



**SGS-CSTC Standards Technical Services Co., Ltd.**  
**Guangzhou Branch**

198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technological  
Development District, Guangzhou, China 510663  
Telephone: +86 (0) 20 82155555  
Fax: +86 (0) 20 82075059  
Email: ee.guangzhou@sgs.com

Report No.: GZEM150800427302  
Page: 1 of 59  
FCC ID: 2AANUE200BT

## **TEST REPORT**

The following sample(s) was/were submitted and identified on behalf of the client as:

|                             |                                                               |
|-----------------------------|---------------------------------------------------------------|
| <b>Application No.:</b>     | GZEM1508004273CR                                              |
| <b>Applicant:</b>           | Gibson Innovations Limited.                                   |
| <b>Manufacturer:</b>        | The same as applicant                                         |
| <b>Factory:</b>             | Minami Acoustics Limited                                      |
| <b>FCC ID:</b>              | 2AANUE200BT                                                   |
| <b>Product Description:</b> | Bluetooth Headphones                                          |
| <b>Model No.:</b>           | E200BT, E200BT/XX, E200BTYY/XX, (YY=AA to ZZ; XX=00 to 99).♣  |
| <b>♣</b>                    | Please refer to section 3 of this report for further details. |
| <b>Trade Mark:</b>          | Onkyo                                                         |
| <b>Standards:</b>           | CFR 47 FCC PART 15 Subpart C: 2014 section 15.247             |
| <b>Date of Receipt:</b>     | 2015-08-19                                                    |
| <b>Date of Test:</b>        | 2015-08-20 to 2015-08-31                                      |
| <b>Date of Issue:</b>       | 2015-10-08                                                    |
| <b>Test Result :</b>        | <b>Pass*</b>                                                  |

\* In the configuration tested, the EUT detailed in this report complied with the standards specified above.  
Please refer to section 3 of this report for further detail.

Authorized Signature:

**Jerry Chan**  
**Manager**



The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



## 2 Version

| Revision Record |         |            |          |                 |
|-----------------|---------|------------|----------|-----------------|
| Version         | Chapter | Date       | Modifier | Remark          |
| 00              |         | 2015-10-08 |          | Original Report |
|                 |         |            |          |                 |
|                 |         |            |          |                 |
|                 |         |            |          |                 |
|                 |         |            |          |                 |

|                          |                                                                                                                      |                                  |  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------|--|
| Authorized for issue by: |                                                                                                                      |                                  |  |
| Tested By                | <br>(Curry Wu) / Project Engineer | 2015-08-20 to 2015-08-31<br>Date |  |
| Prepared By              | <br>(June Chen) / Clerk           | 2015-10-08<br>Date               |  |
| Checked By               | <br>(Ricky Liu) / Reviewer        | 2015-10-08<br>Date               |  |



### 3 Test Summary

| Test                                                     | Test Requirement                                          | Test method                                               | Result |
|----------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|--------|
| Antenna Requirement                                      | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | FCC PART 15 C<br>section 15.247 (c) and<br>Section 15.203 | PASS   |
| Occupied Bandwidth                                       | FCC PART 15 C<br>section 15.247 (a)(1)                    | ANSI C63.10: Clause<br>6.9.1                              | PASS   |
| Carrier Frequencies Separated                            | FCC PART 15 C<br>section 15.247(a)(1)                     | ANSI C63.10:<br>Clause 7.7.2                              | PASS   |
| Hopping Channel Number                                   | FCC PART 15 C<br>section 15.247(a)(1)(iii)                | ANSI C63.10:<br>Clause 7.7.3                              | PASS   |
| Dwell Time                                               | FCC PART 15 C<br>section 15.247(a)(1)(iii)                | ANSI C63.10:<br>Clause 7.7.4                              | PASS   |
| Pseudorandom Frequency<br>Hopping Sequence               | FCC PART 15 C<br>section 15.247(a)(1)                     | ANSI C63.10:<br>Clause 7.7.5                              | PASS   |
| Maximum Peak Output Power                                | FCC PART 15 C<br>section 15.247(b)(1)                     | ANSI C63.10: Clause<br>8.5                                | PASS   |
| Conducted Spurious Emission                              | FCC PART 15 C<br>section 15.247(d)                        | ANSI C63.10: Clause 6.7                                   | PASS   |
| Radiated Emissions which fall<br>in the restricted bands | FCC PART 15 C<br>section 15.247(d)                        | ANSI C63.10: Clause 6.4,<br>6.5 and 6.6                   | PASS   |
| Band Edges Measurement                                   | FCC PART 15 C<br>section 15.247 (d)<br>& 15.205           | ANSI C63.10: Clause<br>6.10.5.2                           | PASS   |

**Remark:**

EUT: In this whole report EUT means Equipment Under Test.

