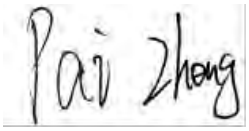
# TEST REPORT

| | |
|---|---|
| **Report No. ……:** | **KS2203S1106E02** |
| **FCC ID……:** | **2AHYV-GMOUSE** |
| **Applicant……:** | **PEAG, LLC dba JLab Audio** |
| Address……: | 5927 Landau Ct, Carlsbad, CA 92008, USA |
| Manufacturer……: | GuangDong Simpreal Intelligent Technology Co., Ltd |
| Address……: | Room 2408, JiaHong ZhenXing DaSha, DongGuan Avenue #13, DongCheng District, DongGuan City, GuangDong Province, P.R. China |
| Factory……: | GuangDong Simpreal Intelligent Technology Co., Ltd |
| Address……: | Room 2408, JiaHong ZhenXing DaSha, DongGuan Avenue #13, DongCheng District, DongGuan City, GuangDong Province, P.R. China |
| **Product Name……:** | **Mouse** |
| Trade Mark……: | JLAB |
| Model/Type reference……: | GO MOUSE |
| **Standard……:** | **FCC 15.247** |
| Date of receipt of test sample…: | March 23, 2022 |
| Date of testing……...: | March 23, 2021~August 6, 2022 |
| Date of issue……....: | August 6, 2022 |
| **Test Result……:** | **Pass** |

| | | |
|---|---|---|
| Prepared by:<br>( Printed name+ signature) | Pai Zheng |  |
| Approved by:<br>( Printed name + Signature ) | Sky Dong |  |

| | |
|---|---|
| **Testing Laboratory Name……:** | **KSIGN(Guangdong) Testing Co., Ltd.** |
| Address……: | West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu,Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China |





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# 1. TEST SUMMARY

## 1.1. Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

**558074 D01 15.247 Meas Guidance v05r02** ：The measurement guidance provided herein is applicable only to Digital Transmission System (DTS) devices operating in the 902-928 MHz. 2400-2483.5 MHz and/or 5725-5850 MHz bands under §15.247 of the FCC rules (Title 47 of the Code of Federal Regulations).

**ANSI C63.10-2020:** American National Standard for Testing Unlicensed Wireless Devices.

## 1.2. Report version

| Revised No. | Date of issue | Description |
|---|---|---|
| 01 | August 6, 2022 | Original |
| | | |
| | | |
| | | |


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## 1.3. Test Description

| FCC Part 15 Subpart C(15.247) | | | |
|---|---|---|---|
| Test Item | Standard Section | Result | Test Engineer |
| | FCC | | |
| Antenna Requirement | 15.203 | Pass | Tom Chen |
| Conducted Emission | 15.207 | N/A | N/A |
| Restricted Bands | 15.205 | Pass | Tom Chen |
| Hopping Channel Separation | 15.247(a)(1) | Pass | Tom Chen |
| Dwell Time | 15.247(a)(1) | Pass | Tom Chen |
| Peak Output Power | 15.247(b)(1) | Pass | Tom Chen |
| Number of Hopping Frequency | 15.247 (a)(1) | Pass | Tom Chen |
| Band Edge Emissions | 15.247(d) | Pass | Tom Chen |
| Radiated Spurious Emission | 15.247(c)&15.209 | Pass | Tom Chen |
| 99% Occupied Bandwidth & 20dB Bandwidth | 15.247(a)(1) | Pass | Tom Chen |
| Pseudorandom Frequency Hopping Sequence | 15.247 (a)(1) | Pass | Tom Chen |

Note:

The measurement uncertainty is not included in the test result.


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## 1.4. Test Facility

**Address of the report laboratory**

**KSIGN(Guangdong) Testing Co., Ltd.**

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu,Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

**Laboratory accreditation**

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

**CNAS-Lab Code: L13261**

KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No.: 5457.01**

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**ISED#: 25693 CAB identifier.: CN0096**

KSIGN(Guangdong) Testing Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

**FCC-Registration No.: 294912 Designation Number: CN1328**

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.



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## 1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

| Test Items | Measurement Uncertainty | Notes |
|---|---|---|
| Transmitter power conducted | 0.42 dB | (1) |
| Transmitter power Radiated | 2.14 dB | (1) |
| Conducted spurious emissions 9kHz~40GHz | 1.60 dB | (1) |
| Radiated spurious emissions 9kHz~40GHz | 2.20 dB | (1) |
| Conducted Emissions 9kHz~30MHz | 3.20 dB | (1) |
| Radiated Emissions 30~1000MHz | 4.70 dB | (1) |
| Radiated Emissions 1~18GHz | 5.00 dB | (1) |
| Radiated Emissions 18~40GHz | 5.54 dB | (1) |
| Occupied Bandwidth | 2.80 dB | (1) |

**Note (1):** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 1.6. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15~35°C |
| Relative Humidity: | 30~60 % |
| Air Pressure: | 950~1050mba |


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# 2. GENERAL INFORMATION

## 2.1. General Description of EUT

| | |
|---|---|
| Test Sample Number: | 1-1-1(Normal Sample),1-1-2(Engineering Sample ) |
| Product Name: | Mouse |
| Trademark: | JLAB |
| Model/Type reference: | GO MOUSE |
| Model Difference: | N/A |
| Power supply: | N/A |
| Power supply(Battery): | DC 1.5V |
| Hardware version: | Lithium battery V3.1 Dry cell batteries V3.1 |
| Software version: | Lithium battery: V3.2, Dry cell batteries: V3.1 |
| **Bluetooth** | |
| Modulation: | GFSK |
| Operation frequency: | 2402MHz~2480MHz |
| Max Peak Output Power: | -1.35dBm |
| Channel number: | 79 |
| Channel separation: | 1MHz |
| Antenna type: | PCB Antenna |
| Antenna gain: | 2.97dBi |


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## 2.2. Operation state

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BT BDR, 79 channels are provided to the EUT. Channels 00/39/78 were selected for testing.

Operation Frequency List:

| Channel | Frequency (MHz) |
|---|---|
| **00** | **2402** |
| 01 | 2403 |
| ⋮ | ⋮ |
| 38 | 2440 |
| **39** | **2441** |
| 40 | 2442 |
| ⋮ | ⋮ |
| 77 | 2479 |
| **78** | **2480** |

Note: The display in gray were the channel selected for testing.

Test mode

| NO. | TEST MODE DESCRIPTION |
|---|---|
| 1 | Low channel GFSK |
| 2 | Middle channel GFSK |
| 3 | High channel GFSK |
| 4 | Hopping mode GFSK |

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2.The test software is the fcc test tool v1.6 which can set the EUT into the individual test modes.



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## 2.3. Measurement Instruments List

| Tonscend JS0806-2 Test system | | | | | |
|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Until |
| 1 | Spectrum Analyzer | R&S | FSV40-N | 101798 | 03/04/2023 |
| 2 | Vector Signal Generator | Agilent | N5182A | MY50142520 | 03/04/2023 |
| 3 | Analog Signal Generator | HP | 83752A | 3344A00337 | 03/04/2023 |
| 4 | Power Sensor | Agilent | E9304A | MY50390009 | 03/04/2023 |
| 5 | Power Sensor | Agilent | E9300A | MY41498315 | 03/04/2023 |
| 6 | Wideband Radio Communication Tester | R&S | CMW500 | 157282 | 03/04/2023 |
| 7 | Climate Chamber | Angul | AGNH80L | 1903042120 | 03/04/2023 |
| 8 | Dual Output DC Power Supply | Agilent | E3646A | MY40009992 | 03/04/2023 |
| 9 | RF Control Unit | Tonscend | JS0806-2 | / | 03/04/2023 |

| Transmitter spurious emissions & Receiver spurious emissions | | | | | |
|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Until |
| 1 | EMI Test Receiver | R&S | ESR | 102525 | 03/04/2023 |
| 2 | High Pass Filter | Chengdu E-Microwave | OHF-3-18-S | 0E01901038 | 03/04/2023 |
| 3 | High Pass Filter | Chengdu E-Microwave | OHF-6.5-18-S | 0E01901039 | 03/04/2023 |
| 4 | Spectrum Analyzer | HP | 8593E | 3831U02087 | 03/04/2023 |
| 5 | Ultra-Broadband logarithmic period Antenna | Schwarzbeck | VULB 9163 | 01230 | 12/04/2023 |
| 6 | Loop Antenna | Beijin ZHINAN | ZN30900C | 18050 | 03/04/2023 |
| 7 | Spectrum Analyzer | R&S | FSV40-N | 101798 | 03/04/2023 |
| 8 | Horn Antenna | Schwarzbeck | BBHA 9120 D | 2023 | 03/29/2023 |
| 9 | Pre-Amplifier | Schwarzbeck | BBV 9745 | 9745#129 | 03/04/2023 |
| 10 | Pre-Amplifier | EMCI | EMC051835SE | 980662 | 03/04/2023 |
| 11 | Pre-Amplifier | Schwarzbeck | BBV-9721 | 57 | 03/04/2023 |
| 12 | Horn Antenna | Schwarzbeck | BBHA 9170 | 00939 | 03/04/2023 |

| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | LISN | R&S | ENV432 | 1326.6105.02 | 03/04/2023 |
| 2 | EMI Test Receiver | R&S | ESR | 102524 | 03/04/2023 |
| 3 | Manual RF Switch | JS TOYO | / | MSW-01/002 | 03/04/2023 |

Note:
1)The Cal. Interval was one year.
2)The cable loss has calculated in test result which connection between each test instruments.


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## 2.4. Test Software

| Software name | Model | Version |
|---|---|---|
| Conducted emission Measurement Software | EZ-EMC | EMC-Con 3A1.1 |
| Radiated emission Measurement Software | EZ-EMC | FA-03A.2.RE |
| Bluetooth and WIFI Test System | JS1120-3 | 2.5.77.0418 |


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# 3. TEST ITEM AND RESULTS

## 3.1. Antenna requirement

**Requirement**

**FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.

**FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):**

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

**Test Result**

The directional gain of the antenna less than 6dBi, please refer to the EUT internal photographs antenna photo.



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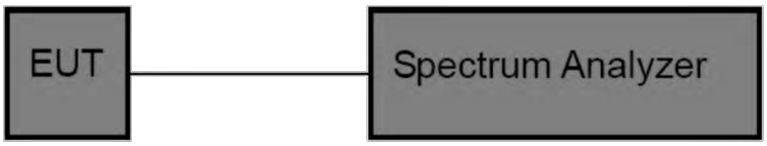
## 3.2. Peak Output Power

**Limit**

| Test Item | Limit | Frequency Range(MHz) |
|---|---|---|
| Peak Output Power | Hopping Channels>75<br>Power<1W(30dBm)<br>Other <125mW(21dBm) | 2400~2483.5 |

**Test Configuration**




**Test Procedure**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   Peak Detector:
   RBW=3 MHz, VBW=10 MHz
   （RBW > 20 dB bandwidth of the emission being measured, VBW≥RBW）
   Sweep: Auto
   Trace: Max hold.

   Allow trace to stabilize.

   Use the marker-to-peak function to set the marker to the peak of the emission.

**Test Mode**

Please refer to the clause 2.2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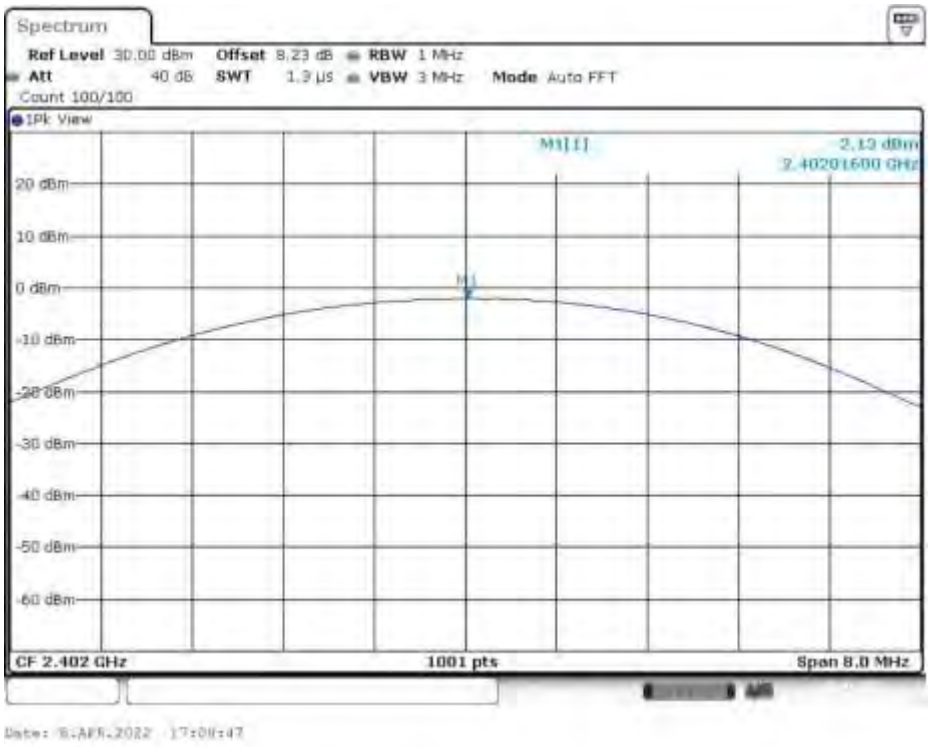
**Test Result**

| Test Mode: | DH5 | |
|---|---|---|
| Channel frequency (MHz) | Test Result (dBm) | Limit (dBm) |
| 2402 | -2.13 | ⩽20.97 |
| 2441 | -2.14 | |
| 2480 | **-1.35** | |
| **DH5-2402 MHz** | | |





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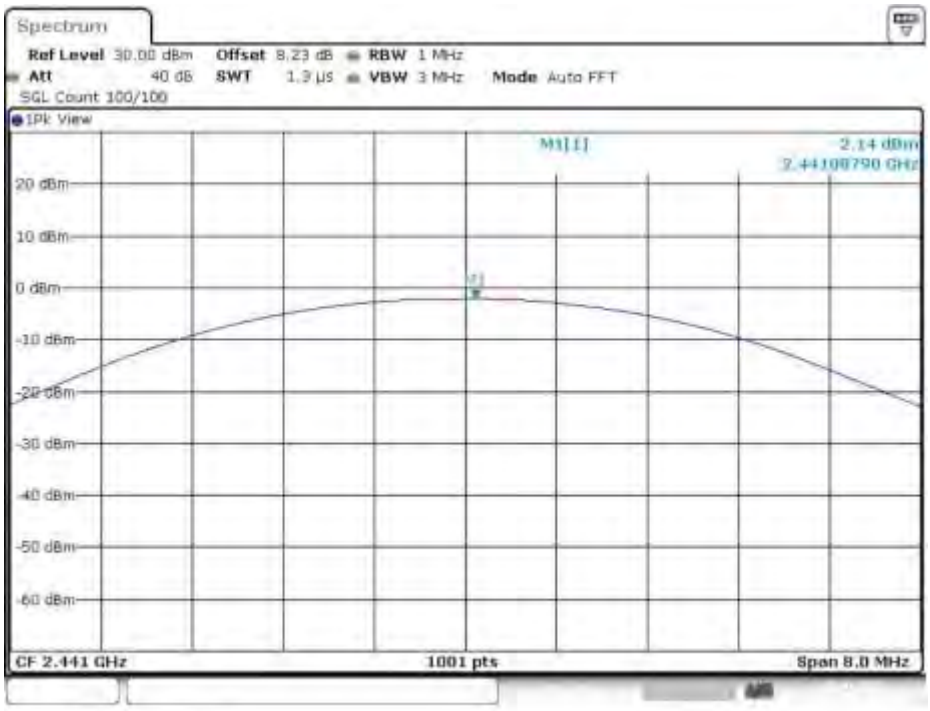
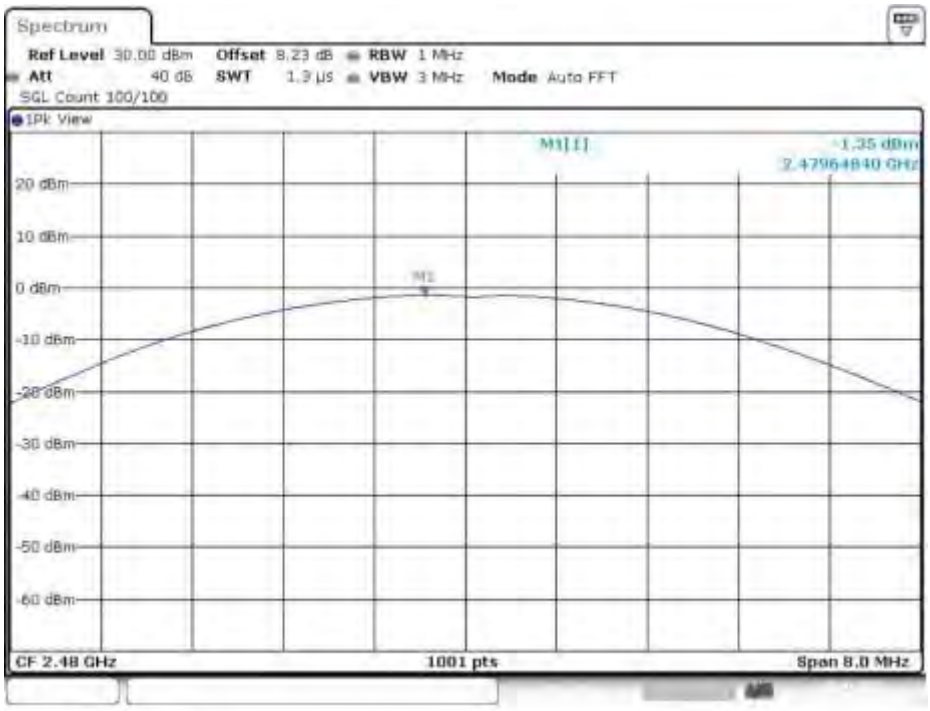
**DH5-2441 MHz**




