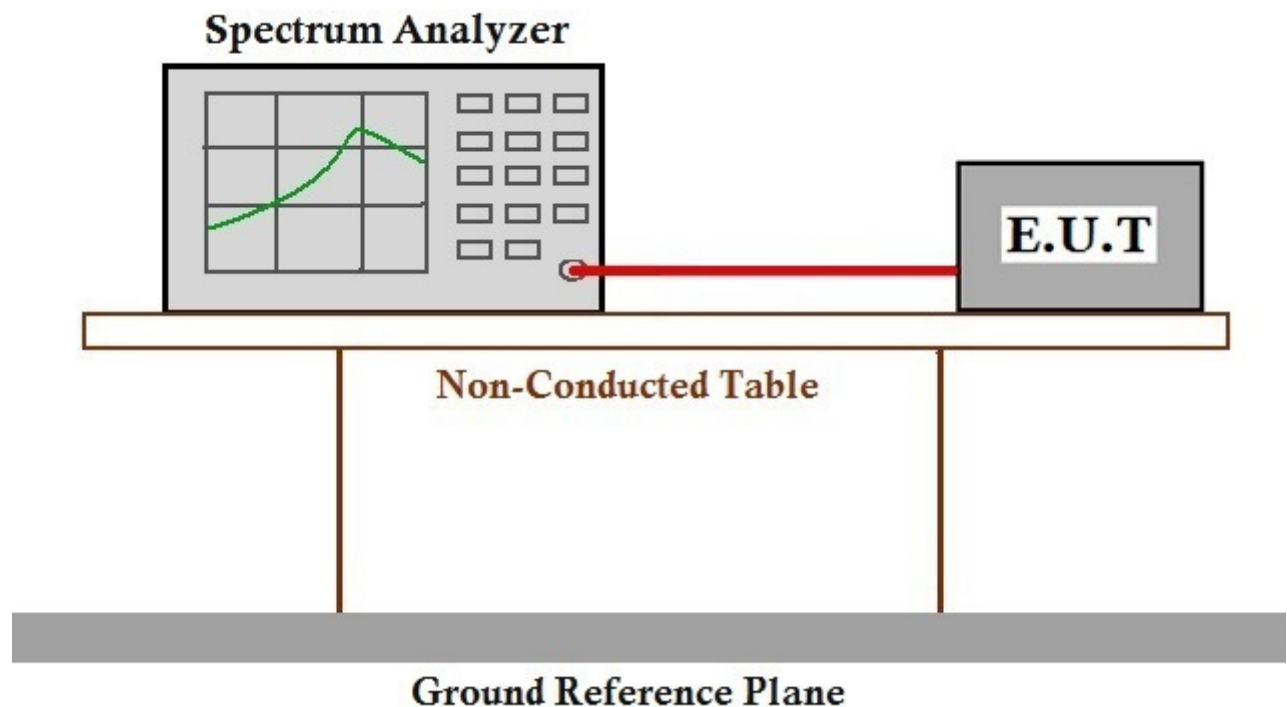
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.8 °C Humidity: 44.5 % RH Atmospheric Pressure: 1015 mbar

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

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data



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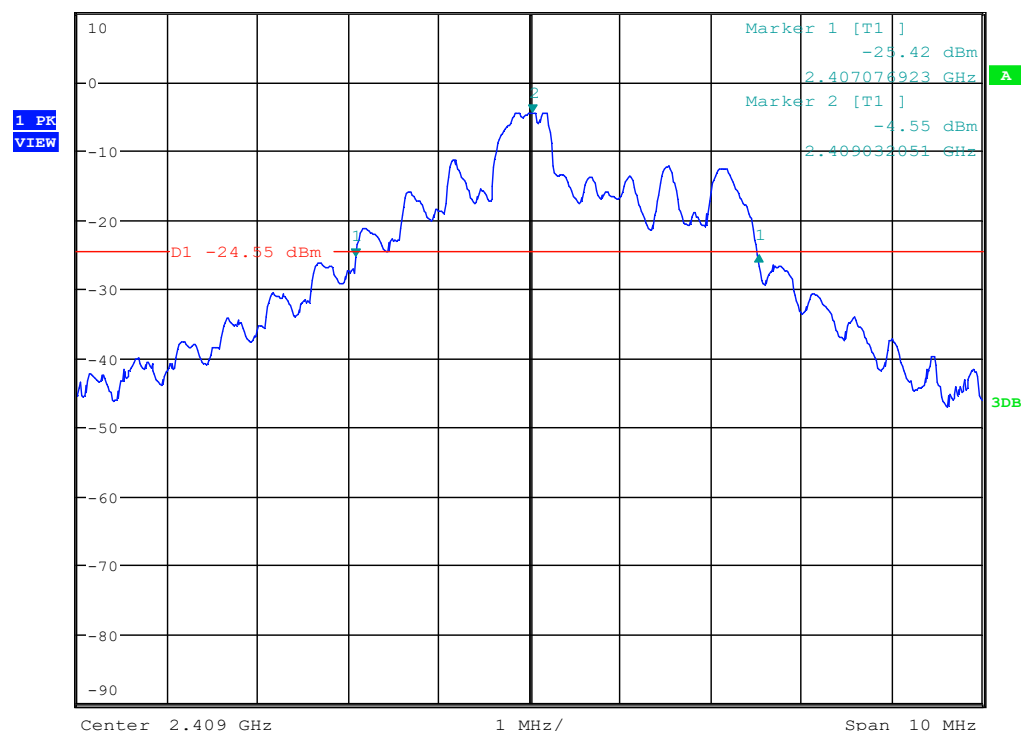
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Mode:a; Channel:Low