N/A: not applicable. Refer to the relative section for the details.

EUT: In this whole report EUT means Equipment Under Test.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radio Frequency.

ANSI C63.10: the detail version is ANSI C63.10:2009 in the whole report.

DA 00-705 was used as a guideline in preparing this Test Report.

♣ **Model No.:** E200BT, E200BT/XX, E200BTYY/XX, (YY=AA to ZZ; XX=00 to 99).

According to the declaration from the applicant, the electrical circuit design, layout, components used and internal wiring were identical for all models, with only difference being the Model number and Marketing propose.

Therefore only one model **E200BT** was tested in this report.



## 4 Contents

|      |                                                             |    |
|------|-------------------------------------------------------------|----|
| 1    | Cover Page .....                                            | 1  |
| 2    | Version .....                                               | 2  |
| 3    | Test Summary .....                                          | 3  |
| 4    | Contents .....                                              | 4  |
| 5    | General Information .....                                   | 5  |
| 5.1  | Client Information .....                                    | 5  |
| 5.2  | General Description of E.U.T. ....                          | 5  |
| 5.3  | Details of E.U.T. ....                                      | 5  |
| 5.4  | Modulation configure .....                                  | 6  |
| 5.5  | Description of Support Units .....                          | 7  |
| 5.6  | Deviation from Standards .....                              | 7  |
| 5.7  | Abnormalities from Standard Conditions .....                | 7  |
| 5.8  | Other Information Requested by the Customer .....           | 7  |
| 5.9  | Test Location .....                                         | 7  |
| 5.10 | Test Facility .....                                         | 8  |
| 6    | Equipment List .....                                        | 9  |
| 7    | Test Results .....                                          | 10 |
| 7.1  | E.U.T. test conditions .....                                | 10 |
| 7.2  | Antenna Requirement .....                                   | 13 |
| 7.3  | Occupied Bandwidth .....                                    | 14 |
| 7.4  | Carrier Frequencies Separated .....                         | 19 |
| 7.5  | Hopping Channel Number .....                                | 23 |
| 7.6  | Dwell Time .....                                            | 25 |
| 7.7  | Pseudorandom Frequency Hopping Sequence .....               | 36 |
| 7.8  | Maximum Peak Output Power .....                             | 39 |
| 7.9  | Conducted Spurious Emissions .....                          | 44 |
| 7.10 | Radiated Emissions which fall in the restricted bands ..... | 50 |
| 7.11 | Band Edges Requirement .....                                | 55 |



## 5 General Information

### 5.1 Client Information

Applicant: Gibson Innovations Limited.  
Address of Applicant: 5/F, Philips Electronics Building. 5 Science Part East Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong  
Manufacturer: The same as applicant  
Address of Manufacturer: The same as applicant  
Factory: Minami Acoustics Limited  
Address of Factory: Muhejing Road Gangkou Town, Zhongshan City ,Guangdong, China

### 5.2 General Description of E.U.T.

Product Description: Bluetooth Headphones  
Model No.: E200BT

### 5.3 Details of E.U.T.

Operating Frequency 2402 MHz to 2480 MHz  
Type of Modulation: GFSK, ( $\pi/4$ )DQPSK, 8DPSK for Classic  
GFSK for BLE  
Number of Channels 79 Channels for Classic; 40 Channels for BLE  
Channel Separation: 1 MHz for Classic; 2MHz for BLE  
Duty Cycle: Continuous operation  
Antenna Type Integral antenna  
Antenna gain: 0dBi  
Speciality: Bluetooth 4.0 Smart Ready (Dual mode)  
Test Software: BlueTest 3 Version 2.4.8 (manufacturer declare)  
Function: Speaker with BT function to transmit and receive audio signal.  
Power Supply: Working voltage: DC 3.7V rechargeable battery  
Normal Test Voltage: DC 3.7V for Host  
USB Cable 1.0m unscreened USB wire