**DH5-2480 MHz**





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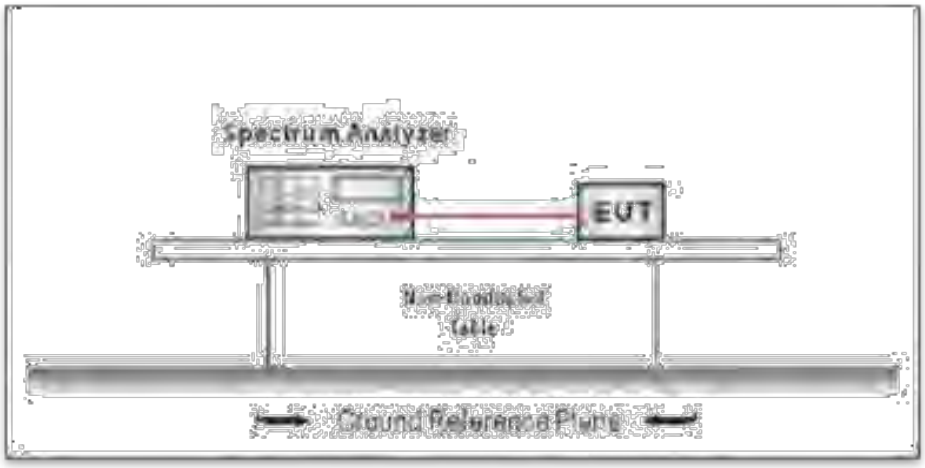
## 3.3. 20dB Bandwidth

**Limit**

| Test Item | Limit | Frequency Range(MHz) |
|---|---|---|
| Bandwidth | N/A | 2400~2483.5 |

**Test Configuration**




**Test Procedure**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:

   (1) Set RBW = 30 kHz.
   (2) Set the video bandwidth (VBW) ≥ 3*RBW.
   (3) Detector = Peak.
   (4) Trace mode = Max hold.
   (5) Sweep = Auto couple.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

**Test Mode**

Please refer to the clause 2.2.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**Test Results**

| Test Mode: | DH5 | | | |
|---|---|---|---|---|
| Channel frequency (MHz) | 20dB Bandwidth [MHz] | FL[MHz] | FH[MHz] | Verdict |
| 2402 | 0.85 | 2401.52 | 2402.41 | PASS |
| 2441 | 0.93 | 2440.52 | 2441.41 | PASS |
| 2480 | 0.87 | 2479.52 | 2480.41 | PASS |
| **2402 MHz** | | | | |



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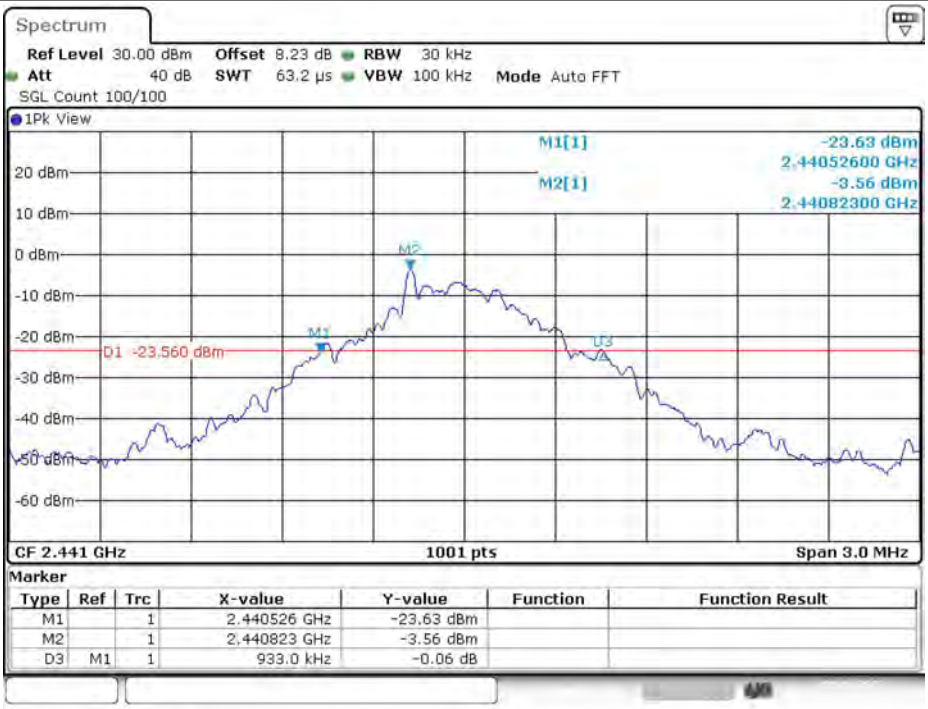
**2441 MHz**

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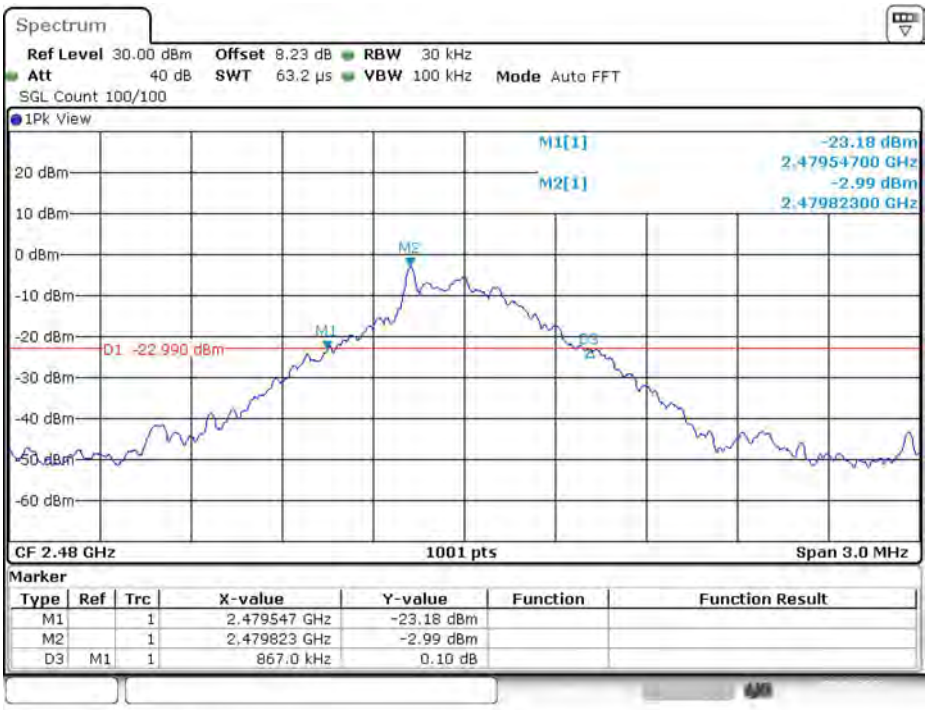
**2480 MHz**

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Add：West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China
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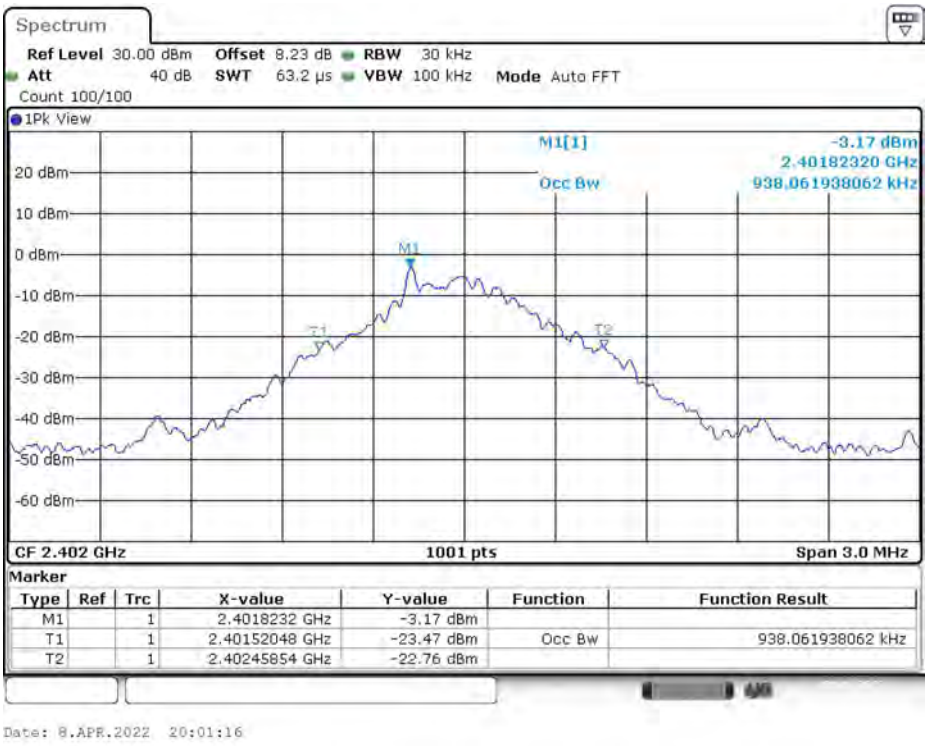
| Test Mode: | DH5 | | | |
|---|---|---|---|---|
| Channel frequency (MHz) | 99% OCB [MHz] | FL[MHz] | FH[MHz] | Verdict |
| 2402 | 0.938 | 2401.544 | 2402.408 | PASS |
| 2441 | 0.941 | 2440.541 | 2441.408 | PASS |
| 2480 | 0.944 | 2479.541 | 2480.408 | PASS |
| **2402 MHz** | | | | |





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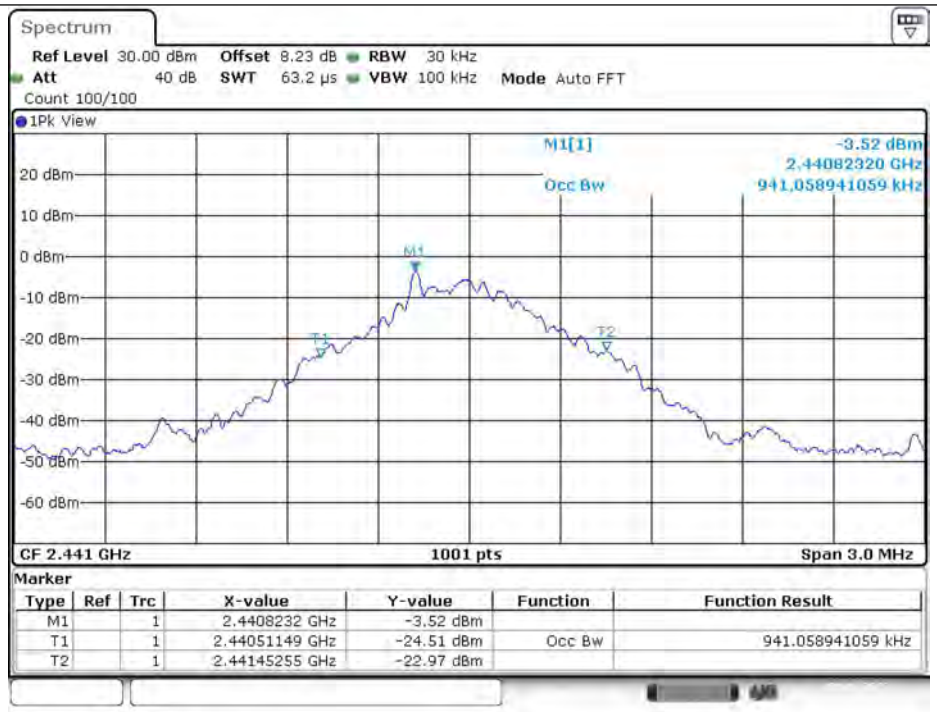
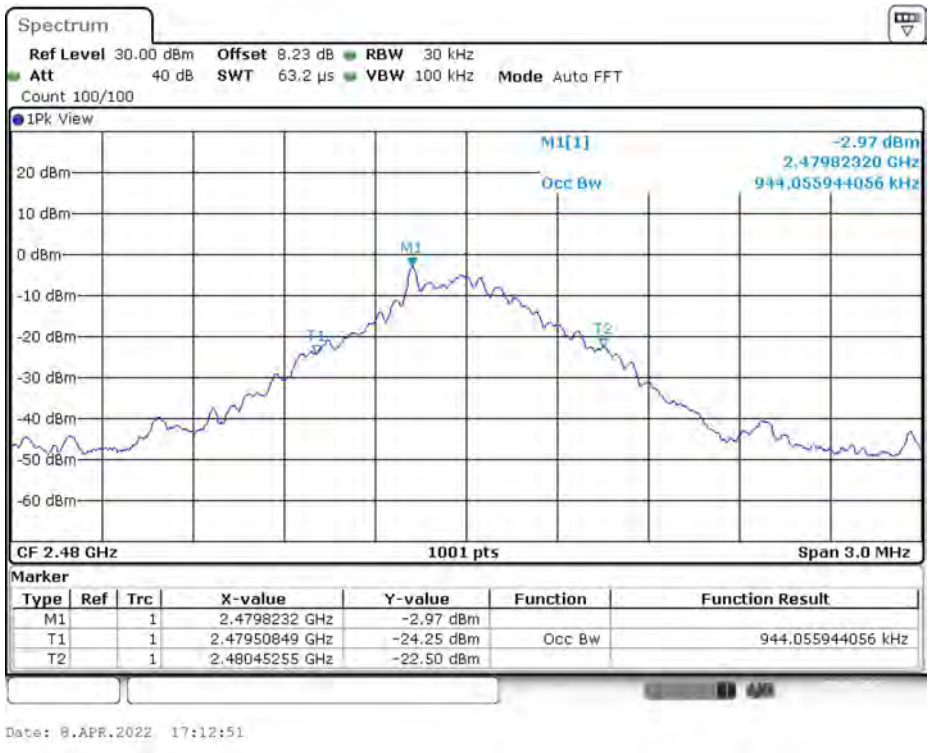
**2441 MHz**




**2480 MHz**





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## 3.4. Carrier Frequencies Separation

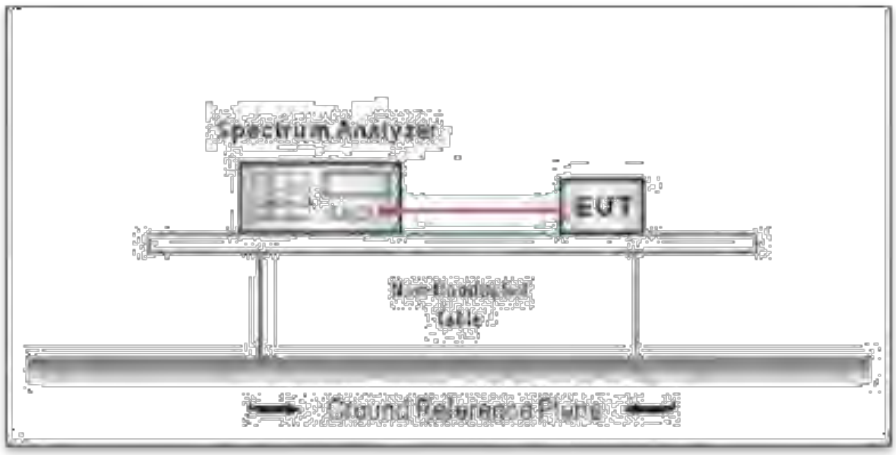
**LIMIT**

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

| Test Item | Limit | Frequency Range(MHz) |
|---|---|---|
| Channel Separation | >25KHz or >two-thirds of the 20 dB bandwidth Which is greater | 2400~2483.5 |

**Test Configuration**




**Test Procedure**

1.Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2.Spectrum Setting:

(1) Set RBW = 100 kHz.
(2) Set the video bandwidth (VBW) ≥ 3 RBW.
(3) Detector = Peak.
(4) Trace mode = Max hold.
(5) Sweep = Auto couple.