\*RBW 100 kHz Delta 1 [T1 ]  
\*VBW 300 kHz 0.31 dB  
SWT 5 ms 4.455128205 MHz

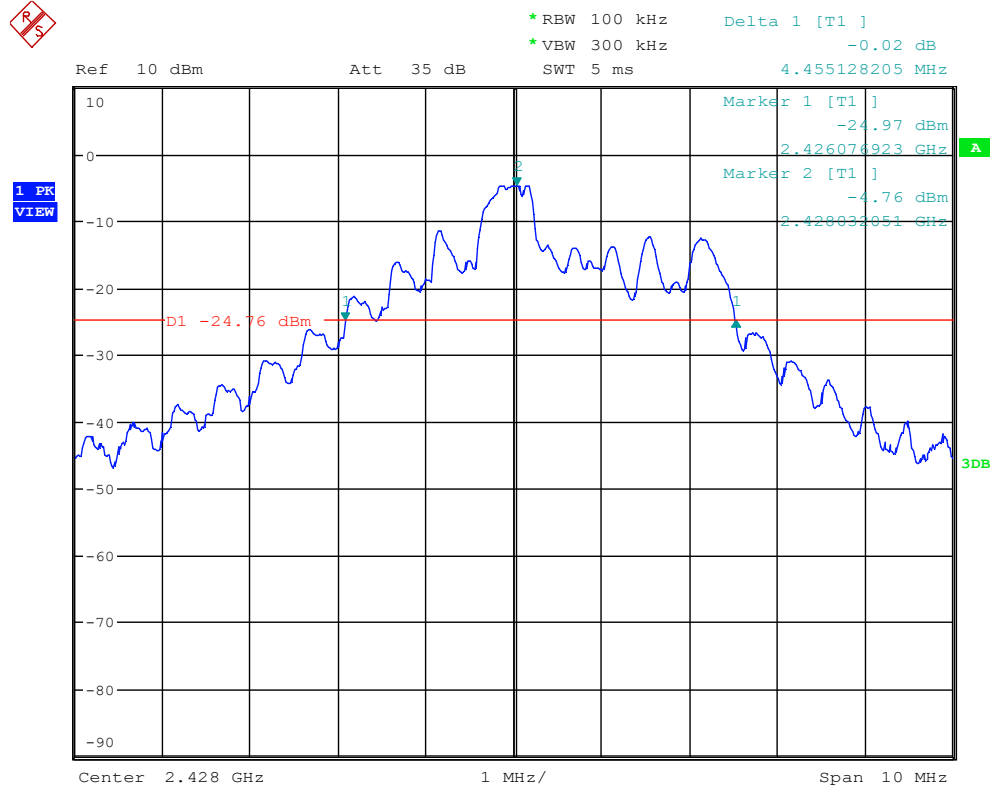


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Mode:a; Channel:middle

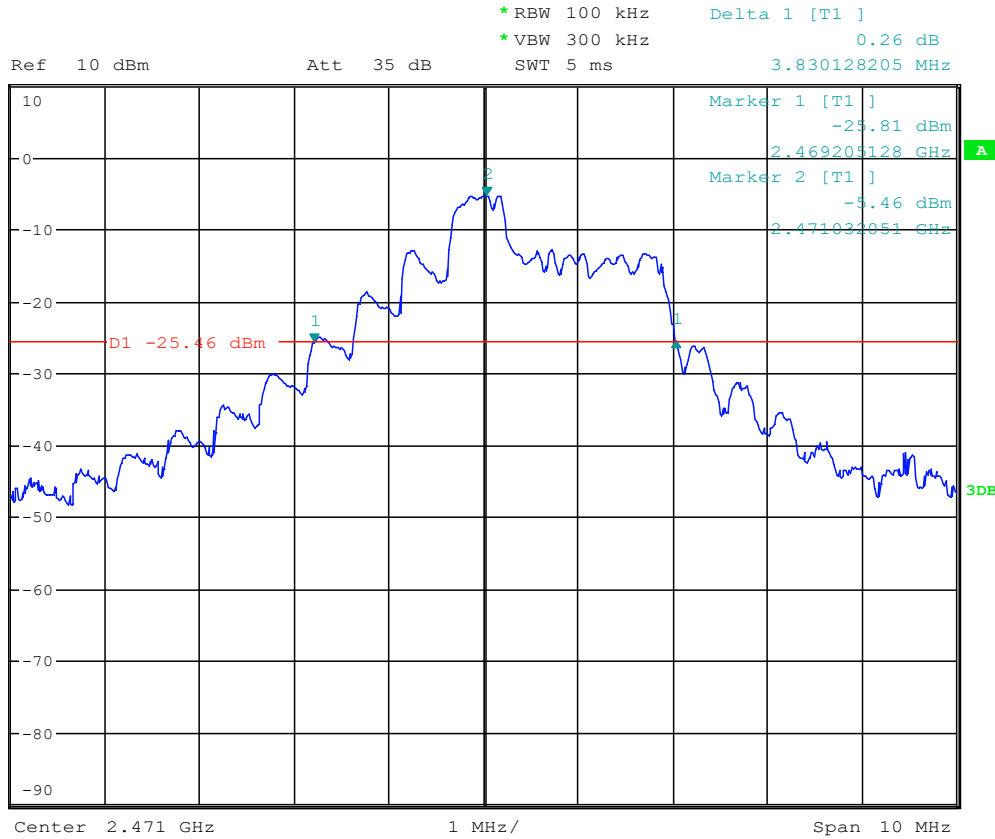




Mode:a; Channel:High



1 PK  
VIEW





## 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.  
For fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.



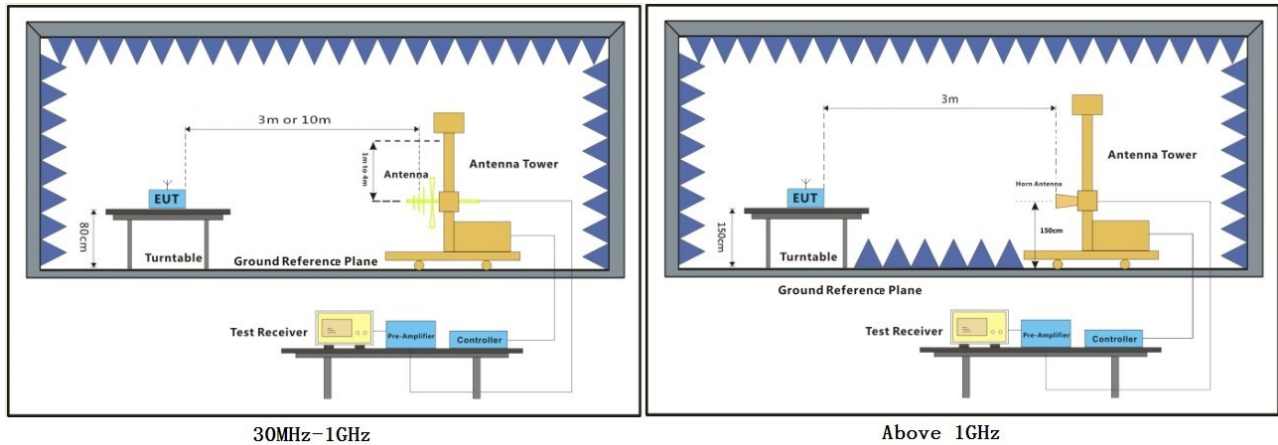
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar

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

### 7.2.2 Test Setup Diagram



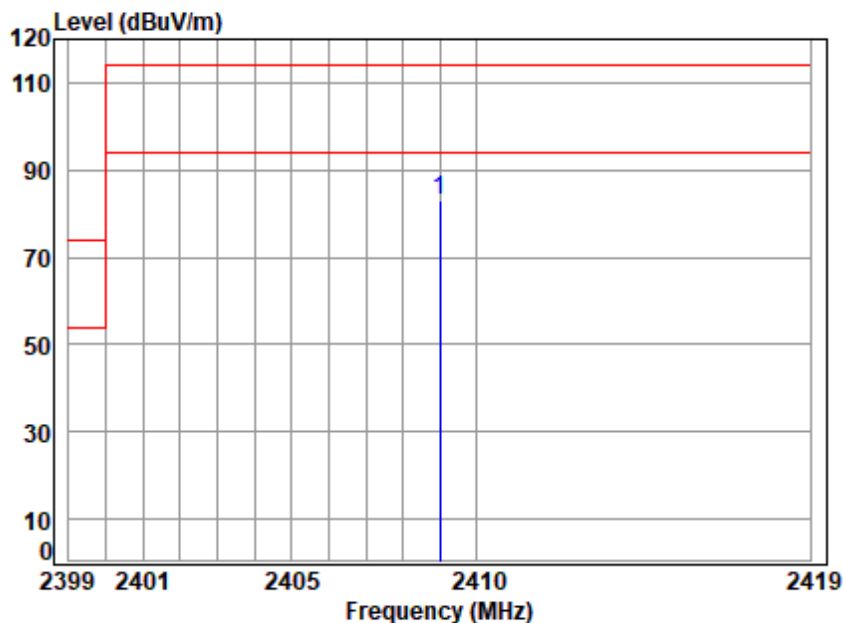
### 7.2.3 Measurement Procedure and Data

- 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.

Remark1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark2: 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.

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



Site : chamber

Condition: 3m HORIZONTAL

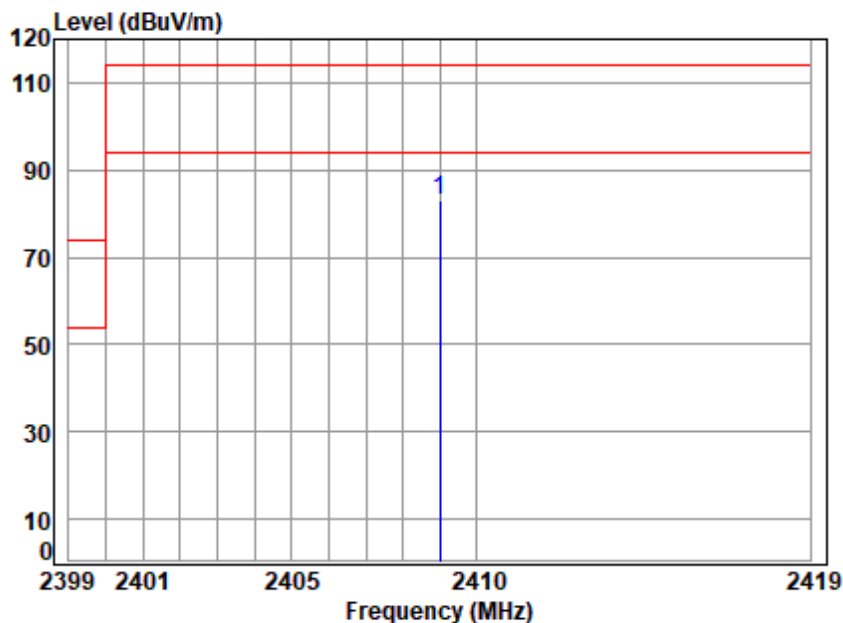
Job No : 00044CR/21582CR

Mode : 2409 Field strength

|      |          | Cable  | Ant    | Preamp | Read   | Limit  | Over   |             |
|------|----------|--------|--------|--------|--------|--------|--------|-------------|
| Freq | Loss     | Factor | Factor | Level  | Level  | Line   | Limit  | Remark      |
| MHz  | dB       | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |             |
| 1    | 2409.000 | 3.66   | 28.55  | 40.98  | 91.63  | 82.86  | 114.00 | -31.14 peak |