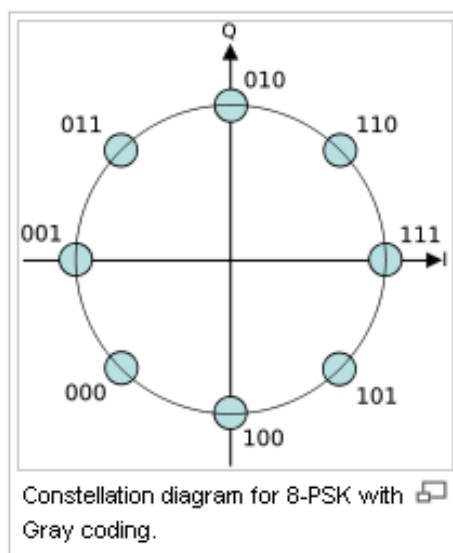
## 5.4 Modulation configure

| Modulation      | Packet | Packet Type | Packet Size |
|-----------------|--------|-------------|-------------|
| GFSK            | DH1    | 4           | 24          |
|                 | DH3    | 11          | 183         |
|                 | DH5    | 15          | 339         |
| $(\pi/4)$ DQPSK | 2DH1   | 20          | 54          |
|                 | 2DH3   | 26          | 367         |
|                 | 2DH5   | 30          | 379         |
| 8DPSK           | 3DH1   | 24          | 83          |
|                 | 3DH3   | 27          | 552         |
|                 | 3DH5   | 31          | 1021        |

### Remark:

#### Modulation 8-DPSK

The modulation 8 PSK works with 8 phases between 0 and  $2\pi$  (0 and 360 degrees), it can be seeing bellow in the circle.



Normal mode: the Bluetooth has been tested on the Modulation of GFSK;

EDR mode: the Bluetooth has been tested on the Modulation of  $(\pi/4)$ DQPSK and 8DPSK, compliance test and record the worst case on 8DPSK.



## 5.5 Description of Support Units

The EUT has been tested with corresponding accessories supplied by SGS as below:

| Description | Manufacturer | Model No. | SN/Certificate NO |
|-------------|--------------|-----------|-------------------|
| NoteBook    | IBM          | T30       | S/N78-3VMLX 06/01 |
| Test board  | N/A          | N/A       | N/A               |

Remark: the notebook and test board are used to configure the channel and power of the BT device and not used during the test.

## 5.6 Deviation from Standards

Biconical and log periodic antennas were used instead of dipole antennas.

## 5.7 Abnormalities from Standard Conditions

None.

## 5.8 Other Information Requested by the Customer

None.

## 5.9 Test Location

All tests were performed at:

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

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

No tests were sub-contracted.

## 5.10 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

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

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

- **ACMA**

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

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

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

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC (Registration No.: 282399)**

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

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584, G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IEC 61010-1:2006-10 and Rules procedure IEC 61010-2:2006-10, and the relevant IEC CB-Scheme Operational documents.



## 6 Equipment List

| RE in Chamber |                                            |                             |            |            |              |              |
|---------------|--------------------------------------------|-----------------------------|------------|------------|--------------|--------------|
| No.           | Test Equipment                             | Manufacturer                | Model No.  | Serial No. | Cal. date    | Cal.Due date |
|               |                                            |                             |            |            | (YYYY-MM-DD) | (YYYY-MM-DD) |
| EMC0525       | Compact Semi-Anechoic Chamber              | ChangZhou ZhongYu           | N/A        | N/A        | 2014-12-05   | 2015-12-05   |
| EMC0522       | EMI Test Receiver                          | Rohde & Schwarz             | ESIB26     | 100283     | 2015-03-02   | 2016-03-02   |
| EMC0056       | EMI Test Receiver                          | Rohde & Schwarz             | ESCI       | 100236     | 2015-04-07   | 2016-04-07   |
| EMC0528       | RI High frequency Cable                    | SGS                         | 20 m       | N/A        | 2014-04-19   | 2016-04-19   |
| EMC2025       | Trilog Broadband Antenna 30-1000MHz        | SCHWARZBECK MESS-ELEKTRONIK | VULB 9160  | 9160-3372  | 2014-07-14   | 2017-07-14   |
| EMC0524       | Bi-log Type Antenna                        | Schaffner -Chase            | CBL6112B   | 2966       | 2013-08-31   | 2016-08-31   |
| EMC0519       | Bilog Type Antenna                         | Schaffner -Chase            | CBL6143    | 5070       | 2014-05-04   | 2017-05-04   |
| EMC2026       | Horn Antenna 1-18GHz                       | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | 9120D-841  | 2013-08-31   | 2016-08-31   |
| EMC0521       | 1-26.5 GHz Pre-Amplifier                   | Agilent                     | 8449B      | 3008A01649 | 2015-03-02   | 2016-03-02   |
| EMC2065       | Amplifier                                  | HP                          | 8447F      | N/A        | 2015-07-18   | 2016-07-17   |
| EMC0075       | 310N Amplifier                             | Sonoma                      | 310N       | 272683     | 2015-03-02   | 2016-03-02   |
| EMC0523       | Active Loop Antenna                        | EMCO                        | 6502       | 42963      | 2014-03-03   | 2016-03-03   |
| EMC2041       | Broad-Band Horn Antenna (14)15-26.5(40)GHz | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9170  | 9170-375   | 2014-05-26   | 2017-05-26   |
| EMC2079       | High Pass Filter(915MHz)                   | FSY MICROWAVE               | HM1465-9SS | 009        | 2015-03-02   | 2016-03-02   |
| EMC2069       | 2.4GHz filter                              | Micro-Tronics               | BRM 50702  | 149        | 2015-03-02   | 2016-03-02   |
| EMC0530       | 10m Semi-Anechoic Chamber                  | ETS                         | N/A        | N/A        | 2014-05-03   | 2016-05-03   |