NOTE: The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

**Test Mode**

Please refer to the clause 2.2.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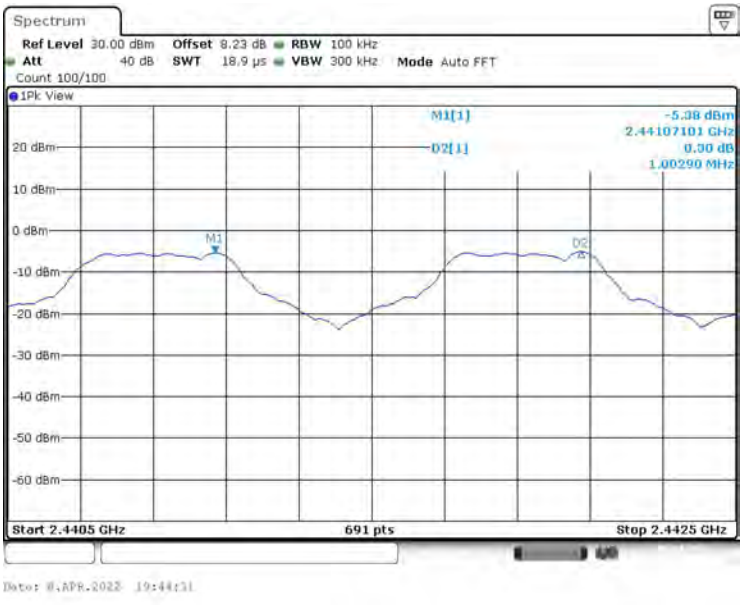
**Test Results**

| Test Mode: | DH5 Hopping Mode | | |
|---|---|---|---|
| Channel | Result[MHz] | Limit[MHz] | Verdict |
| DH5 | 1.003 | >=0.593 | PASS |
| DH5 Hopping Mode | | | |



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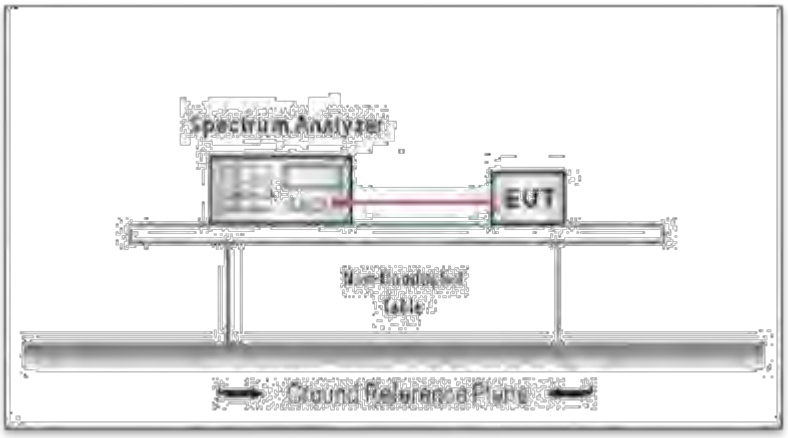
## 3.5. Number of Hopping Channel

**Limit**

| Section | Test Item | Limit |
|---|---|---|
| 15.247 | Number of Hopping Channel | >15 |

**Test Configuration**




**Test Procedure**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   (1) Peak Detector: RBW=100 kHz, VBW≥RBW, Sweep time= Auto.

**Test Mode**

Please refer to the clause 2.2.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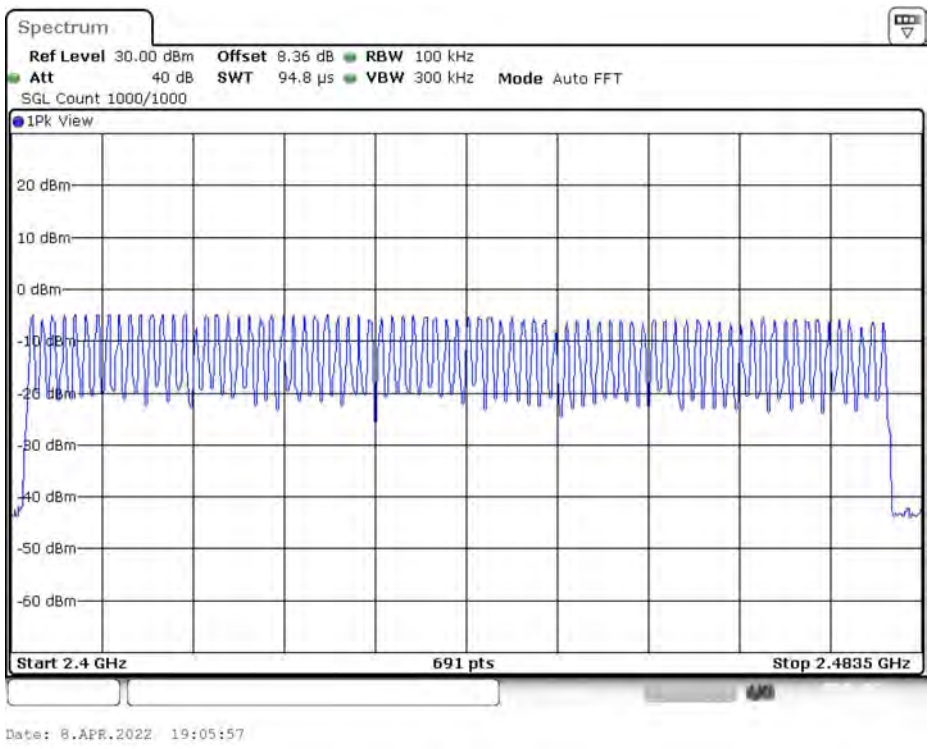
**Test Result**

| Test Mode: | Hopping Mode | |
|---|---|---|
| Frequency Range | Quantity of Hopping Channel | Limit |
| 2402MHz~2480MHz | 79 | >15 |
| | | |

**DH5 Mode**





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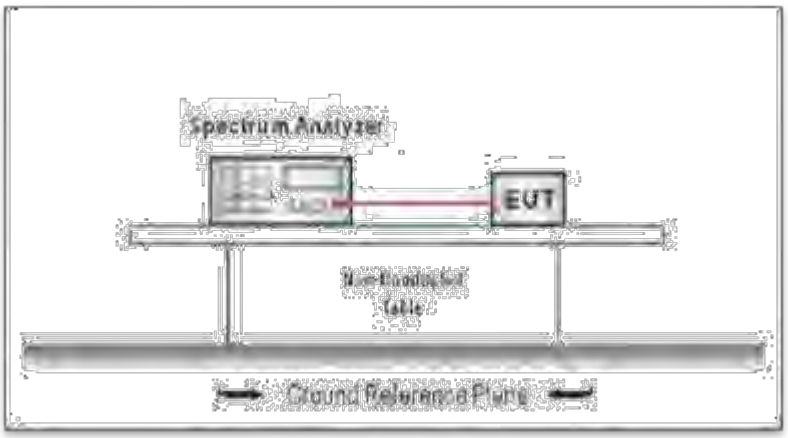
## 3.6. Dwell Time

**Limit**

| Section | Test Item | Limit |
|---|---|---|
| 15.247(a)(1) | Average Time of Occupancy | 0.4 sec |

**Test Configuration**




**Test Procedure**

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
   (1) Spectrum Setting: RBW=1MHz, VBW≥RBW.
   (2) Use video trigger with the trigger level set to enable triggering only on full pulses.
   (3) Sweep Time is more than once pulse time.
   (4) Set the center frequency on any frequency would be measure and set the frequency span to zero.
   (5) Measure the maximum time duration of one single pulse.
   (6) Set the EUT for packet transmitting.

**Test Mode**

Please refer to the clause 2.2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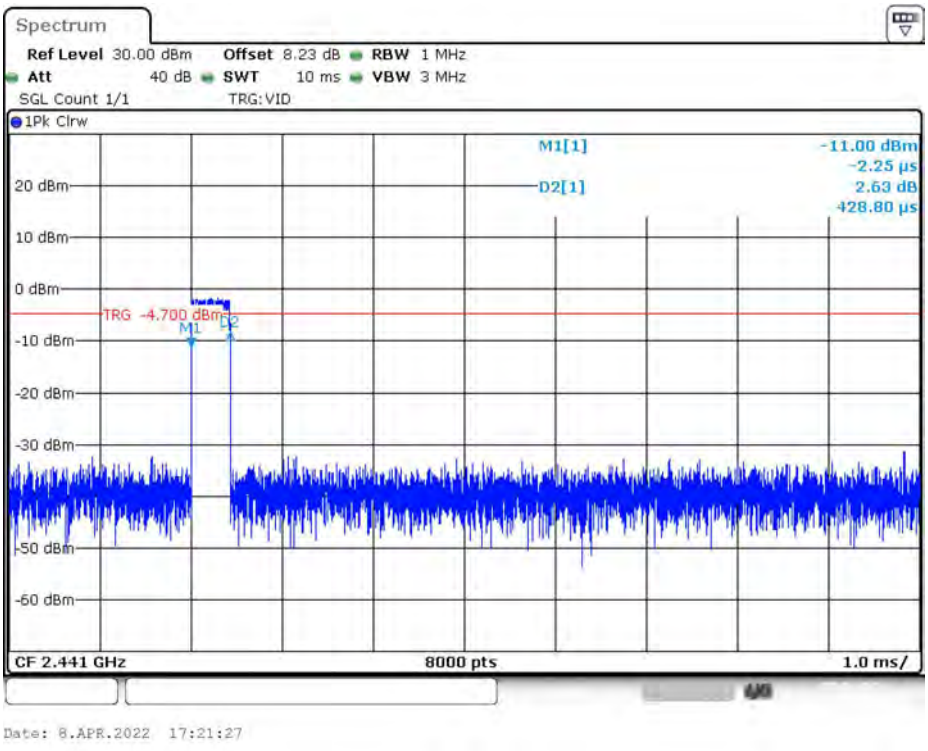
**Test Result**

| Mode | Data Packet | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (ms) | Limit(s) | Conclusion |
|---|---|---|---|---|---|---|
| GFSK | DH1 | 2441 | 0.43 | 121.60 | <0.4 | Pass |
| | DH3 | 2441 | 1.62 | 260.80 | <0.4 | Pass |
| | DH5 | 2441 | 2.81 | 306.13 | <0.4 | Pass |

Note:
1. A period time = 0.4 (s) * 79 = 31.6(s)
2. DH1 time slot = Pulse Duration * (1600/(2*79)) * A period time
   DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time
   DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time
3. For GFSK, π/4-DQPSK and 8DPSK: The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

**Test plots**

**GFSK mode-DH1**





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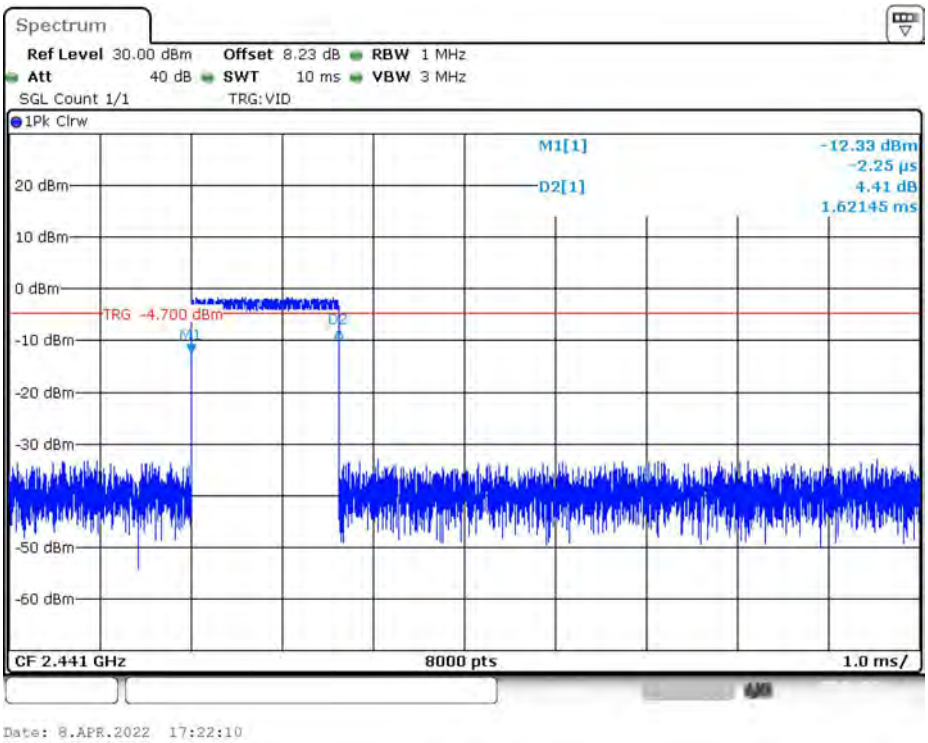
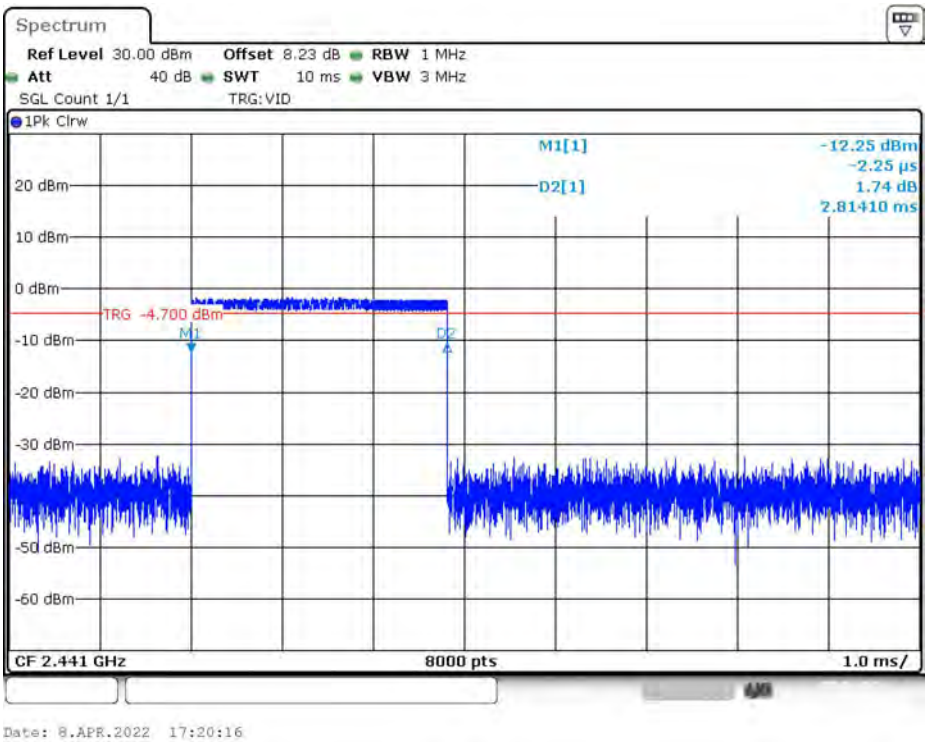
**GFSK mode-DH3**




**GFSK mode-DH5**





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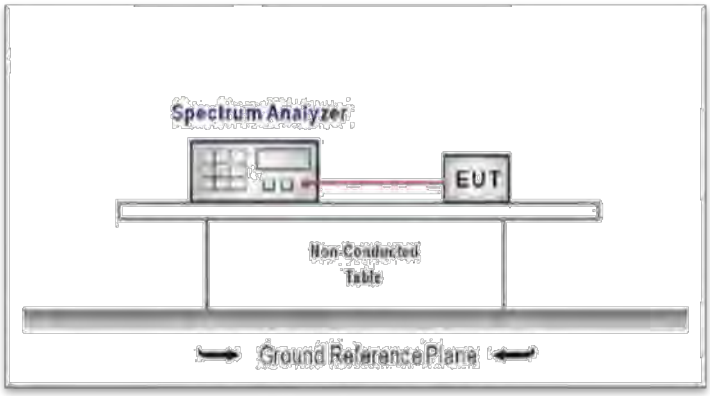
## 3.7. Band Edge and Spurious Emission (conducted)

**LIMIT**

**FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):**
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

**TEST CONFIGURATION**




**TEST PROCEDURE**

1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:

   RBW=100KHz

   VBW=3*RBW.