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



Site : chamber

Condition: 3m VERTICAL

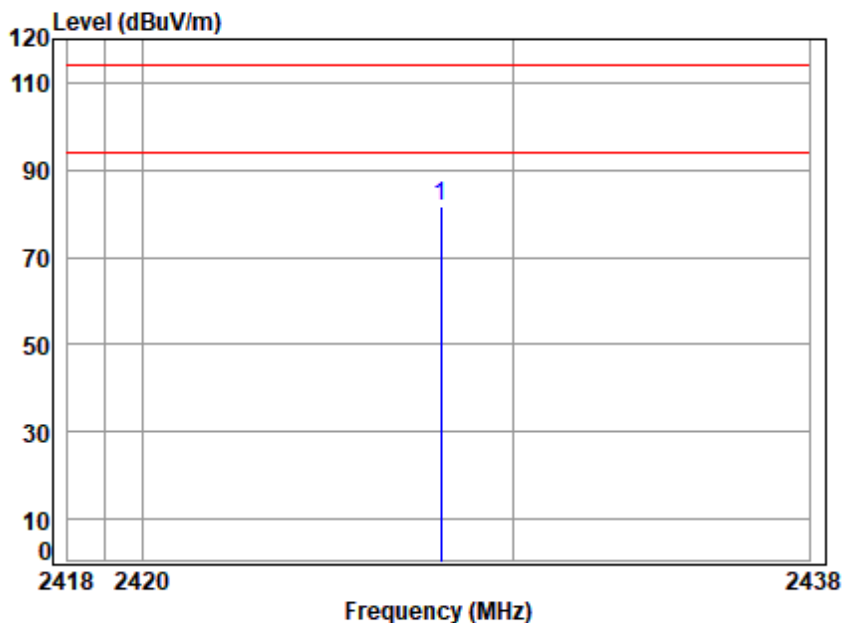
Job No : 00044CR/21582CR

Mode : 2409 Field strength

|            |      | Cable  | Ant    | Preamp | Read   | Limit  | Over   |        |
|------------|------|--------|--------|--------|--------|--------|--------|--------|
| Freq       | Loss | Factor | Factor | Level  | Level  | Line   | Limit  | Remark |
| MHz        | dB   | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |        |
| 1 2409.000 | 3.66 | 28.55  | 40.98  | 91.64  | 82.87  | 114.00 | -31.13 | peak   |



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



Site : chamber

Condition: 3m HORIZONTAL

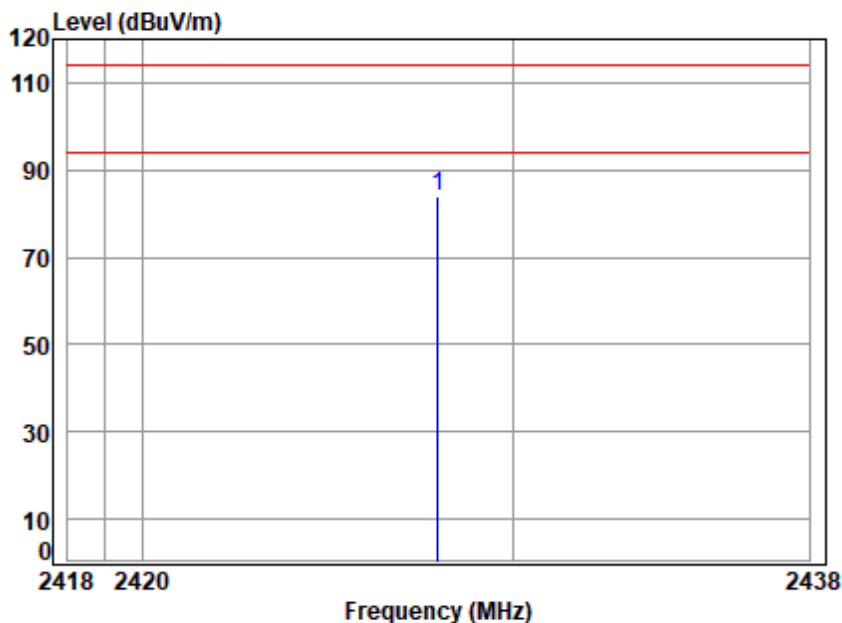
Job No : 00044CR/21582CR

Mode : 2428 Field strength

|      |          | Cable  | Ant    | Preamp | Read   | Limit  | Over   |             |
|------|----------|--------|--------|--------|--------|--------|--------|-------------|
| Freq | Loss     | Factor | Factor | Level  | Level  | Line   | Limit  | Remark      |
| MHz  | dB       | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |             |
| 1    | 2428.041 | 3.75   | 28.58  | 40.99  | 90.43  | 81.77  | 114.00 | -32.23 Peak |



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



Site : chamber

Condition: 3m VERTICAL

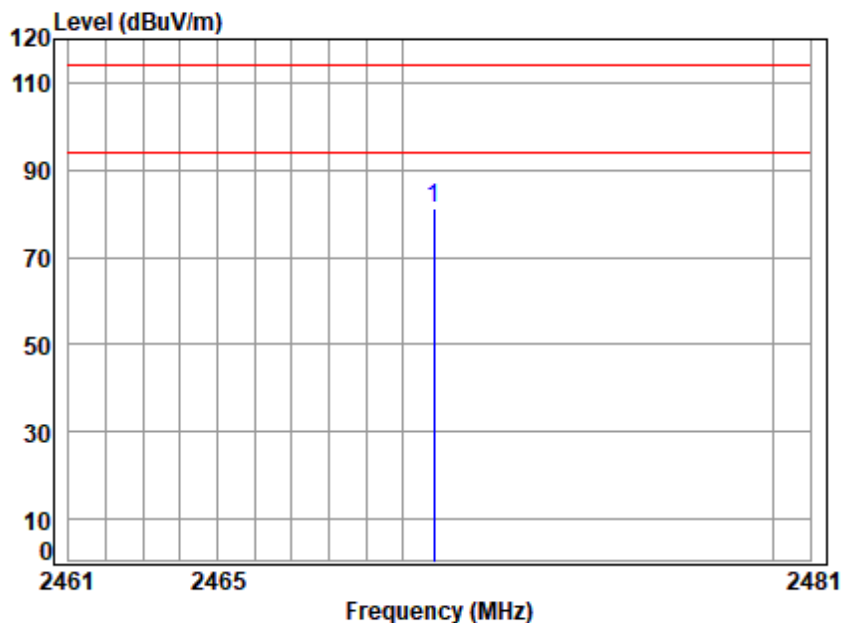
Job No : 00044CR/21582CR

Mode : 2428 Field strength

|      |          | Cable  | Ant    | Preamp | Read   | Limit  | Over   |             |
|------|----------|--------|--------|--------|--------|--------|--------|-------------|
| Freq | Loss     | Factor | Factor | Level  | Level  | Line   | Limit  | Remark      |
| MHz  | dB       | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |             |
| 1    | 2427.961 | 3.75   | 28.58  | 40.99  | 92.82  | 84.16  | 114.00 | -29.84 Peak |



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



Site : chamber

Condition: 3m HORIZONTAL

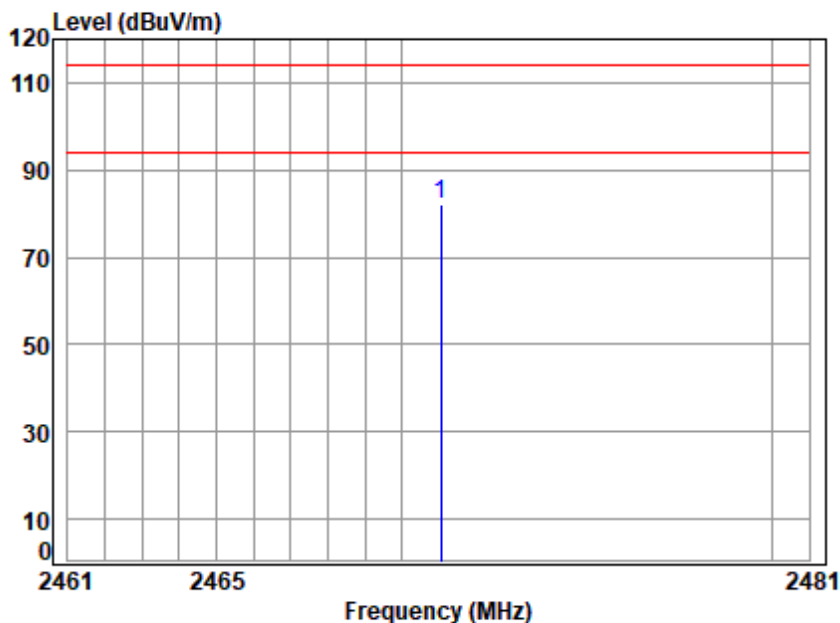
Job No : 00044CR/21582CR

Mode : 2471 Field strength

|            | Cable | Ant    | Preamp | Read  | Limit  | Over   |              |
|------------|-------|--------|--------|-------|--------|--------|--------------|
| Freq       | Loss  | Factor | Factor | Level | Level  | Line   | Limit Remark |
| MHz        | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB           |
| 1 2470.840 | 3.95  | 28.65  | 41.01  | 89.45 | 81.04  | 114.00 | -32.96 Peak  |