| General used equipment |                |              |           |            |              |              |
|------------------------|----------------|--------------|-----------|------------|--------------|--------------|
| No.                    | Test Equipment | Manufacturer | Model No. | Serial No. | Cal. date    | Cal.Due date |
|                        |                |              |           |            | (YYYY-MM-DD) | (YYYY-MM-DD) |
| EMC0006                | DMM            | Fluke        | 73        | 70681569   | 2015-09-17   | 2016-09-16   |
| EMC0007                | DMM            | Fluke        | 73        | 70671122   | 2015-09-17   | 2016-09-16   |

## 7 Test Results

### 7.1 E.U.T. test conditions

**Test Voltage:** DC 3.7V  
**Temperature:** 20.0 -25.0 °C  
**Humidity:** 38-50 % RH  
**Atmospheric Pressure:** 1000 -1010 mbar

**Requirements:** **15.31(e):** For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

**15.32:** Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested as follows: Testing shall be in accordance with the procedures specified in Section 15.31 of this part.

**Test frequencies and frequency range:** According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

According to the 15.33 (a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in the following table:



**Number of fundamental frequencies to be tested in EUT transmit band**

| Frequency range in which device operates | Number of frequencies | Location in frequency range of operation    |
|------------------------------------------|-----------------------|---------------------------------------------|
| 1 MHz or less                            | 1                     | Middle                                      |
| 1 MHz to 10 MHz                          | 2                     | 1 near top and 1 near bottom                |
| More than 10 MHz                         | 3                     | 1 near top, 1 near middle and 1 near bottom |

**Frequency range of radiated emission measurements**

| Lowest frequency generated in the device | Upper frequency range of measurement                                                                        |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 9 kHz to below 10 GHz                    | 10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower                             |
| At or above 10 GHz to below 30 GHz       | 5th harmonic of highest fundamental frequency or to 100 GHz, whichever is lower                             |
| At or above 30 GHz                       | 5th harmonic of highest fundamental frequency or to 200 GHz, whichever is lower, unless otherwise specified |

EUT channels and frequencies list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 0       | 2402            | 27      | 2429            | 54      | 2456            |
| 1       | 2403            | 28      | 2430            | 55      | 2457            |
| 2       | 2404            | 29      | 2431            | 56      | 2458            |
| 3       | 2405            | 30      | 2432            | 57      | 2459            |
| 4       | 2406            | 31      | 2433            | 58      | 2460            |
| 5       | 2407            | 32      | 2434            | 59      | 2461            |
| 6       | 2408            | 33      | 2435            | 60      | 2462            |
| 7       | 2409            | 34      | 2436            | 61      | 2463            |
| 8       | 2410            | 35      | 2437            | 62      | 2464            |
| 9       | 2411            | 36      | 2438            | 63      | 2465            |
| 10      | 2412            | 37      | 2439            | 64      | 2466            |
| 11      | 2413            | 38      | 2440            | 65      | 2467            |
| 12      | 2414            | 39      | 2441            | 66      | 2468            |
| 13      | 2415            | 40      | 2442            | 67      | 2469            |
| 14      | 2416            | 41      | 2443            | 68      | 2470            |
| 15      | 2417            | 42      | 2444            | 69      | 2471            |
| 16      | 2418            | 43      | 2445            | 70      | 2472            |
| 17      | 2419            | 44      | 2446            | 71      | 2473            |
| 18      | 2420            | 45      | 2447            | 72      | 2474            |
| 19      | 2421            | 46      | 2448            | 73      | 2475            |
| 20      | 2422            | 47      | 2449            | 74      | 2476            |
| 21      | 2423            | 48      | 2450            | 75      | 2477            |
| 22      | 2424            | 49      | 2451            | 76      | 2478            |
| 23      | 2425            | 50      | 2452            | 77      | 2479            |
| 24      | 2426            | 51      | 2453            | 78      | 2480            |
| 25      | 2427            | 52      | 2454            | /       | /               |
| 26      | 2428            | 53      | 2455            | /       | /               |

Using the special software and development board we can enter the product for engineer mode then we can control the EUT to select the wanted channel for test as above list.