   Detector function: Peak.
   Trace: Max hold.
   Sweep = Auto couple.

   Allow the trace to stabilize.

**TEST MODE:**

Please refer to the clause 2.2.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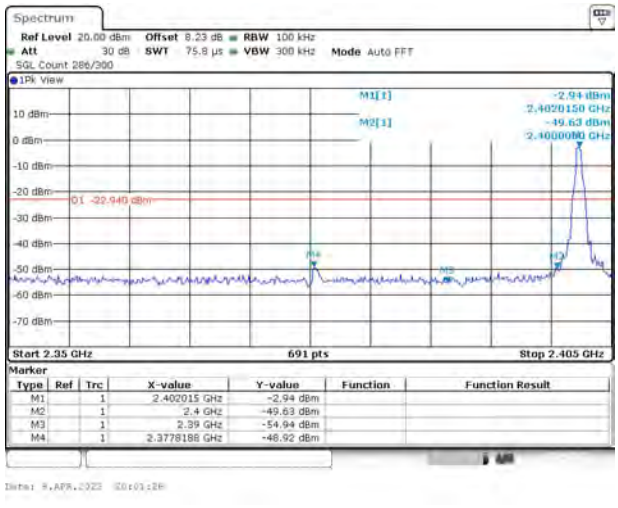
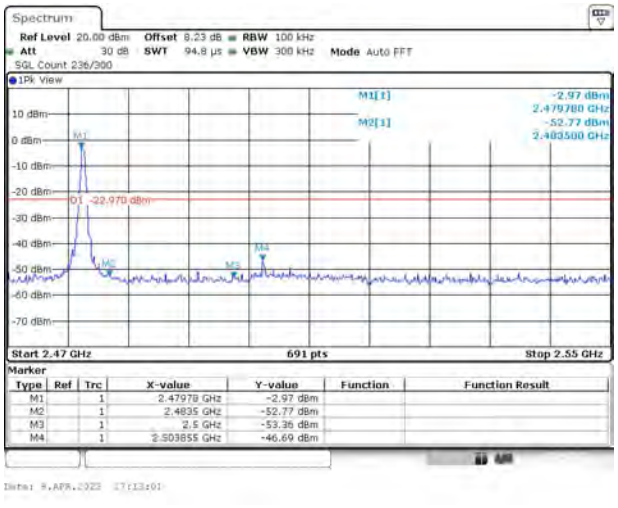
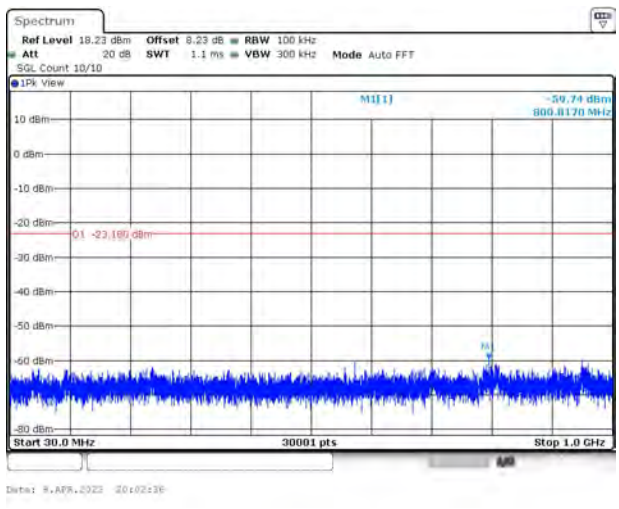
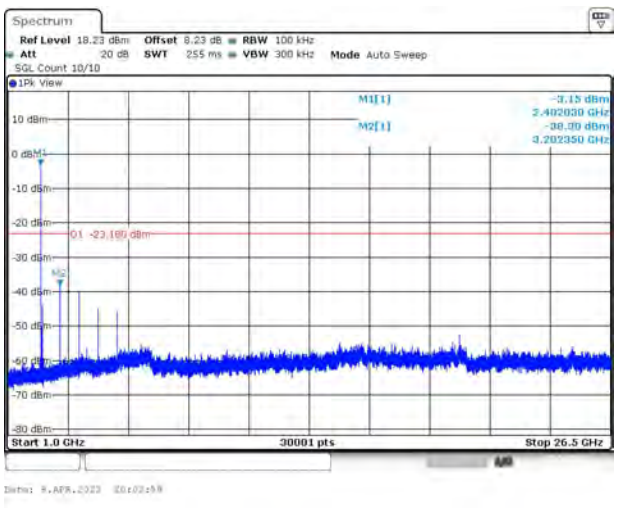
**TEST RESULTS**

| DH5 | |
|---|---|
| CH00-Bandedge | CH78-Bandedge |
|  |  |

| DH5 | |
|---|---|
| CH00-SE | |
|  |  |



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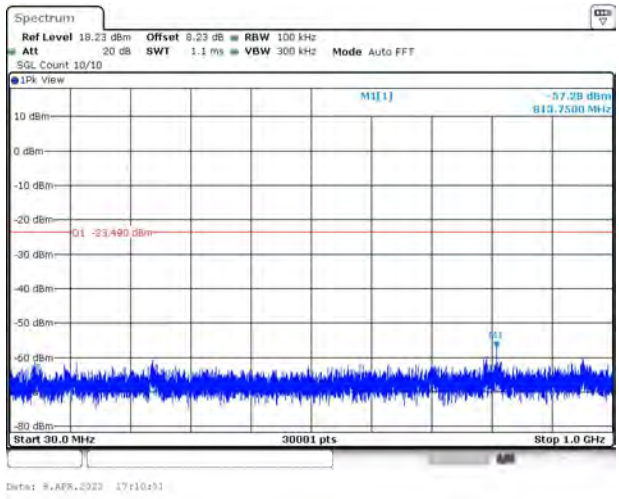
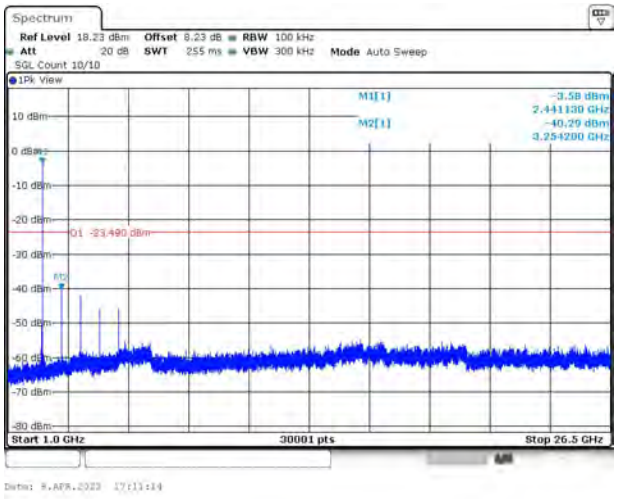
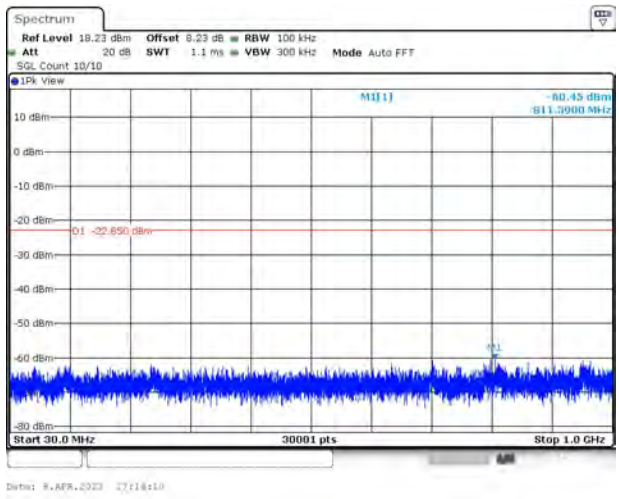
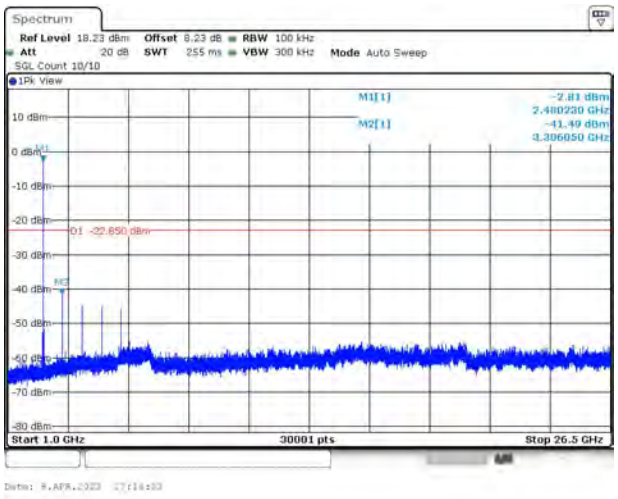
CH39-SE




CH78-SE





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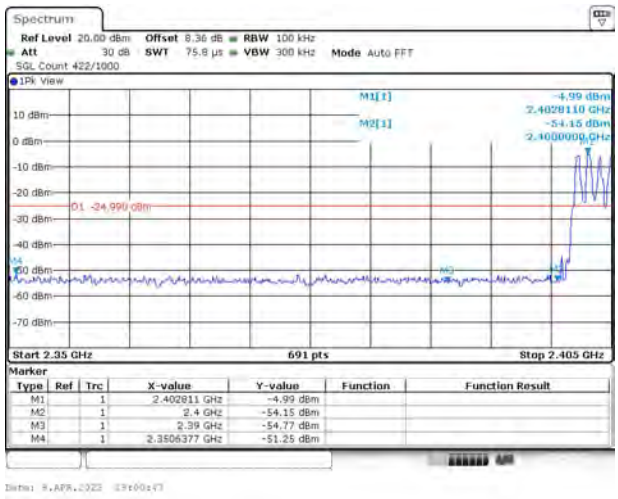
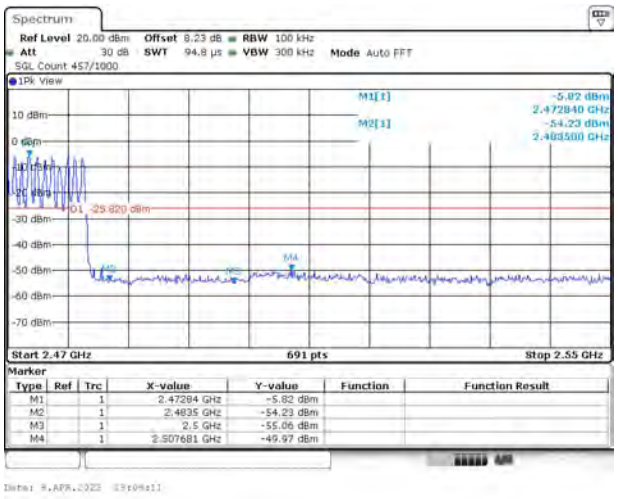
| DH5(2402)-Hopping on | DH5(2480)-Hopping on |
| --- | --- |
|  |  |



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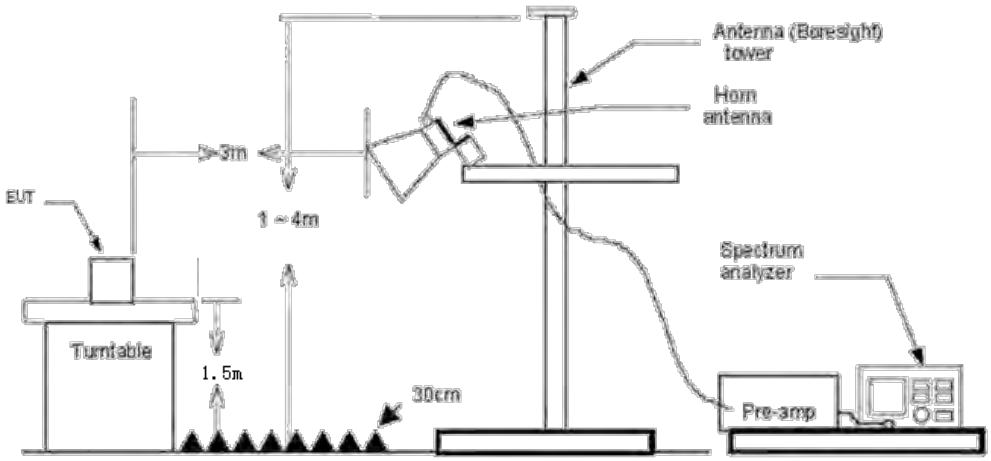
## 3.8. Band Edge Emissions(Radiated)

**Limit**

| Restricted Frequency Band (MHz) | (dBuV/m)(at 3m) | |
|---|---|---|
| | Peak | Average |
| 2310 ~2390 | 74 | 54 |
| 2483.5 ~2500 | 74 | 54 |
| **Note: All restriction bands have been tested, only the worst case is reported.** | | |

**Test Configuration**




**Test Procedure**

1. The EUT was setup and tested according to ANSI C63.10:2020 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2020on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHz PEAK detector for Peak value.
   RBW=1MHz, VBW=10Hz with PEAK Detector for Average Value.