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



Site : chamber

Condition: 3m VERTICAL

Job No : 00044CR/21582CR

Mode : 2471 Field strength

|      |          | Cable  | Ant    | Preamp | Read   | Limit  | Over   |             |
|------|----------|--------|--------|--------|--------|--------|--------|-------------|
| Freq | Loss     | Factor | Factor | Level  | Level  | Line   | Limit  | Remark      |
| MHz  | dB       | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |             |
| 1    | 2471.060 | 3.95   | 28.65  | 41.01  | 90.41  | 82.00  | 114.00 | -32.00 Peak |





### 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 6.4&6.5&6.6  
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.



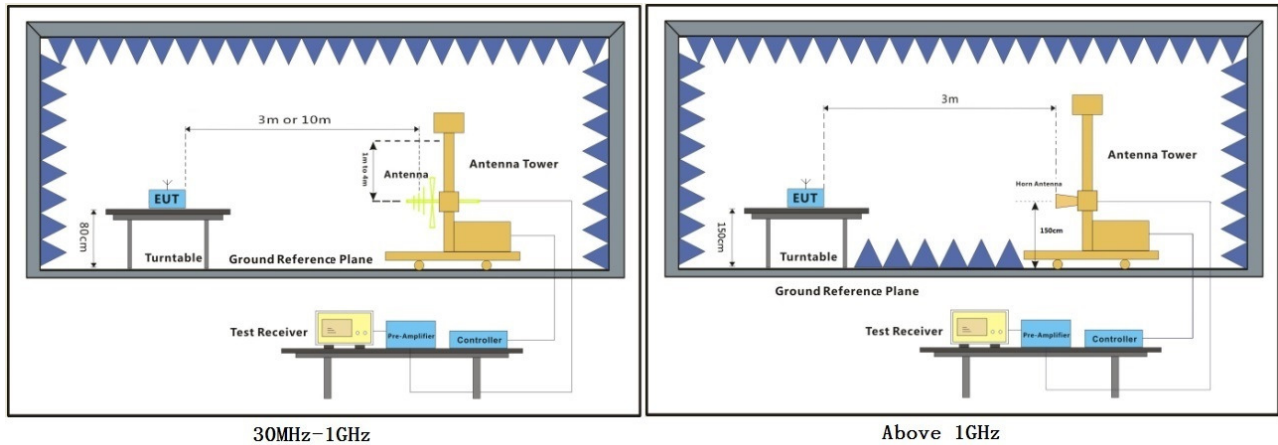
### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1015 mbar

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

### 7.3.2 Test Setup Diagram



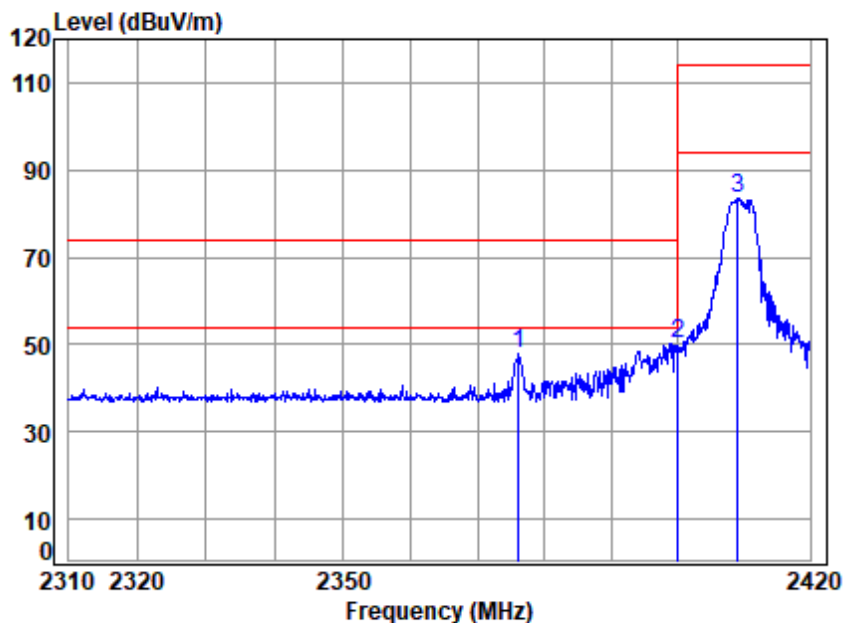
### 7.3.3 Measurement Procedure and Data

- 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.

Remark1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark2: 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.

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



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00044CR/21582CR  
Mode : 2409 Band edge

|      |          | Cable | Ant    | Preamp | Read  | Limit  | Over   |              |
|------|----------|-------|--------|--------|-------|--------|--------|--------------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB           |
| 1    | 2376.159 | 3.78  | 28.50  | 40.97  | 56.40 | 47.71  | 74.00  | -26.29 Peak  |
| 2    | 2400.000 | 3.63  | 28.53  | 40.98  | 59.16 | 50.34  | 74.00  | -23.66 peak  |
| 3    | 2409.104 | 3.66  | 28.55  | 40.98  | 92.06 | 83.29  | 114.00 | -30.71 peak  |

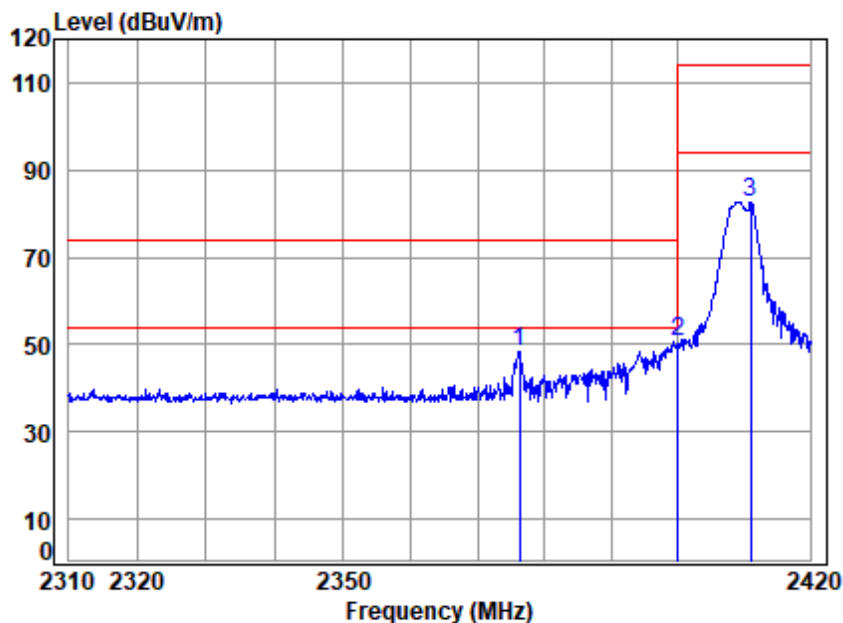


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00044CR/21582CR  
Mode : 2409 Band edge

|      |          | Cable  | Ant    | Preamp | Read   | Limit  | Over   |             |
|------|----------|--------|--------|--------|--------|--------|--------|-------------|
| Freq | Loss     | Factor | Factor | Level  | Level  | Line   | Limit  | Remark      |
| MHz  | dB       | dB/m   | dB     | dBuV   | dBuV/m | dBuV/m | dB     |             |
| 1    | 2376.269 | 3.78   | 28.50  | 40.97  | 57.26  | 48.57  | 74.00  | -25.43 Peak |
| 2    | 2400.000 | 3.62   | 28.53  | 40.98  | 59.39  | 50.56  | 74.00  | -23.44 peak |
| 3    | 2411.010 | 3.67   | 28.55  | 40.98  | 91.55  | 82.79  | 114.00 | -31.21 peak |