Test frequencies are the lowest channel: 0 channel(2402MHz), middle channel: 39 channel(2441 MHz) and highest channel: 78 channel(2480 MHz)

## 7.2 Antenna Requirement

### Standard requirement

15.203 requirement:

For intentional device. According to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

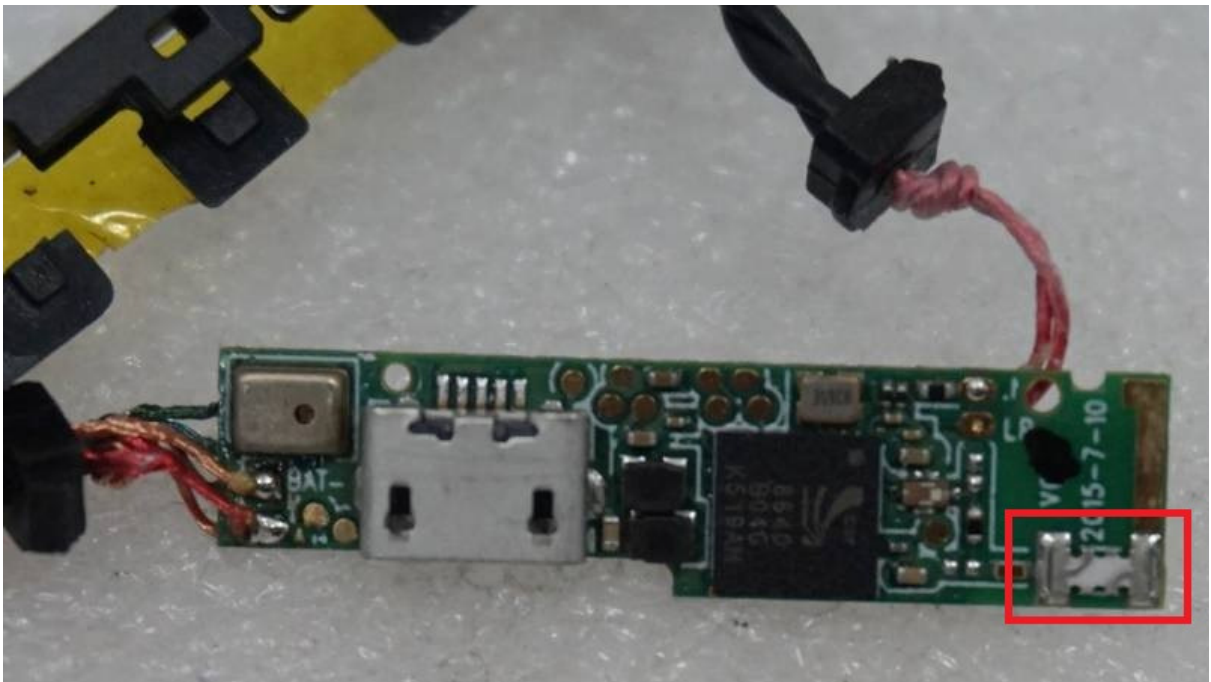
15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz bands that are used exclusively for fixed.

Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi 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 6 dBi.

### EUT Antenna

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



**Test result: The unit does meet the FCC requirements.**

### 7.3 Occupied Bandwidth

**Test Requirement:** FCC Part 15 C section 15.247

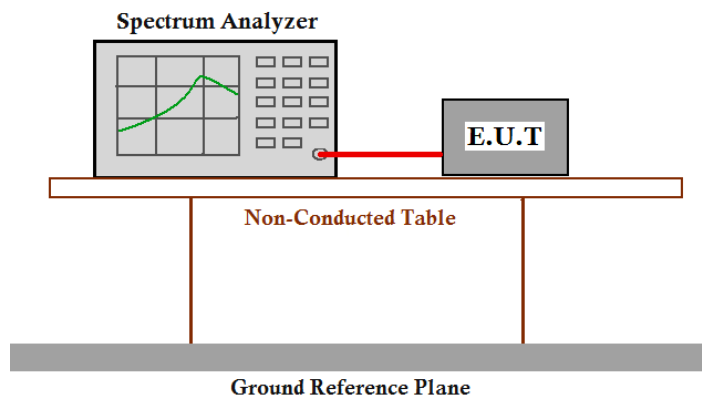
(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies 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.