**Test Mode**

Please refer to the clause 2.2.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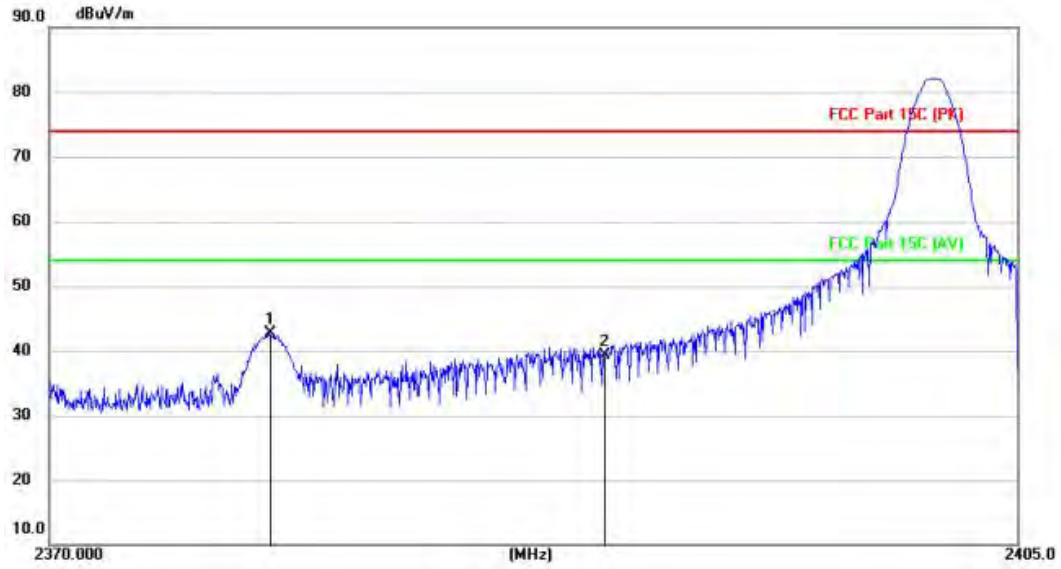
**Test Results**

Note:

1. Measurement = Reading level + Correct Factor

2.Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | DH5 Mode 2402MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | * | 2377.910 | 53.56 | -10.93 | 42.63 | 74.00 | -31.37 | peak |
| 2 | | 2390.000 | 50.18 | -10.92 | 39.26 | 74.00 | -34.74 | peak |

**Measurement = Reading level + Correct Factor**



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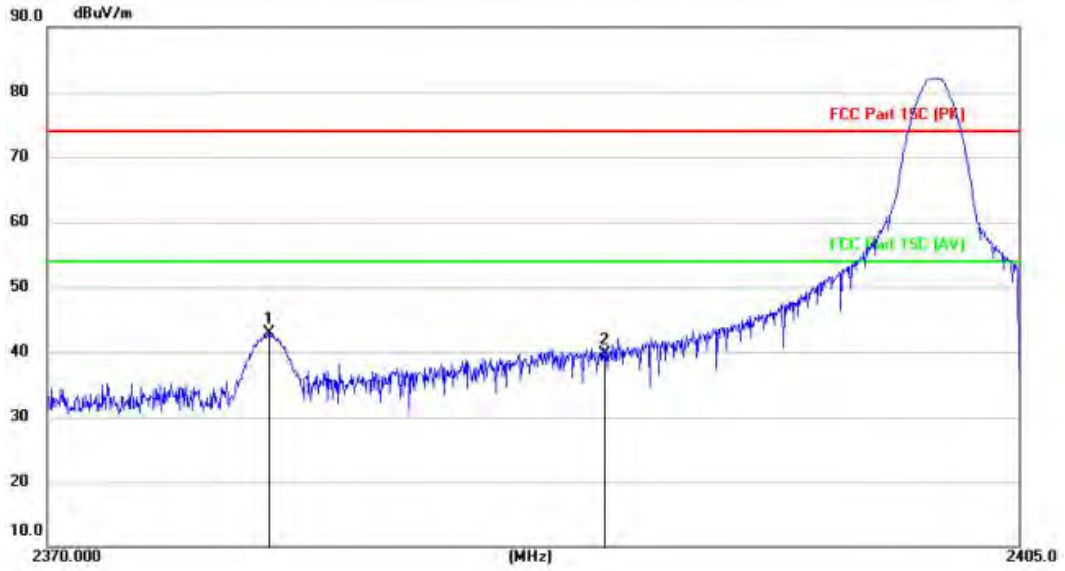
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Vertical |
| **Test Mode:** | DH5 Mode 2402 MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | * | 2377.945 | 53.78 | -10.93 | 42.85 | 74.00 | -31.15 | peak |
| 2 | | 2390.000 | 50.60 | -10.92 | 39.68 | 74.00 | -34.32 | peak |

**Measurement = Reading level + Correct Factor**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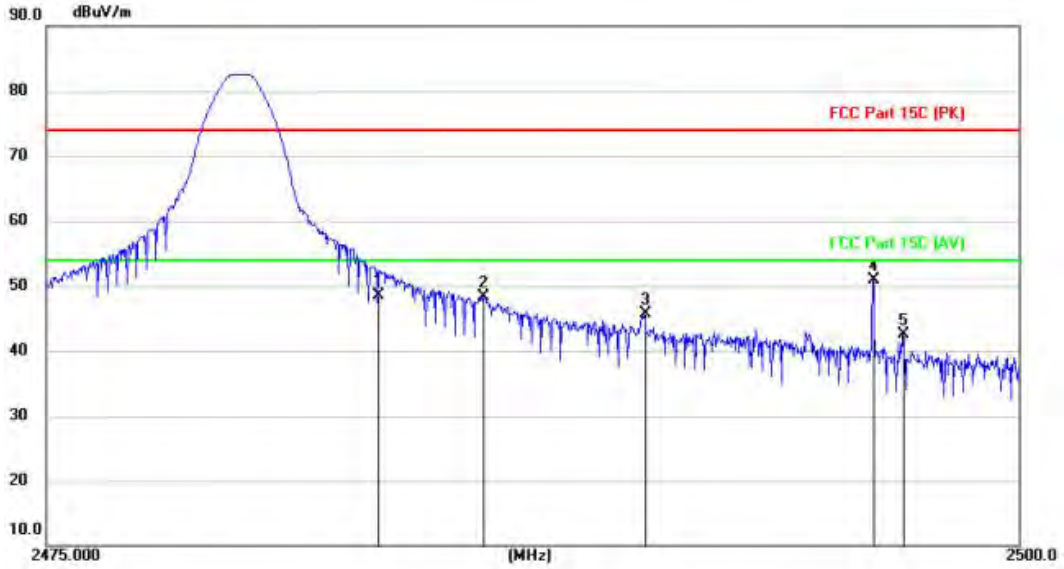
| Test Voltage | DC 1.5V |
|---|---|
| Ant. Pol. | Horizontal |
| Test Mode: | DH5 Mode 2480MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 2483.500 | 59.36 | -10.88 | 48.48 | 74.00 | -25.52 | peak |
| 2 | | 2486.207 | 59.22 | -10.88 | 48.34 | 74.00 | -25.66 | peak |
| 3 | | 2490.360 | 56.53 | -10.89 | 45.64 | 74.00 | -28.36 | peak |
| 4 | * | 2496.255 | 61.77 | -10.88 | 50.89 | 74.00 | -23.11 | peak |
| 5 | | 2497.025 | 53.47 | -10.88 | 42.59 | 74.00 | -31.41 | peak |

**Measurement = Reading level + Correct Factor**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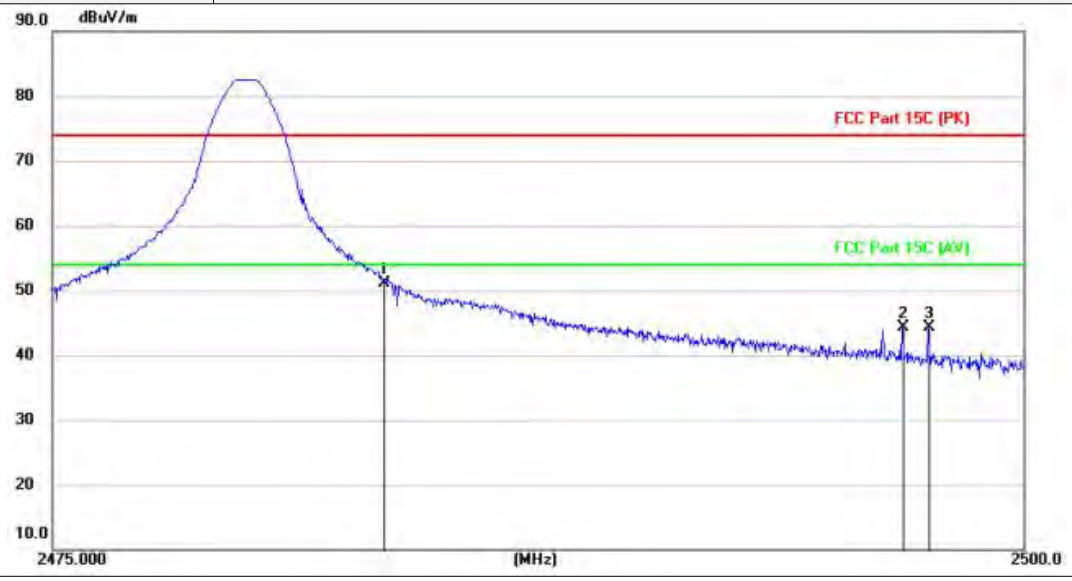
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Vertical |
| **Test Mode:** | DH5 Mode 2480 MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | * | 2483.500 | 62.06 | -10.88 | 51.18 | 74.00 | -22.82 | peak |
| 2 | | 2496.865 | 55.12 | -10.88 | 44.24 | 74.00 | -29.76 | peak |
| 3 | | 2497.543 | 55.16 | -10.88 | 44.28 | 74.00 | -29.72 | peak |

**Measurement = Reading level + Correct Factor**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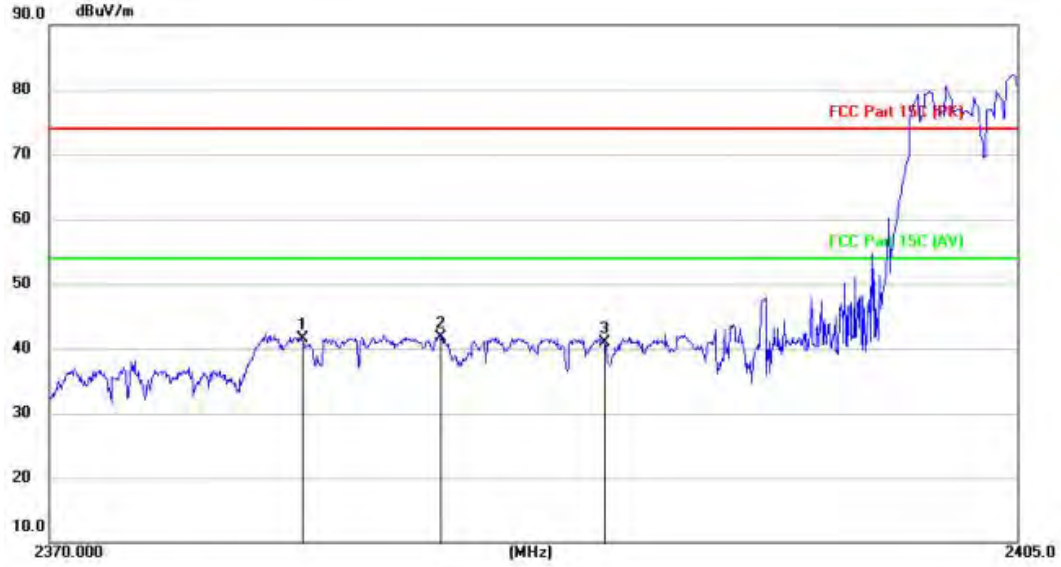
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | DH5-Hopping Mode 2402MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 2379.093 | 52.50 | -10.92 | 41.58 | 74.00 | -32.42 | peak |
| 2 | * | 2384.091 | 52.53 | -10.92 | 41.61 | 74.00 | -32.39 | peak |
| 3 | | 2390.000 | 51.77 | -10.92 | 40.85 | 74.00 | -33.15 | peak |

**Measurement = Reading level + Correct Factor**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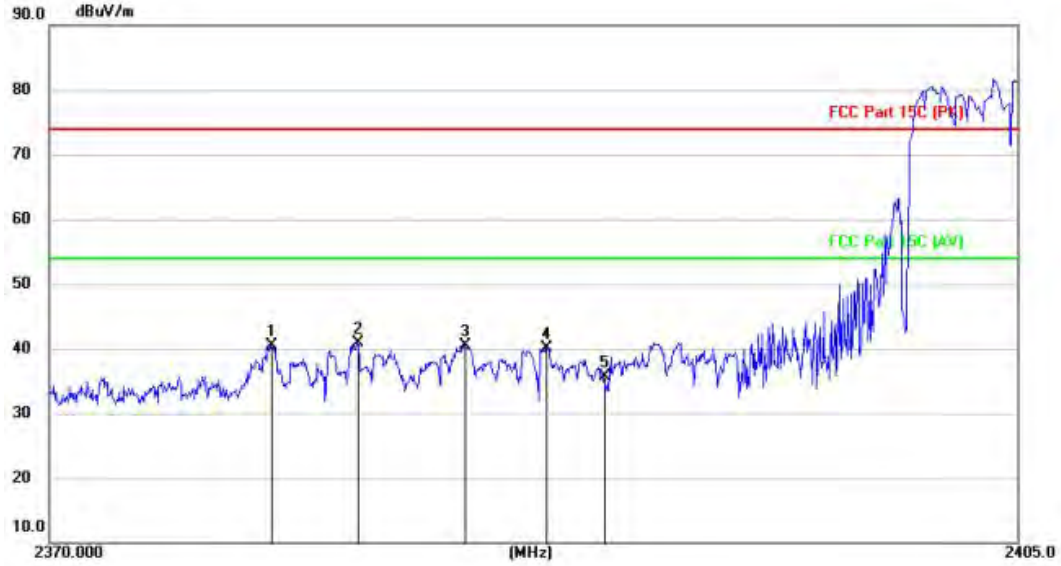
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Vertical |
| **Test Mode:** | DH5-Hopping Mode 2402 MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 2377.973 | 51.47 | -10.93 | 40.54 | 74.00 | -33.46 | peak |
| 2 | * | 2381.077 | 51.78 | -10.93 | 40.85 | 74.00 | -33.15 | peak |
| 3 | | 2384.987 | 51.34 | -10.92 | 40.42 | 74.00 | -33.58 | peak |
| 4 | | 2387.913 | 51.03 | -10.92 | 40.11 | 74.00 | -33.89 | peak |
| 5 | | 2390.000 | 46.67 | -10.92 | 35.75 | 74.00 | -38.25 | peak |

**Measurement = Reading level + Correct Factor**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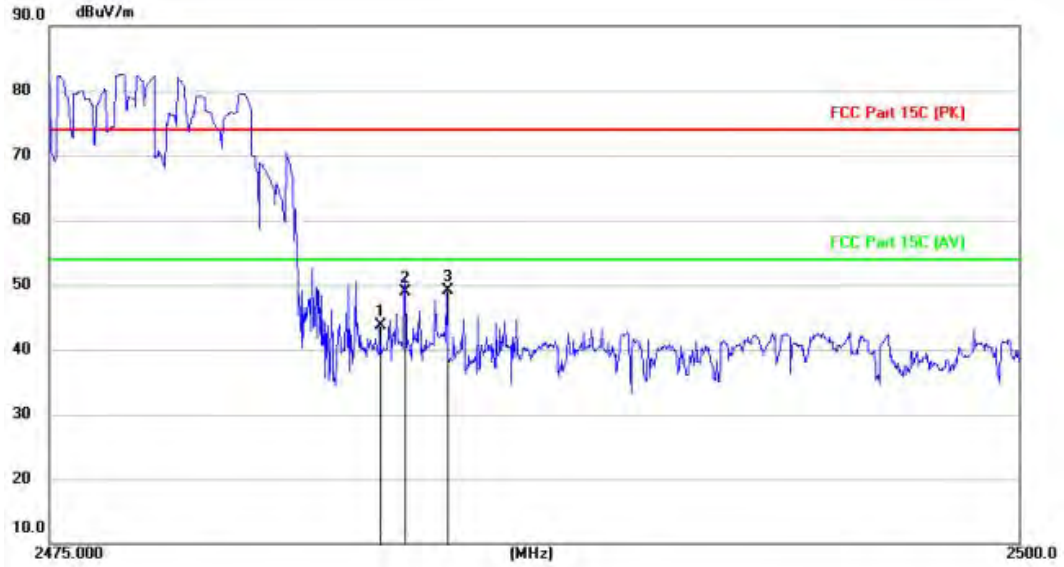
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | DH5-Hopping Mode 2480MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 2483.500 | 54.68 | -10.88 | 43.80 | 74.00 | -30.20 | peak |
| 2 | | 2484.133 | 59.73 | -10.88 | 48.85 | 74.00 | -25.15 | peak |
| 3 | * | 2485.227 | 60.03 | -10.88 | 49.15 | 74.00 | -24.85 | peak |