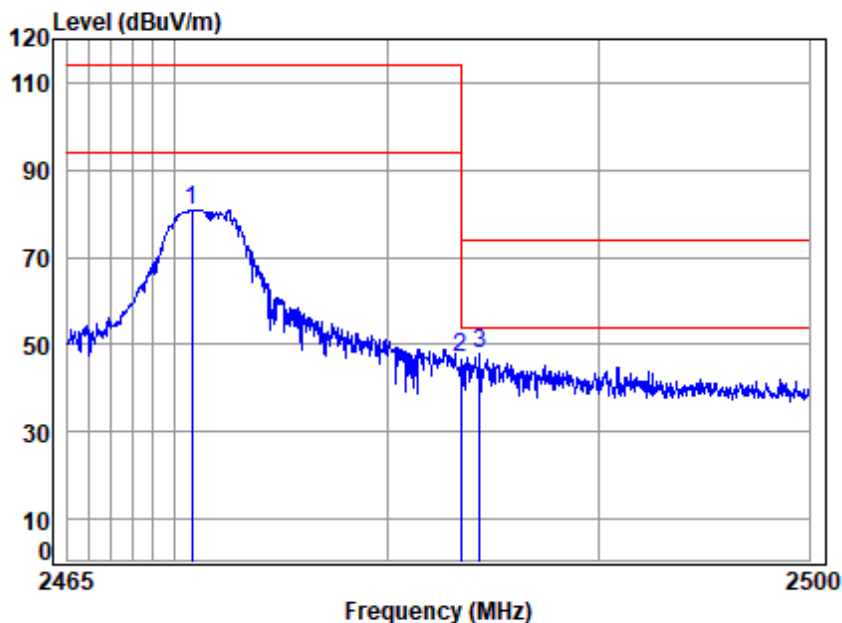


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Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00044CR/21582CR  
Mode : 2471 Band edge

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 2470.845 | 3.95  | 28.65  | 41.01  | 89.28 | 80.87  | 114.00 | -33.13 | peak   |
| 2    | 2483.500 | 4.01  | 28.67  | 41.01  | 55.20 | 46.87  | 74.00  | -27.13 | peak   |
| 3    | 2484.399 | 4.01  | 28.67  | 41.01  | 56.03 | 47.70  | 74.00  | -26.30 | Peak   |

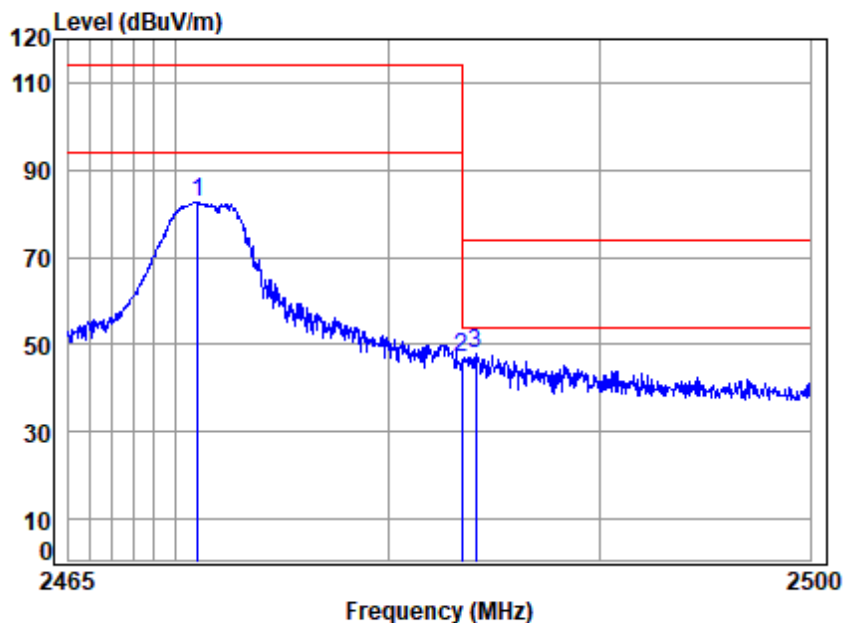


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Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:High



Site : chamber

Condition: 3m VERTICAL

Job No : 00044CR/21582CR

Mode : 2471 Band edge

|      |          | Cable  | Ant    | Preamp | Read  | Limit  | Over   |              |
|------|----------|--------|--------|--------|-------|--------|--------|--------------|
| Freq | Loss     | Factor | Factor | Factor | Level | Level  | Line   | Limit Remark |
| MHz  | dB       |        | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB           |
| 1    | 2471.055 | 3.95   | 28.65  | 41.01  | 90.81 | 82.40  | 114.00 | -31.60 peak  |
| 2    | 2483.500 | 4.01   | 28.67  | 41.01  | 55.31 | 46.98  | 74.00  | -27.02 peak  |
| 3    | 2484.154 | 4.01   | 28.67  | 41.01  | 56.16 | 47.83  | 74.00  | -26.17 Peak  |



## 7.4 Radiated Emissions

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&6.6

Measurement Distance: 3m

Limit:

| Frequency(MHz) | Field strength<br>(microvolts/meter) | Limit<br>(dBuV/m) | Detector | Measurement Distance<br>(meters) |
|----------------|--------------------------------------|-------------------|----------|----------------------------------|
| 0.009-0.490    | 2400/F(kHz)                          | -                 | -        | 300                              |
| 0.490-1.705    | 24000/F(kHz)                         | -                 | -        | 30                               |
| 1.705-30       | 30                                   | -                 | -        | 30                               |
| 30-88          | 100                                  | 40.0              | QP       | 3                                |
| 88-216         | 150                                  | 43.5              | QP       | 3                                |
| 216-960        | 200                                  | 46.0              | QP       | 3                                |
| 960-1000       | 500                                  | 54.0              | QP       | 3                                |
| Above 1000     | 500                                  | 54.0              | AV       | 3                                |

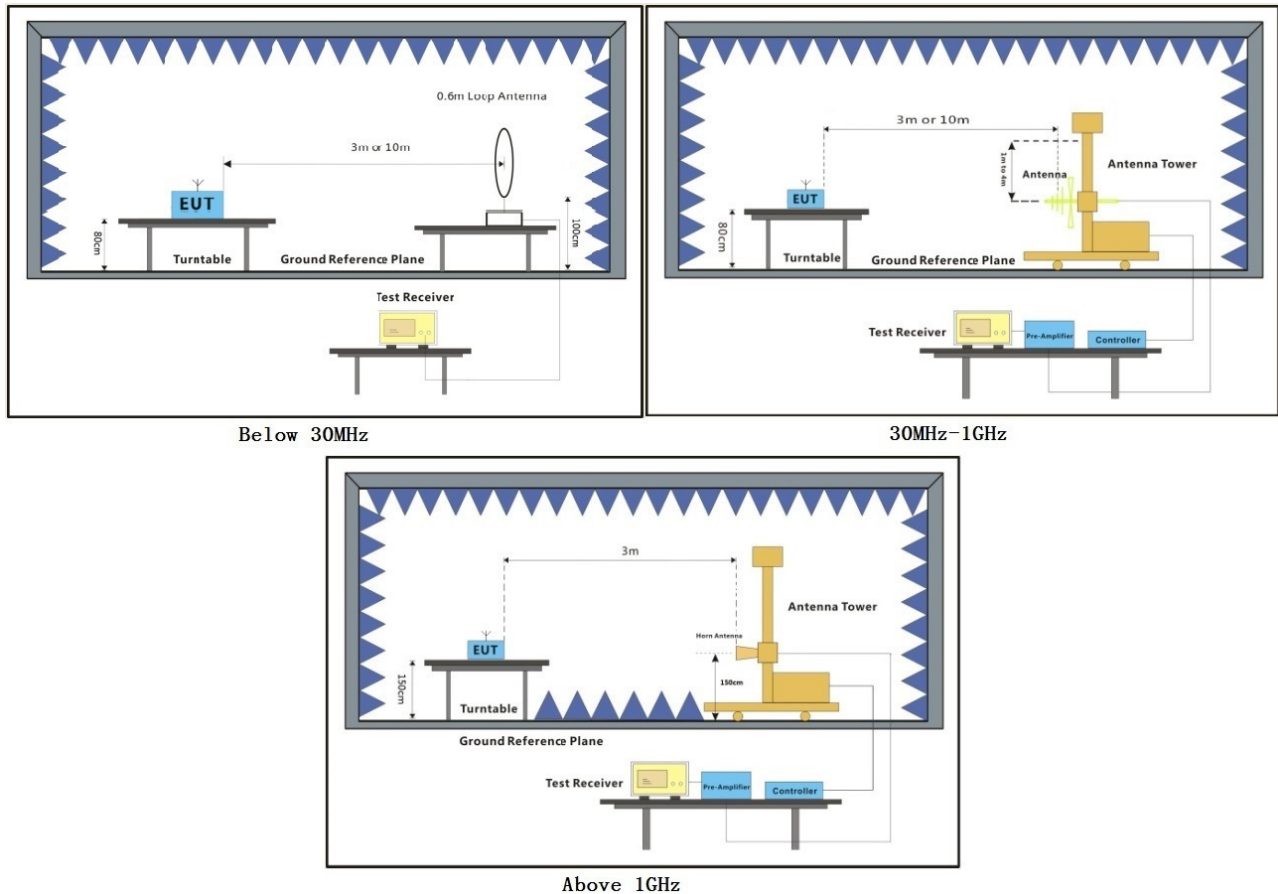
### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 51 % RH Atmospheric Pressure: 1015 mbar