**Test Method:** ANSI C63.10: Clause 6.9.1

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data package. Compliance test in normal mode (DH5) and EDR mode (3DH5) as the worst case was found.

Test the EUT in battery operation mode.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centring on a hopping channel;
3. Set the spectrum analyzer: RBW  $\geq$  1% of the 20dB bandwidth VBW  $\geq$  RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20 dB points bandwidth.



**Test result:**

**Normal mode:**

| Test Channel | -20dB down bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|---------------------------|--------------------|
| Lowest       | 1.132                     | 0.755              |
| Middle       | 1.122                     | 0.748              |
| Highest      | 1.132                     | 0.755              |

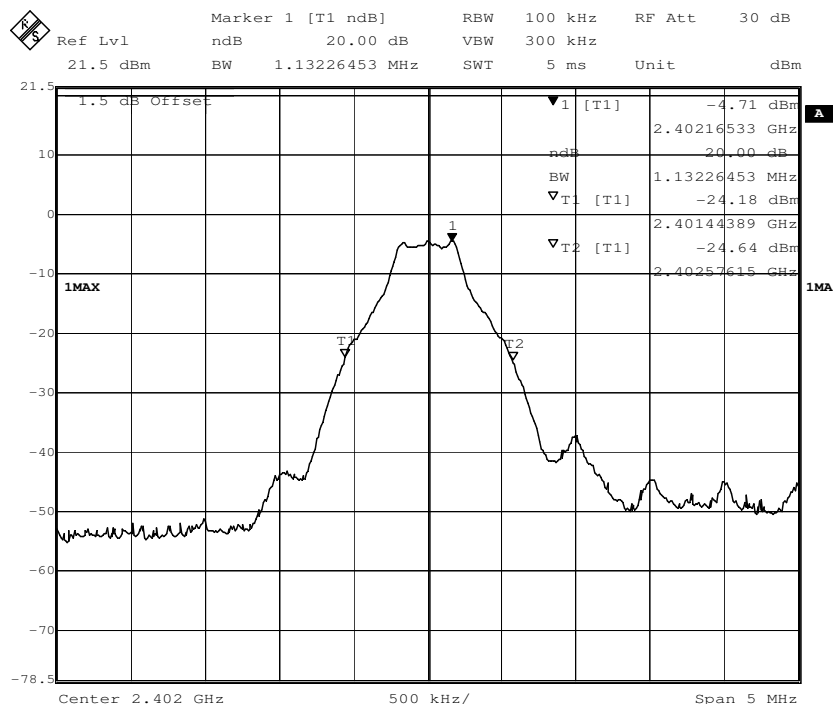
**EDR mode:**

| Test Channel | -20dB down bandwidth(MHz) | 2/3 bandwidth(MHz) |
|--------------|---------------------------|--------------------|
| Lowest       | 1.403                     | 0.935              |
| Middle       | 1.393                     | 0.929              |
| Highest      | 1.393                     | 0.929              |