**Measurement = Reading level + Correct Factor**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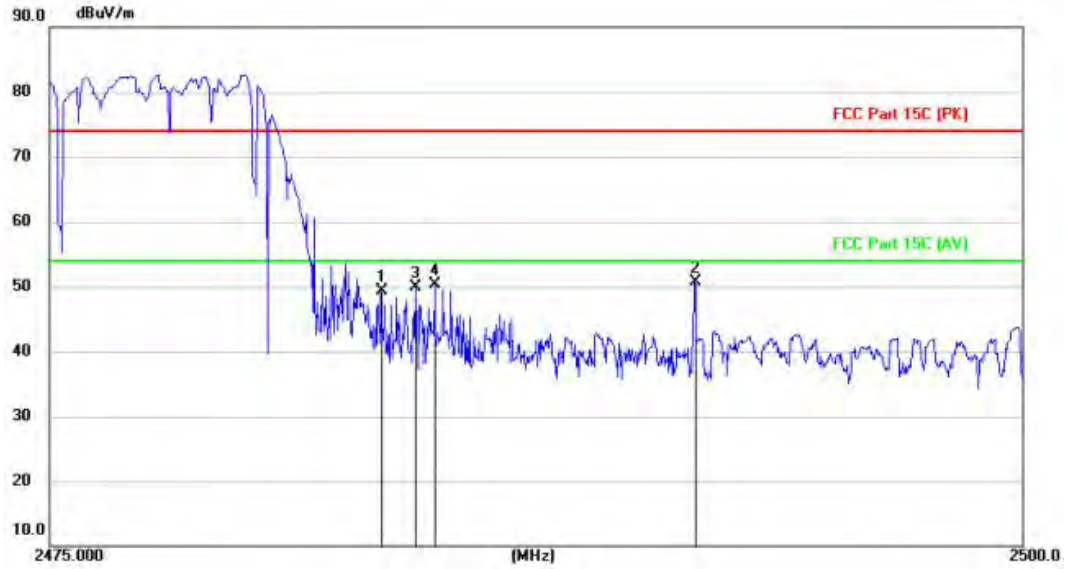
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Vertical |
| **Test Mode:** | DH5-Hopping Mode 2480 MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 2483.500 | 60.10 | -10.88 | 49.22 | 74.00 | -24.78 | peak |
| 2 | * | 2491.550 | 61.55 | -10.89 | 50.66 | 74.00 | -23.34 | peak |
| 3 | | 2484.385 | 60.83 | -10.88 | 49.95 | 74.00 | -24.05 | peak |
| 4 | | 2484.880 | 61.22 | -10.88 | 50.34 | 74.00 | -23.66 | peak |

**Measurement = Reading level + Correct Factor**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## 3.9. Radiated Spurious Emissions

**Limit**

**Radiated Emission Limits (9 kHz~1000 MHz)**

| Frequency (MHz) | Field Strength (microvolt/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(KHz) | 300 |
| 0.490~1.705 | 24000/F(KHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Radiated Emission Limit (Above 1000MHz)**

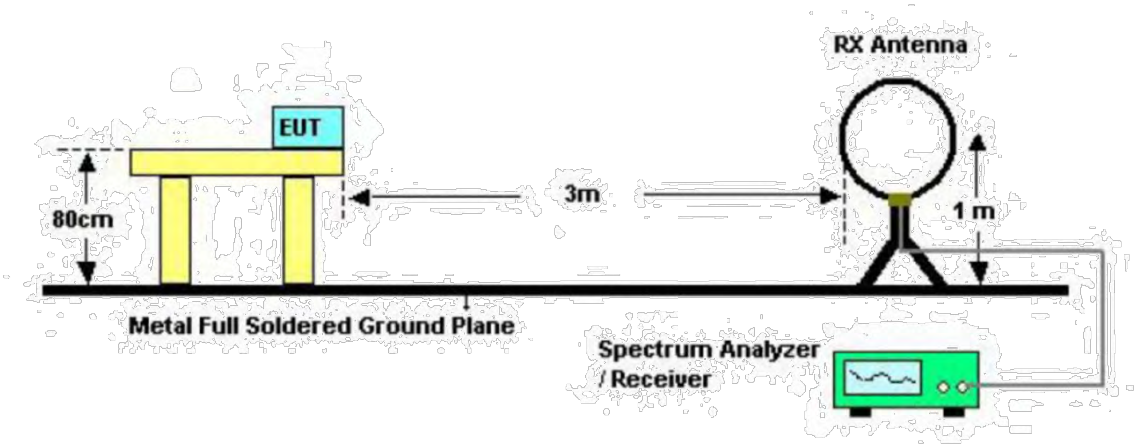
| Frequency (MHz) | Distance Meters(at 3m) | |
|---|---|---|
| | Peak | Average |
| Above 1000 | 74 | 54 |

**Note:**

(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

**Test Configuration**




Below 30MHz Test Setup



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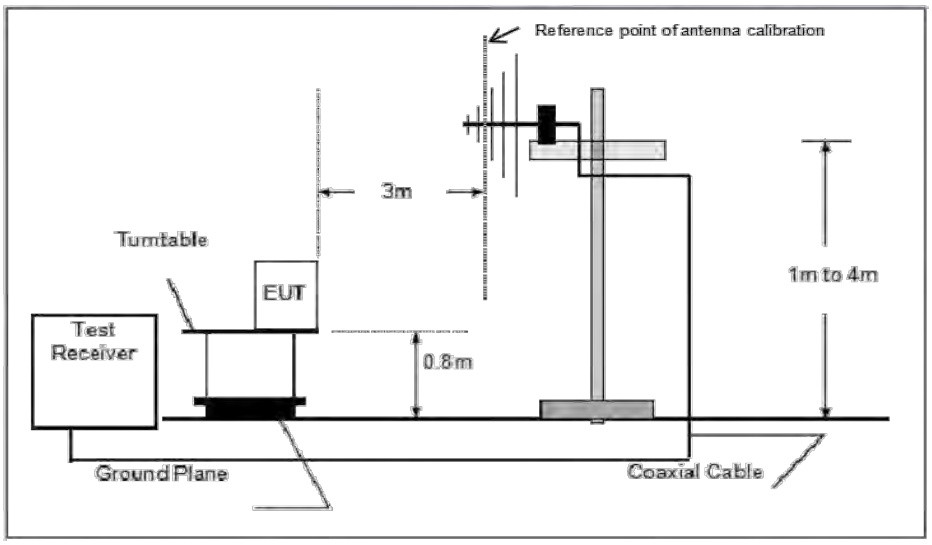
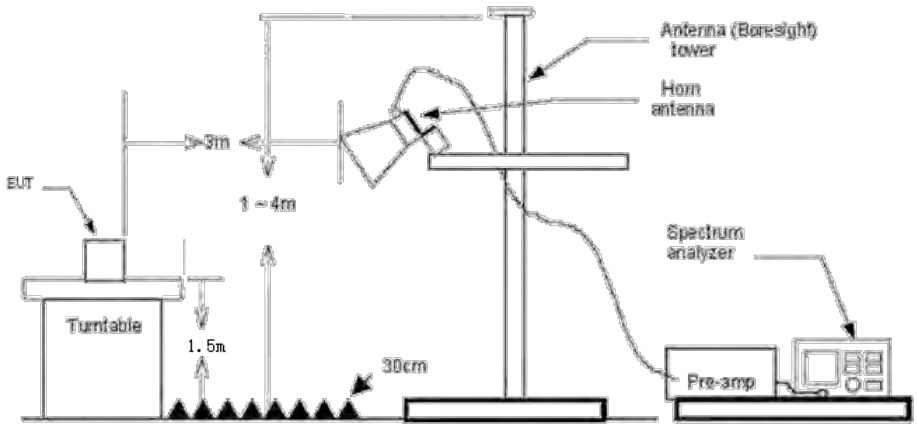



Below 1000MHz Test Setup




Above 1GHz Test Setup

**Test Procedure**

1. The EUT was setup and tested according to ANSI C63.10:2020
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Below 1 GHz:
   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
   If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
   (3) From 1 GHz to 10$^{th}$ harmonic:
   RBW=1MHz, VBW=3MHz Peak detector for Peak value.
   RBW=1MHz, VBW=10Hz Peak detector for Peak value.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**Test Mode**

Please refer to the clause 2.2.

**Test Result**

PASS

Note:

1) Measurement = Reading level + Correct Factor

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

**2) From 9 KHz~30 MHz and 18GHz~25GHz,the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.**

3) Pre-scan DH5, 2DH5 and 3DH5 modulation, found the DH5-CH00 Channel Below 1GHz and found the DH5 modulation which it is worse case for above 1GHz, so only show the test data for worse case.

**RADIATED EMISSION BELOW 30MHz**

the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



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**30MHz-1GHz**

| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | DH5 Mode 2402 MHz |


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 64.8409 | 34.30 | -18.61 | 15.69 | 40.00 | -24.31 | QP |
| 2 | | 92.6568 | 29.89 | -19.12 | 10.77 | 43.50 | -32.73 | QP |
| 3 | | 204.0945 | 34.94 | -17.83 | 17.11 | 43.50 | -26.39 | QP |
| 4 | | 296.9113 | 38.29 | -14.74 | 23.55 | 46.00 | -22.45 | QP |
| 5 | | 399.8706 | 36.09 | -10.91 | 25.18 | 46.00 | -20.82 | QP |
| 6 | * | 796.7413 | 33.65 | -6.26 | 27.39 | 46.00 | -18.61 | QP |

**Measurement = Reading level + Correct Factor**


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| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Vertical |
| **Test Mode:** | DH5 Mode 2402 MHz |


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | * | 64.3426 | 41.00 | -18.51 | 22.49 | 40.00 | -17.51 | QP |
| 2 | | 77.5655 | 38.84 | -20.85 | 17.99 | 40.00 | -22.01 | QP |
| 3 | | 139.8505 | 34.33 | -21.27 | 13.06 | 43.50 | -30.44 | QP |
| 4 | | 244.6605 | 35.54 | -15.94 | 19.60 | 46.00 | -26.40 | QP |
| 5 | | 380.1806 | 35.45 | -11.56 | 23.89 | 46.00 | -22.11 | QP |
| 6 | | 797.0208 | 32.08 | -6.26 | 25.82 | 46.00 | -20.18 | QP |

**Measurement = Reading level + Correct Factor**


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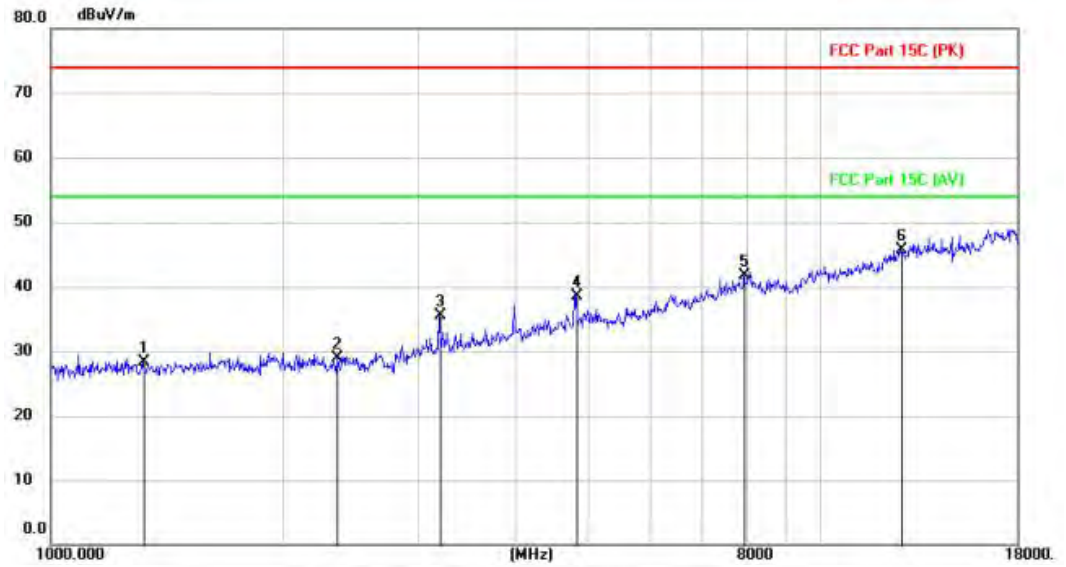
**Adobe 1GHz**

| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | TX DH5 Mode 2402MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1319.600 | 40.28 | -11.96 | 28.32 | 74.00 | -45.68 | peak |
| 2 | | 2353.200 | 39.84 | -10.94 | 28.90 | 74.00 | -45.10 | peak |
| 3 | | 3203.200 | 45.79 | -10.22 | 35.57 | 74.00 | -38.43 | peak |
| 4 | | 4804.600 | 44.52 | -5.92 | 38.60 | 74.00 | -35.40 | peak |
| 5 | | 7966.600 | 39.78 | 1.99 | 41.77 | 74.00 | -32.23 | peak |
| 6 | * | 12704.500 | 36.30 | 9.36 | 45.66 | 74.00 | -28.34 | peak |

**Measurement = Reading level + Correct Factor**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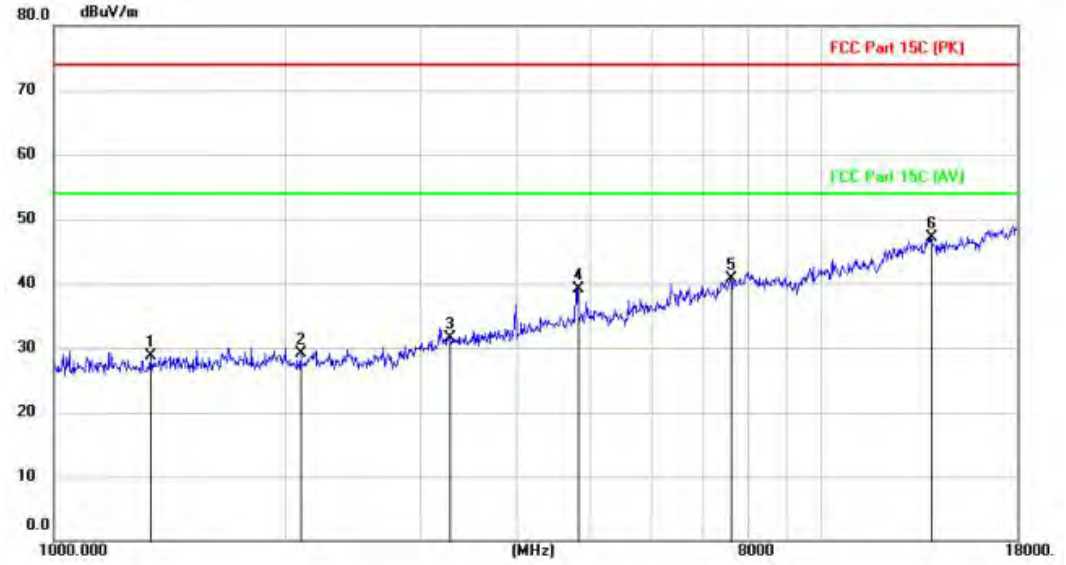
| Test Voltage | DC 1.5V |
|---|---|
| Ant. Pol. | Vertical |
| Test Mode: | TX DH5 Mode 2402MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1338.300 | 40.67 | -11.94 | 28.73 | 74.00 | -45.27 | peak |
| 2 | | 2096.500 | 40.18 | -11.03 | 29.15 | 74.00 | -44.85 | peak |
| 3 | | 3271.200 | 41.61 | -10.09 | 31.52 | 74.00 | -42.48 | peak |
| 4 | | 4804.600 | 45.02 | -5.92 | 39.10 | 74.00 | -34.90 | peak |
| 5 | | 7616.400 | 39.55 | 1.11 | 40.66 | 74.00 | -33.34 | peak |
| 6 | * | 13903.000 | 36.05 | 11.11 | 47.16 | 74.00 | -26.84 | peak |