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

### 7.4.2 Test Setup Diagram



### 7.4.3 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

- 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.

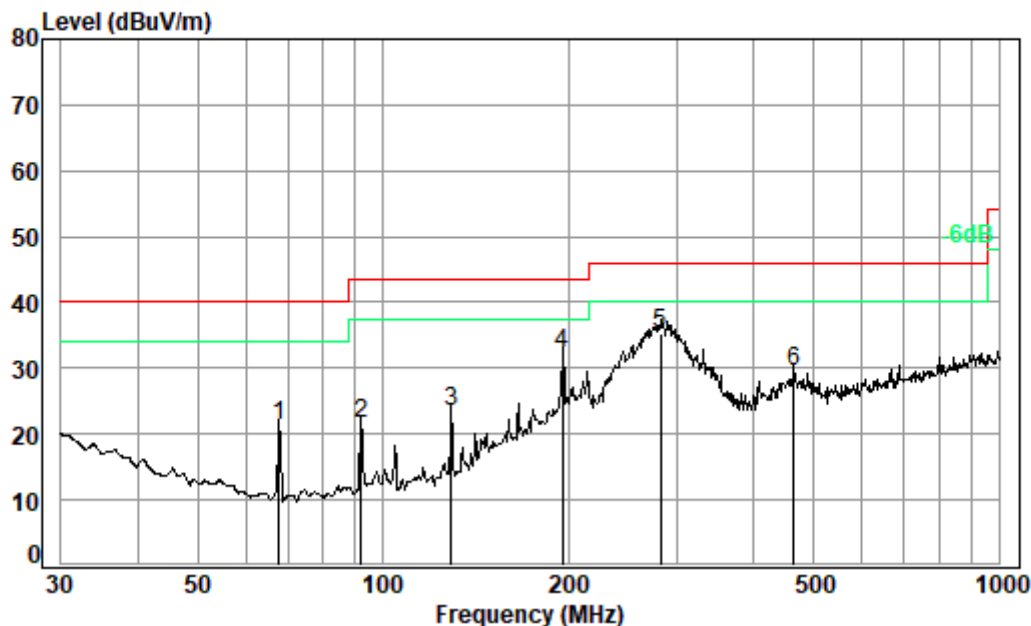
Remark1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamplifier Factor

Remark2: Remark: for below 30MHz, all tests margins are more than 10 dB relative to the limit, so it is not reported and it is deemed to comply with the requirement.

Remark3: 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.

Below 1GHz

Mode:a; Polarization:Horizontal;



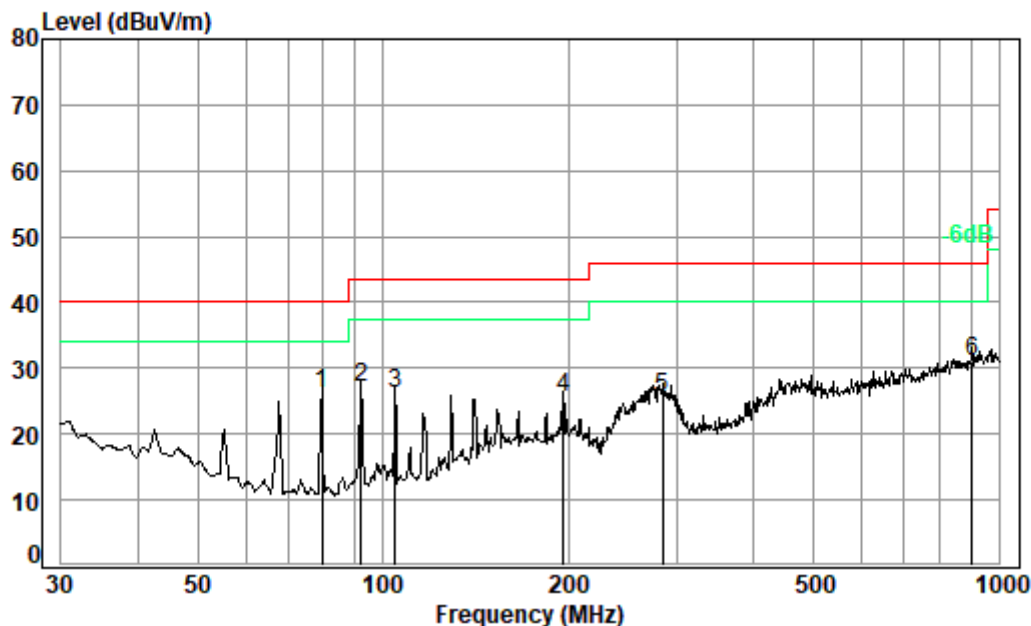
Condition: 3m HORIZONTAL

Job No. : 21582CR

Test mode: a

|      | Freq   | Cable Loss | Ant Factor | Preamp Factor | Read Level | Level  | Limit  | Over   | Remark |
|------|--------|------------|------------|---------------|------------|--------|--------|--------|--------|
|      | MHz    | dB         | dB/m       | dB            | dBuV       | dBuV/m | dBuV/m | dB     |        |
| 1    | 67.91  | 0.80       | 12.88      | 27.67         | 35.16      | 21.17  | 40.00  | -18.83 | QP     |
| 2    | 92.14  | 1.12       | 13.30      | 27.65         | 34.68      | 21.45  | 43.50  | -22.05 | QP     |
| 3    | 129.01 | 1.27       | 13.38      | 27.47         | 36.20      | 23.38  | 43.50  | -20.12 | QP     |
| 4    | 195.82 | 1.39       | 16.38      | 27.18         | 41.64      | 32.23  | 43.50  | -11.27 | QP     |
| 5 pp | 281.99 | 1.82       | 18.88      | 26.93         | 41.64      | 35.41  | 46.00  | -10.59 | QP     |
| 6    | 463.97 | 2.47       | 23.86      | 27.70         | 30.88      | 29.51  | 46.00  | -16.49 | QP     |

Mode:a; Polarization:Vertical;