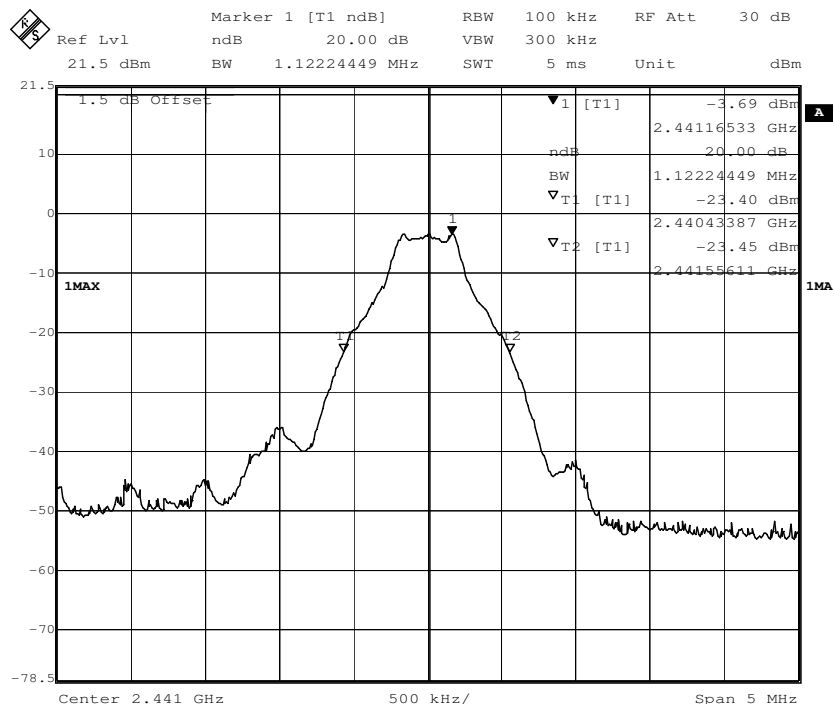
**Result plot as follows:**

**Normal mode (DH5):**

**Lowest Channel(2.402 GHz):**

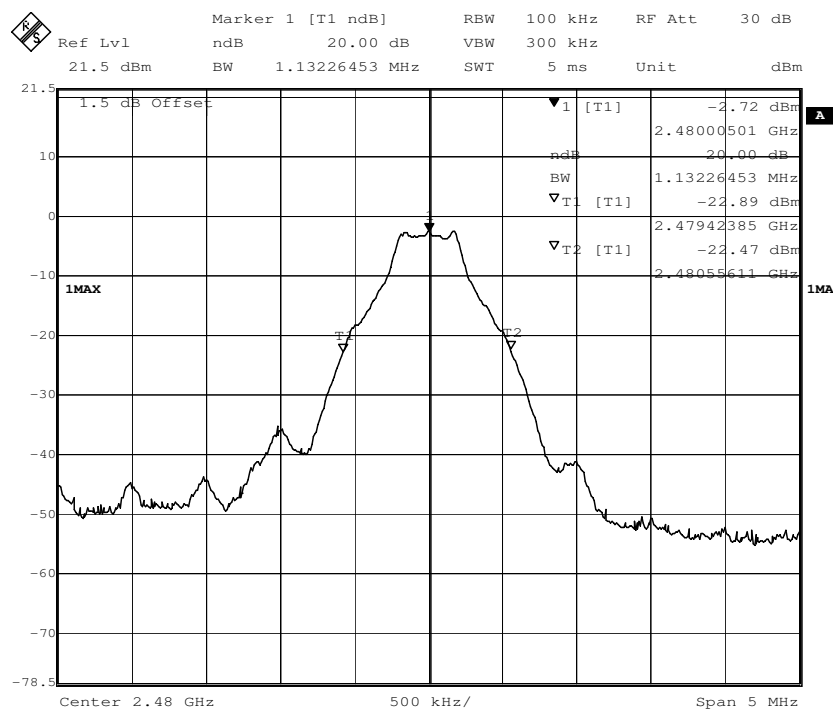


**Middle Channel(2.441 GHz):**



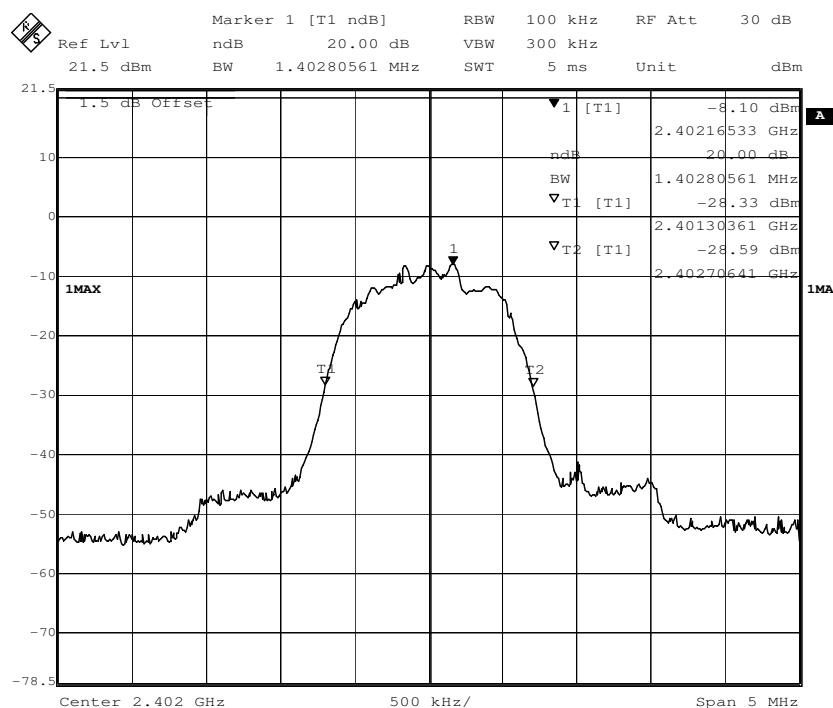


Highest Channel(2.480 GHz):