**Measurement = Reading level + Correct Factor**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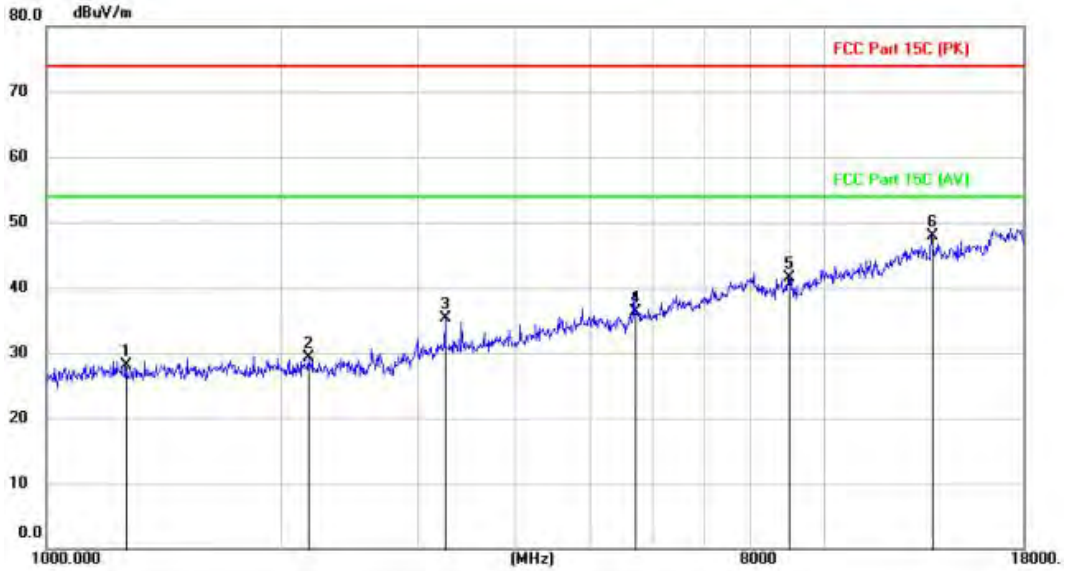
| Test Voltage | DC 1.5V |
|---|---|
| Ant. Pol. | Horizontal |
| Test Mode: | TX DH5 Mode 2441MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1265.200 | 40.12 | -11.99 | 28.13 | 74.00 | -45.87 | peak |
| 2 | | 2173.000 | 40.23 | -10.99 | 29.24 | 74.00 | -44.76 | peak |
| 3 | | 3254.200 | 45.39 | -10.13 | 35.26 | 74.00 | -38.74 | peak |
| 4 | | 5709.000 | 40.85 | -4.46 | 36.39 | 74.00 | -37.61 | peak |
| 5 | | 8991.700 | 39.59 | 1.83 | 41.42 | 74.00 | -32.58 | peak |
| 6 | * | 13756.800 | 37.03 | 10.93 | 47.96 | 74.00 | -26.04 | peak |

**Measurement = Reading level + Correct Factor**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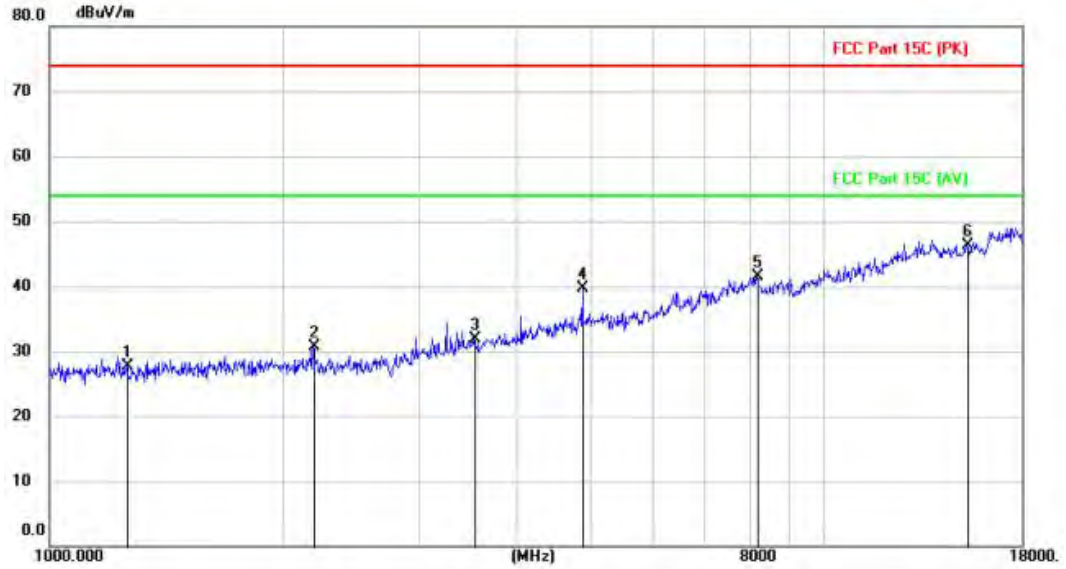
| Test Voltage | DC 1.5V |
|---|---|
| Ant. Pol. | Vertical |
| Test Mode: | TX DH5 Mode 2441MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1261.800 | 39.74 | -12.00 | 27.74 | 74.00 | -46.26 | peak |
| 2 | | 2193.400 | 41.73 | -10.99 | 30.74 | 74.00 | -43.26 | peak |
| 3 | | 3536.400 | 41.43 | -9.59 | 31.84 | 74.00 | -42.16 | peak |
| 4 | | 4881.100 | 45.41 | -5.71 | 39.70 | 74.00 | -34.30 | peak |
| 5 | | 8194.400 | 39.56 | 2.03 | 41.59 | 74.00 | -32.41 | peak |
| 6 | * | 15297.000 | 34.42 | 11.85 | 46.27 | 74.00 | -27.73 | peak |

**Measurement = Reading level + Correct Factor**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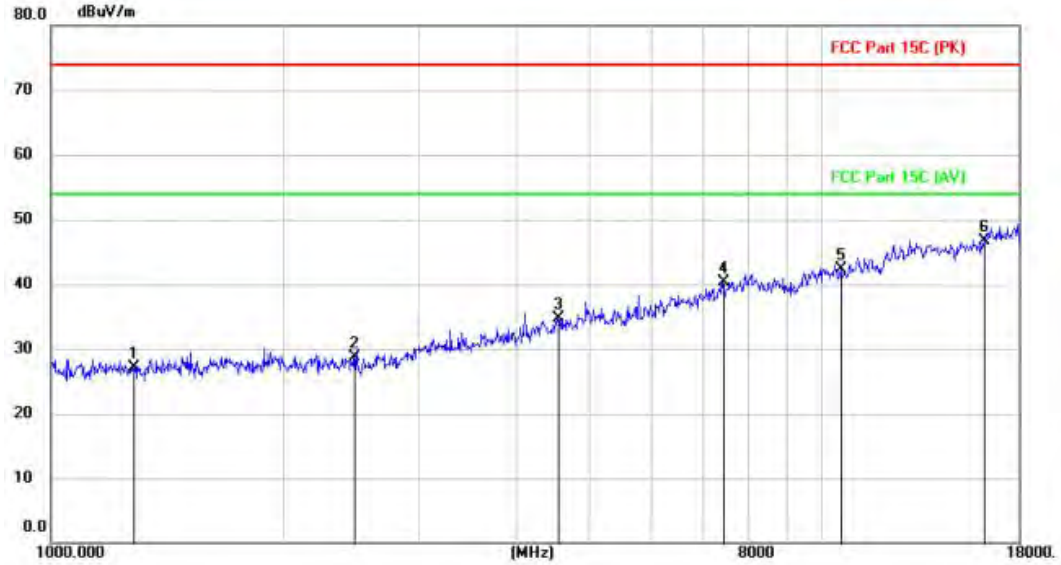
| | |
|---|---|
| **Test Voltage** | DC 1.5V |
| **Ant. Pol.** | Horizontal |
| **Test Mode:** | TX DH5 Mode 2480MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1278.800 | 39.15 | -11.99 | 27.16 | 74.00 | -46.84 | peak |
| 2 | | 2473.900 | 39.55 | -10.89 | 28.66 | 74.00 | -45.34 | peak |
| 3 | | 4546.200 | 41.33 | -6.62 | 34.71 | 74.00 | -39.29 | peak |
| 4 | | 7439.600 | 39.76 | 0.64 | 40.40 | 74.00 | -33.60 | peak |
| 5 | | 10581.200 | 37.25 | 5.05 | 42.30 | 74.00 | -31.70 | peak |
| 6 | * | 16238.800 | 33.50 | 13.18 | 46.68 | 74.00 | -27.32 | peak |

**Measurement = Reading level + Correct Factor**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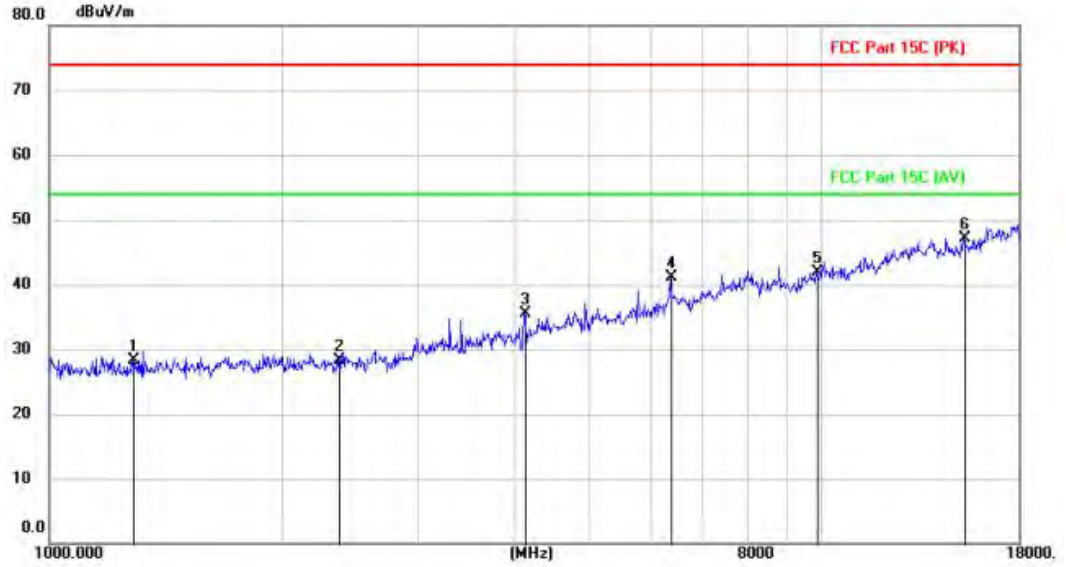
| Test Voltage | DC 1.5V |
|---|---|
| Ant. Pol. | Vertical |
| Test Mode: | TX DH5 Mode 2480MHz |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | (dBuV) | (dB/m) | (dBuV/m) | (dBuV/m) | (dB) | Detector |
| 1 | | 1282.200 | 40.19 | -11.98 | 28.21 | 74.00 | -45.79 | peak |
| 2 | | 2368.500 | 39.29 | -10.93 | 28.36 | 74.00 | -45.64 | peak |
| 3 | | 4133.100 | 43.58 | -7.98 | 35.60 | 74.00 | -38.40 | peak |
| 4 | | 6383.900 | 43.64 | -2.51 | 41.13 | 74.00 | -32.87 | peak |
| 5 | | 9853.600 | 38.23 | 3.75 | 41.98 | 74.00 | -32.02 | peak |
| 6 | * | 15283.400 | 35.18 | 11.84 | 47.02 | 74.00 | -26.98 | peak |

**Measurement = Reading level + Correct Factor**

Note:

18GHz-26.5GHz is the background of the site, there is no radiated spurious.



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## 3.10. Conducted Emission

**Limit**

**Conducted Emission Test Limit**

| Frequency | Maximum RF Line Voltage (dBμV) | |
|---|---|---|
| | Quasi-peak Level | Average Level |
| 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

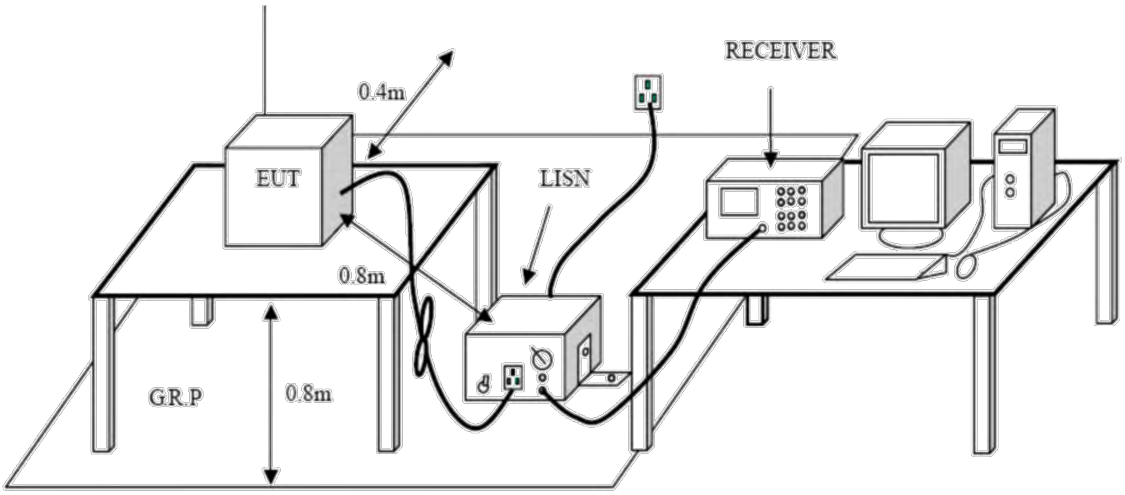
Notes:

(1) *Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

**Test Configuration**




**Test Procedure**

1. The EUT was setup according to ANSI C63.10:2020 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment.
   The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

**Test Mode:**

Please refer to the clause 2.2

**Test Results**

N/A

NOTE:This product is battery powered ,Therefore this test is not applicable.