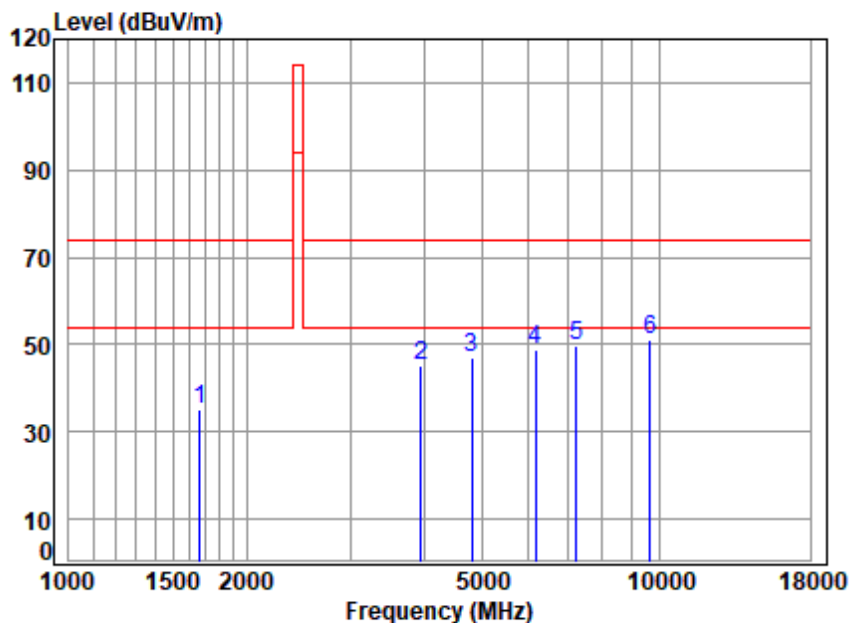
Condition: 3m VERTICAL

Job No. : 21582CR

Test mode: a

|   |      | Cable  | Ant    | Preamp | Read  |        | Limit  | Over  |           |
|---|------|--------|--------|--------|-------|--------|--------|-------|-----------|
|   | Freq | Loss   | Factor | Factor | Level | Level  | Line   | Limit | Remark    |
|   | MHz  | dB     | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB    |           |
| 1 | pp   | 79.52  | 1.08   | 12.04  | 27.66 | 40.79  | 26.25  | 40.00 | -13.75 QP |
| 2 |      | 92.14  | 1.12   | 13.30  | 27.65 | 40.20  | 26.97  | 43.50 | -16.53 QP |
| 3 |      | 104.54 | 1.21   | 13.78  | 27.61 | 38.78  | 26.16  | 43.50 | -17.34 QP |
| 4 |      | 196.51 | 1.39   | 16.40  | 27.18 | 34.87  | 25.48  | 43.50 | -18.02 QP |
| 5 |      | 283.98 | 1.83   | 18.96  | 26.93 | 31.77  | 25.63  | 46.00 | -20.37 QP |
| 6 |      | 903.31 | 3.60   | 29.82  | 27.28 | 24.94  | 31.08  | 46.00 | -14.92 QP |

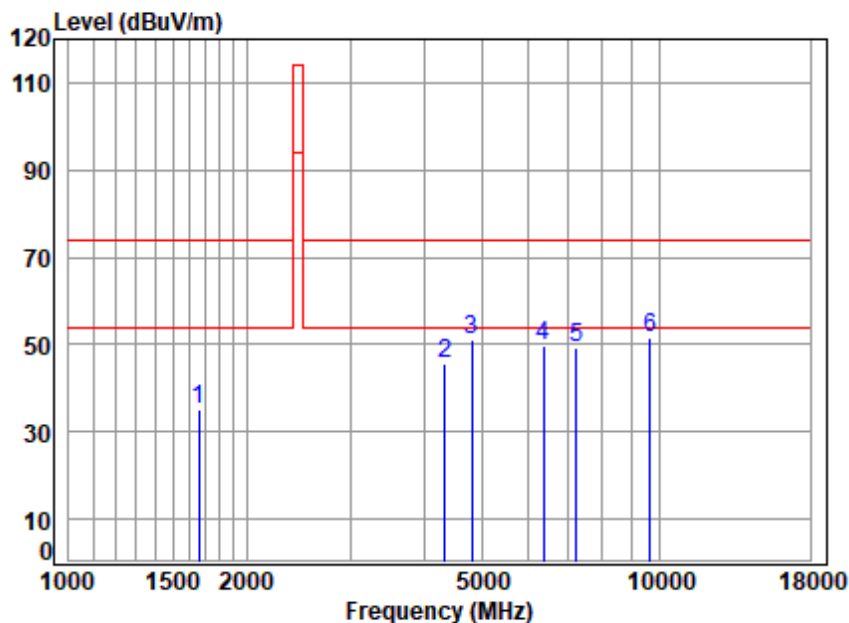
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:Low



Site : chamber  
Condition: 3m Horizontal  
Job No : 00044CR/21582CR  
Mode : 2409 TX RSE

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 1667.951 | 3.20  | 26.54  | 40.61  | 46.17 | 35.30  | 74.00  | -38.70 | peak   |
| 2    | 3946.885 | 5.99  | 32.60  | 42.11  | 48.69 | 45.17  | 74.00  | -28.83 | peak   |
| 3    | 4818.000 | 6.85  | 33.99  | 42.78  | 49.16 | 47.22  | 74.00  | -26.78 | peak   |
| 4    | 6177.627 | 7.59  | 35.28  | 42.14  | 47.98 | 48.71  | 74.00  | -25.29 | Peak   |
| 5    | 7227.000 | 8.43  | 36.09  | 41.57  | 46.85 | 49.80  | 74.00  | -24.20 | peak   |
| 6    | 9640.000 | 9.36  | 37.69  | 38.53  | 42.60 | 51.12  | 74.00  | -22.88 | peak   |

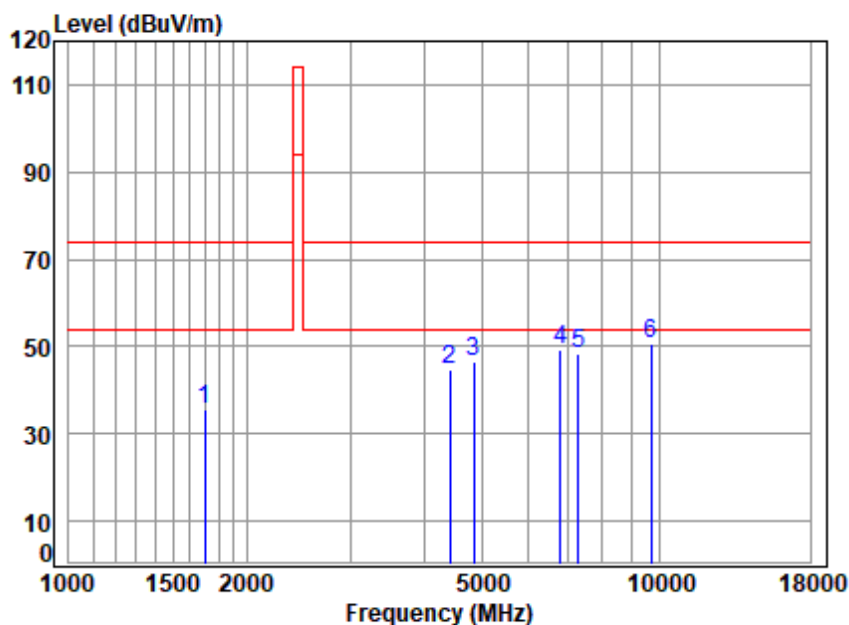
Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:Low



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00044CR/21582CR  
Mode : 2409 TX RSE

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 1663.137 | 3.18  | 26.52  | 40.61  | 46.13 | 35.22  | 74.00  | -38.78 | peak   |
| 2    | 4341.886 | 6.46  | 33.33  | 42.43  | 48.07 | 45.43  | 74.00  | -28.57 | peak   |
| 3    | 4818.000 | 6.85  | 33.99  | 42.78  | 53.25 | 51.31  | 74.00  | -22.69 | peak   |
| 4    | 6358.789 | 7.48  | 35.46  | 42.03  | 48.80 | 49.71  | 74.00  | -24.29 | Peak   |
| 5    | 7227.000 | 8.43  | 36.09  | 41.57  | 46.50 | 49.45  | 74.00  | -24.55 | peak   |
| 6    | 9640.000 | 9.36  | 37.69  | 38.53  | 42.89 | 51.41  | 74.00  | -22.59 | peak   |

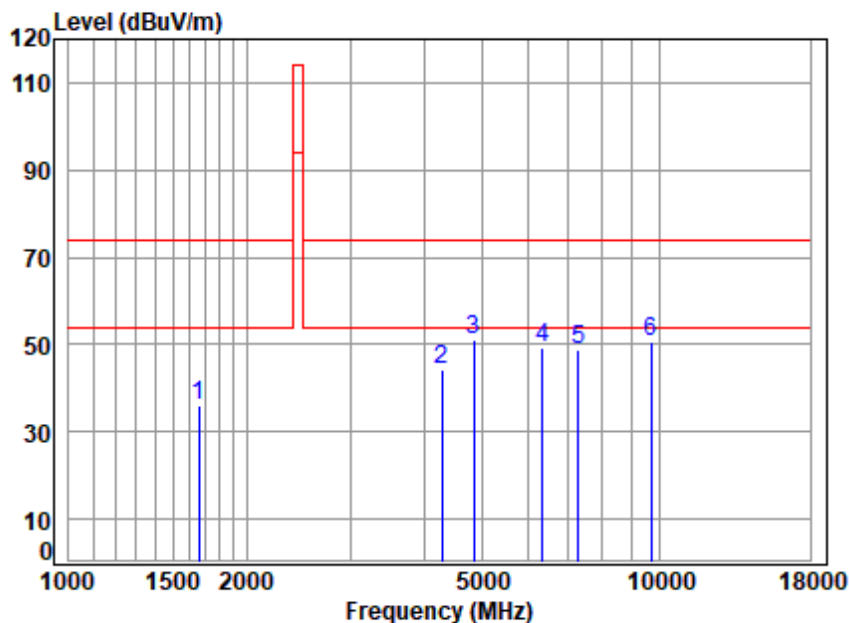
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00044CR/21582CR  
Mode : 2428 TX RSE

|   |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|---|----------|-------|--------|--------|-------|--------|--------|--------|--------|
|   | Freq     | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
|   | MHz      | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1 | 1702.042 | 3.30  | 26.68  | 40.63  | 46.45 | 35.80  | 74.00  | -38.20 | peak   |
| 2 | 4417.841 | 6.63  | 33.46  | 42.49  | 47.13 | 44.73  | 74.00  | -29.27 | peak   |
| 3 | 4856.000 | 6.94  | 34.03  | 42.80  | 48.19 | 46.36  | 74.00  | -27.64 | peak   |
| 4 | 6795.879 | 8.00  | 35.78  | 41.79  | 47.46 | 49.45  | 74.00  | -24.55 | peak   |
| 5 | 7284.000 | 8.42  | 36.12  | 41.54  | 45.48 | 48.48  | 74.00  | -25.52 | peak   |
| 6 | 9700.000 | 9.73  | 37.72  | 38.44  | 41.81 | 50.82  | 74.00  | -23.18 | peak   |

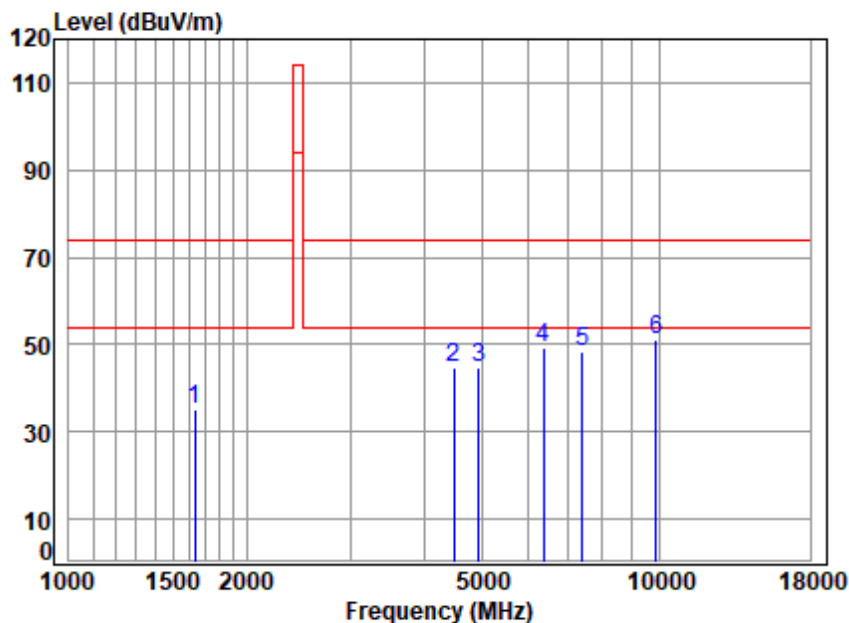
Mode:a; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00044CR/21582CR  
Mode : 2428 TX RSE

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 1663.137 | 3.18  | 26.52  | 40.61  | 47.06 | 36.15  | 74.00  | -37.85 | peak   |
| 2    | 4291.977 | 6.29  | 33.24  | 42.39  | 47.11 | 44.25  | 74.00  | -29.75 | peak   |
| 3    | 4856.000 | 6.94  | 34.03  | 42.80  | 52.97 | 51.14  | 74.00  | -22.86 | peak   |
| 4    | 6340.436 | 7.40  | 35.44  | 42.04  | 48.45 | 49.25  | 74.00  | -24.75 | peak   |
| 5    | 7284.000 | 8.42  | 36.12  | 41.54  | 45.62 | 48.62  | 74.00  | -25.38 | peak   |
| 6    | 9700.000 | 9.73  | 37.72  | 38.44  | 41.44 | 50.45  | 74.00  | -23.55 | peak   |

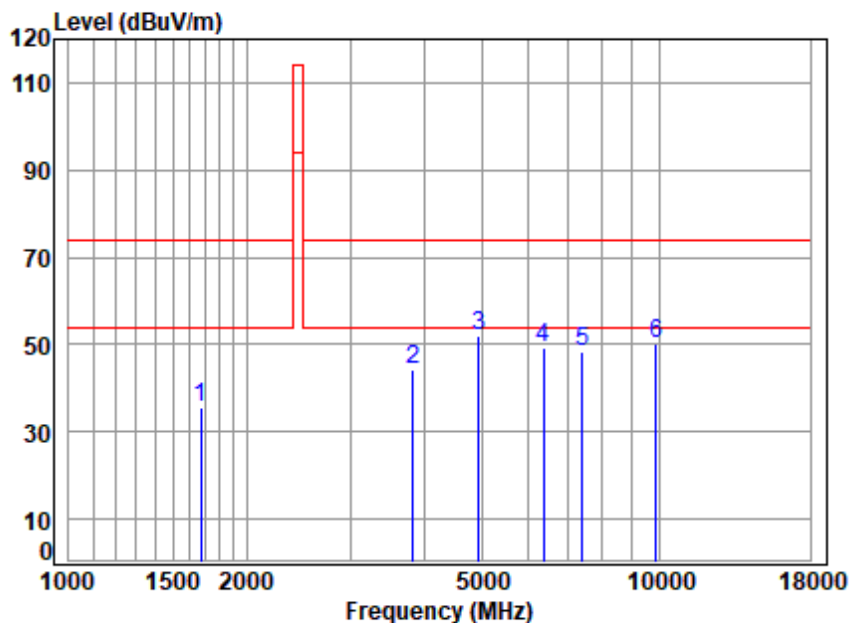
Mode:a; Polarization:Horizontal; Modulation:GFSK; ; Channel:High



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 00044CR/21582CR  
Mode : 2471 TX RSE

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 1634.543 | 3.08  | 26.40  | 40.59  | 46.38 | 35.27  | 74.00  | -38.73 | peak   |
| 2    | 4482.150 | 6.43  | 33.57  | 42.54  | 47.47 | 44.93  | 74.00  | -29.07 | peak   |
| 3    | 4942.000 | 7.04  | 34.13  | 42.86  | 46.55 | 44.86  | 74.00  | -29.14 | peak   |
| 4    | 6358.789 | 7.48  | 35.46  | 42.03  | 48.50 | 49.41  | 74.00  | -24.59 | Peak   |
| 5    | 7413.000 | 8.16  | 36.23  | 41.48  | 45.29 | 48.20  | 74.00  | -25.80 | peak   |
| 6    | 9880.000 | 9.00  | 37.83  | 38.17  | 42.61 | 51.27  | 74.00  | -22.73 | peak   |

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



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00044CR/21582CR  
Mode : 2471 TX RSE

|      |          | Cable | Ant    | Preamp | Read  |        | Limit  | Over   |        |
|------|----------|-------|--------|--------|-------|--------|--------|--------|--------|
| Freq |          | Loss  | Factor | Factor | Level | Level  | Line   | Limit  | Remark |
| MHz  |          | dB    | dB/m   | dB     | dBuV  | dBuV/m | dBuV/m | dB     |        |
| 1    | 1672.779 | 3.21  | 26.56  | 40.62  | 46.50 | 35.65  | 74.00  | -38.35 | peak   |
| 2    | 3834.438 | 6.67  | 32.38  | 42.02  | 47.14 | 44.17  | 74.00  | -29.83 | peak   |
| 3    | 4942.000 | 7.04  | 34.13  | 42.86  | 53.73 | 52.04  | 74.00  | -21.96 | peak   |
| 4    | 6377.195 | 7.56  | 35.48  | 42.02  | 48.21 | 49.23  | 74.00  | -24.77 | Peak   |
| 5    | 7413.000 | 8.16  | 36.23  | 41.48  | 45.55 | 48.46  | 74.00  | -25.54 | peak   |
| 6    | 9880.000 | 9.00  | 37.83  | 38.17  | 41.67 | 50.33  | 74.00  | -23.67 | peak   |



## 8 Photographs

### 8.1 Test Setup

Refer to Setup Photos

### 8.2 EUT Constructional Details (EUT Photos)

Refer to EUT external and internal photos

- End of the Report -