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## 3.11. Pseudorandom Frequency Hopping Sequence

**LIMIT**

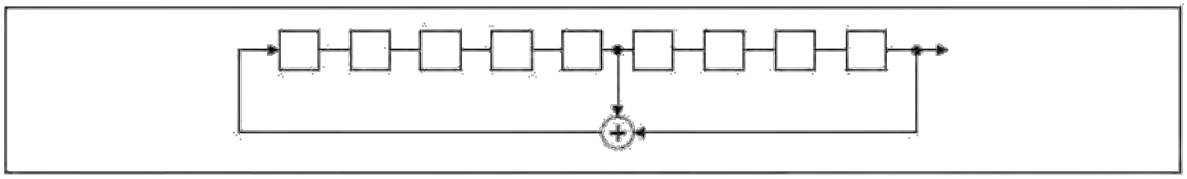
FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

**TEST RESULTS**

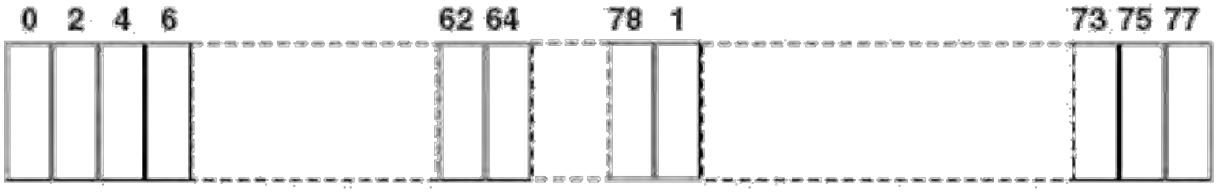
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose $5^{th}$ and $9^{th}$ stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the friststage.The sequence begins with the frist one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

An explame of pseudorandom frequency hopping sequence as follows:




Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.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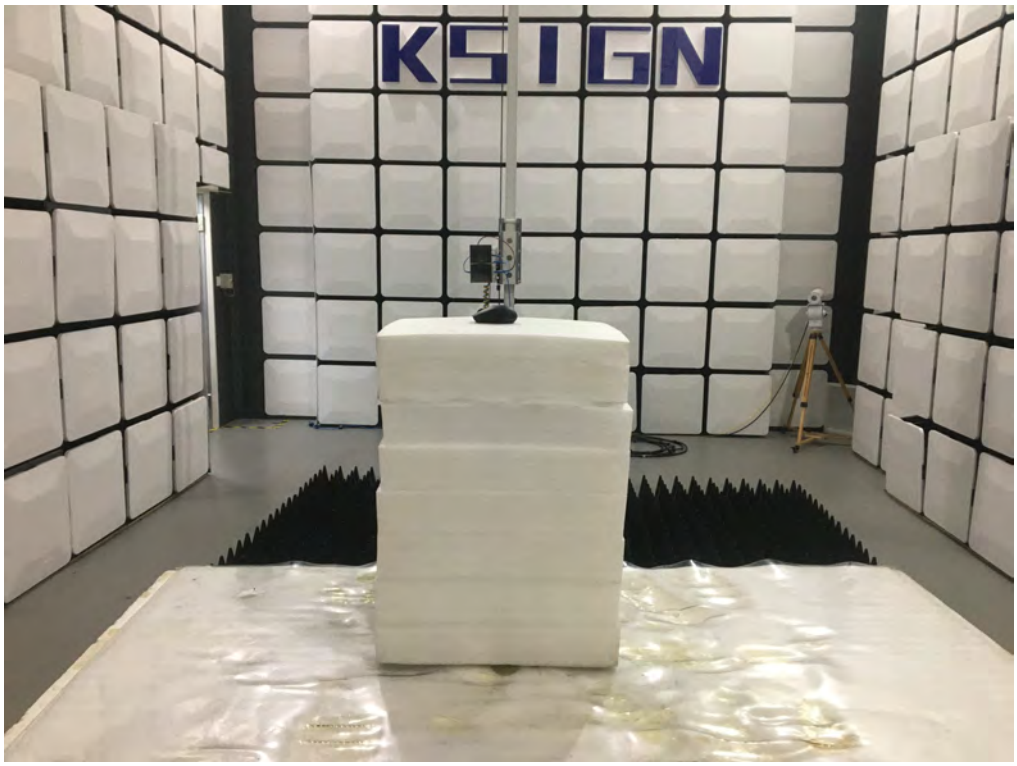
# 4.EUT TEST PHOTOS

| Radiated Measurement (Below 1GHz) |
| --- |
|  |
| Radiated Measurement (Above 1GHz) |
|  |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# 5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

**External Photographs**

| Photo 1 |
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|  |
| Photo 2 |
|  |



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| Photo 3 |
| --- |
|  |
| Photo 4 |
|  |


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Photo 5


Photo 6



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Photo 7



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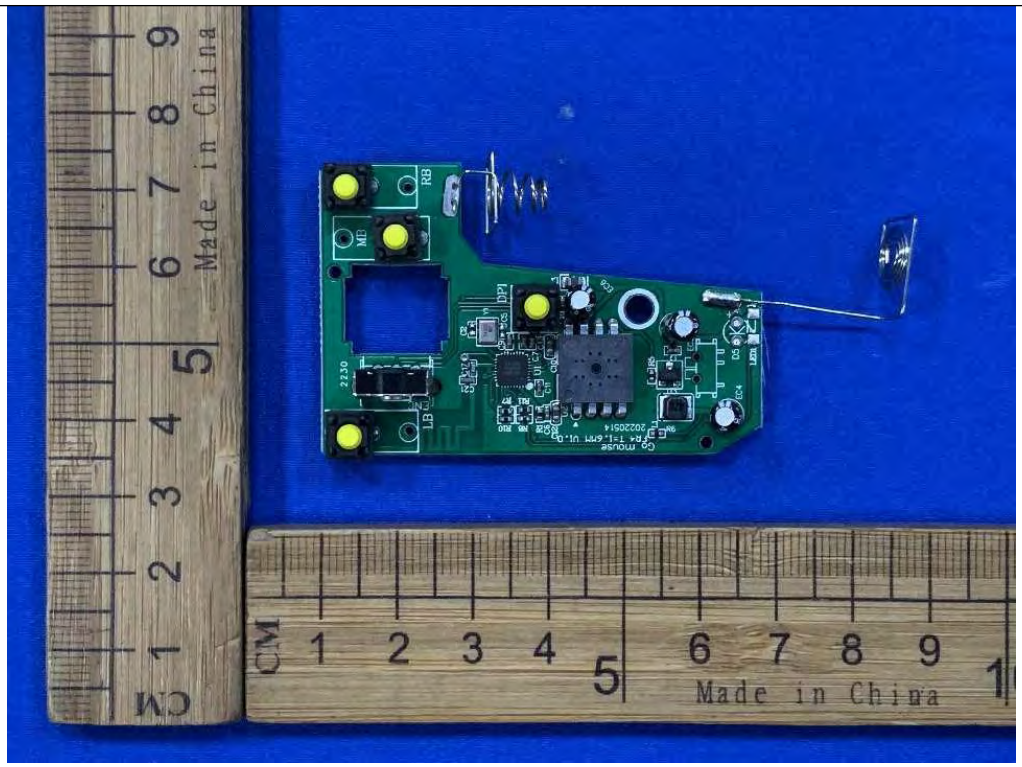
Internal Photographs

| Photo 1 |
| --- |
|  |
| Photo 2 |
|  |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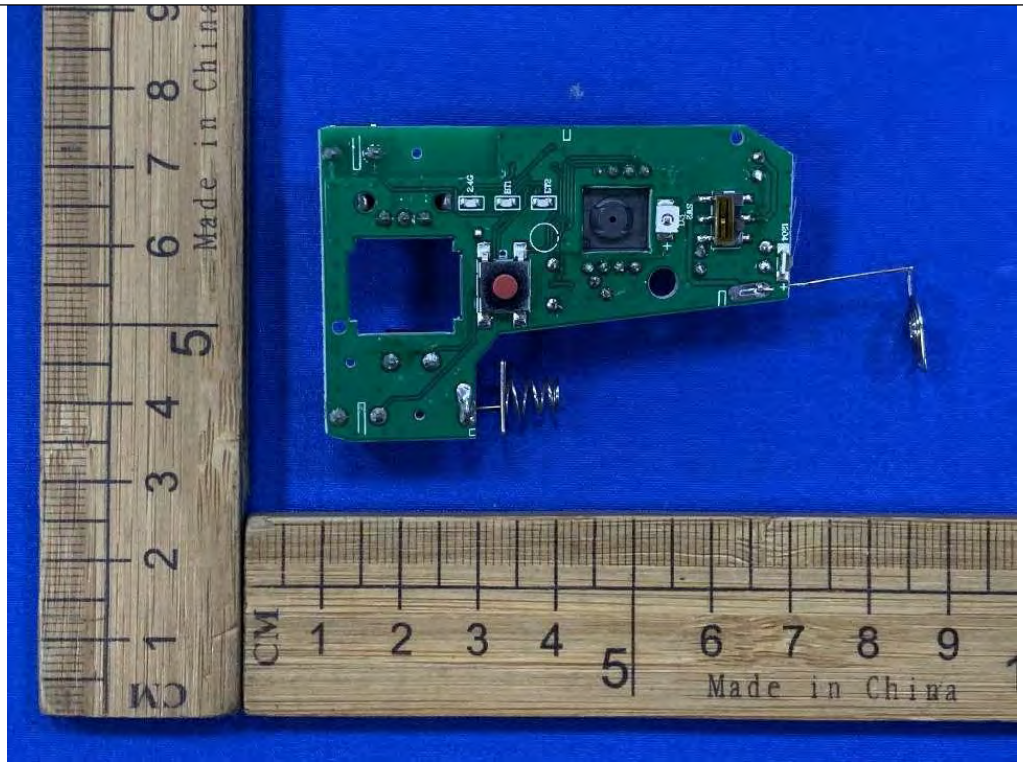
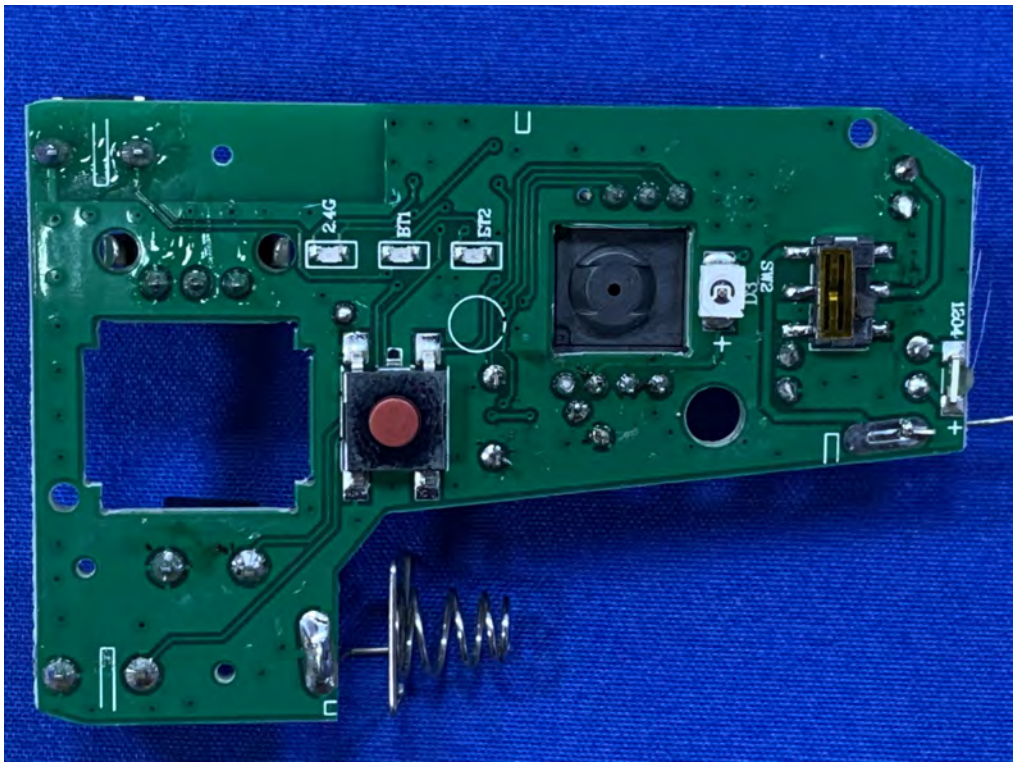
| Photo 3 |
| --- |
|  |
| Photo 4 |
|  |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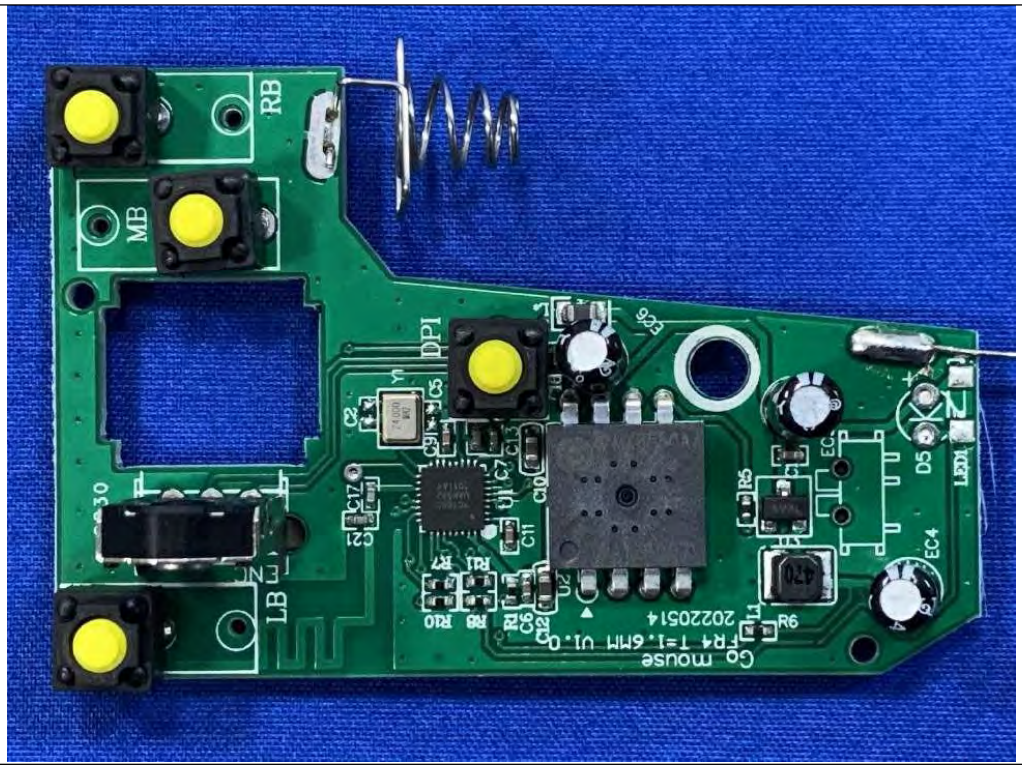
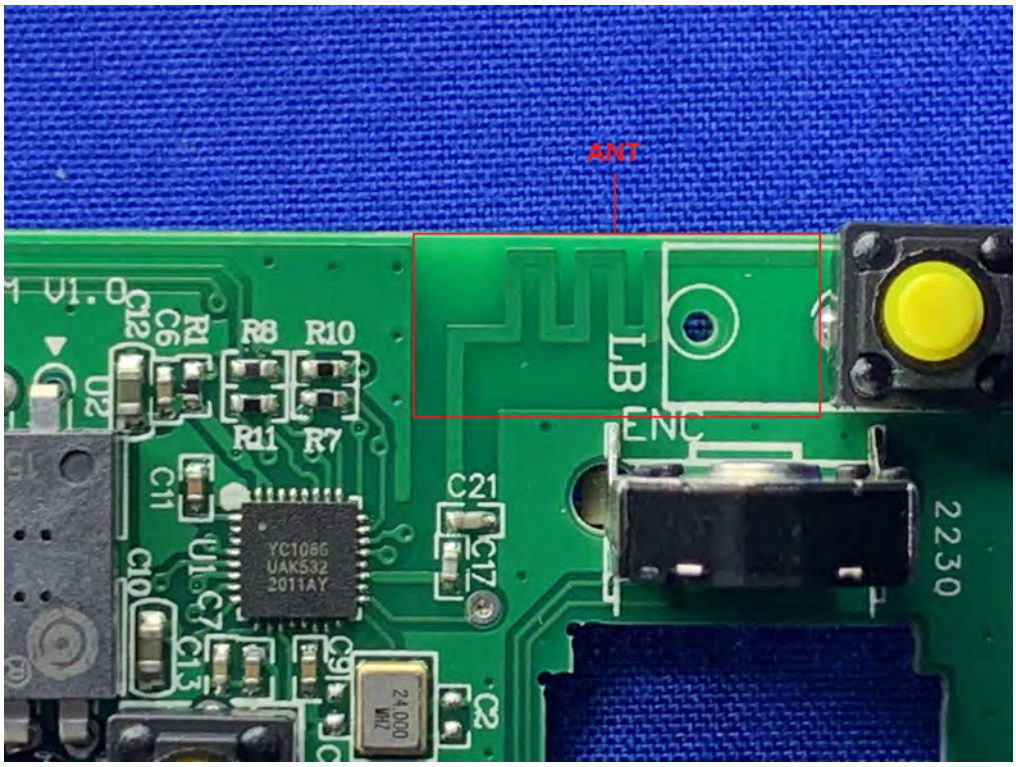
| Photo 5 |
| --- |
|  |
| Photo 6 |
|  |



**--THE END--**



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