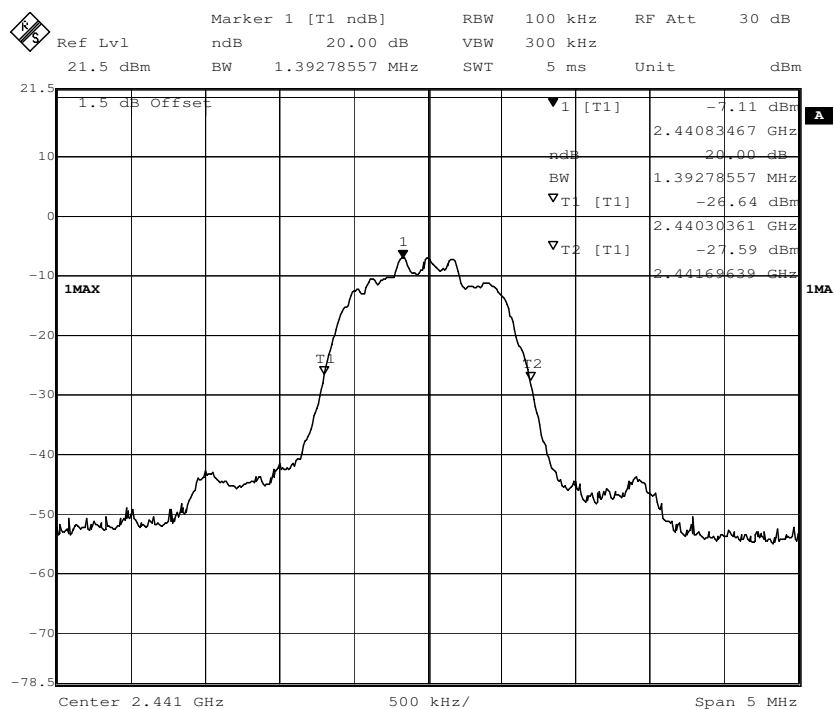


EDR mode (3DH5):

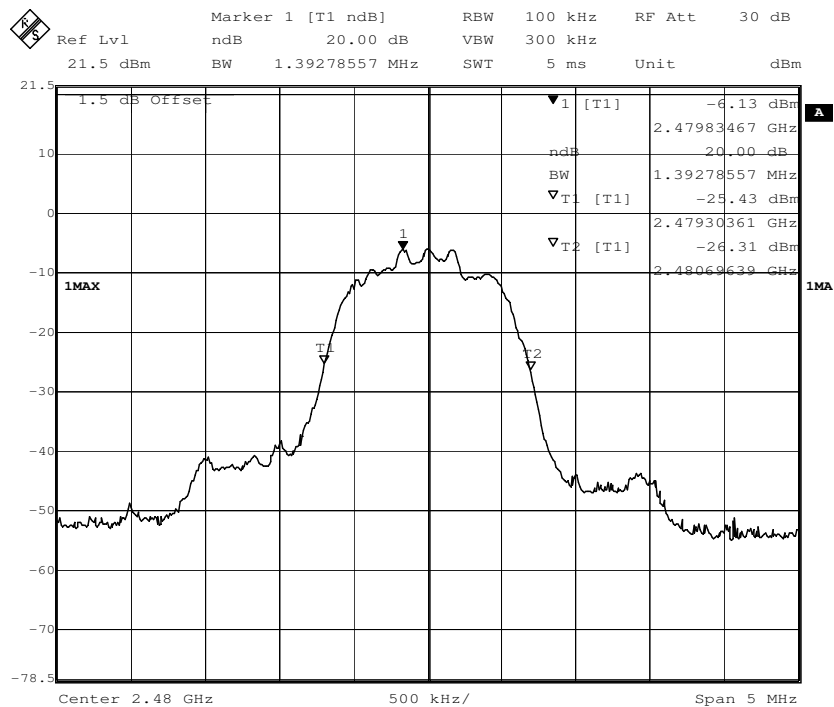
Lowest channel(2.402 GHz):



Middle channel(2.441 GHz):



Highest channel(2.480 GHz):



## 7.4 Carrier Frequencies Separated

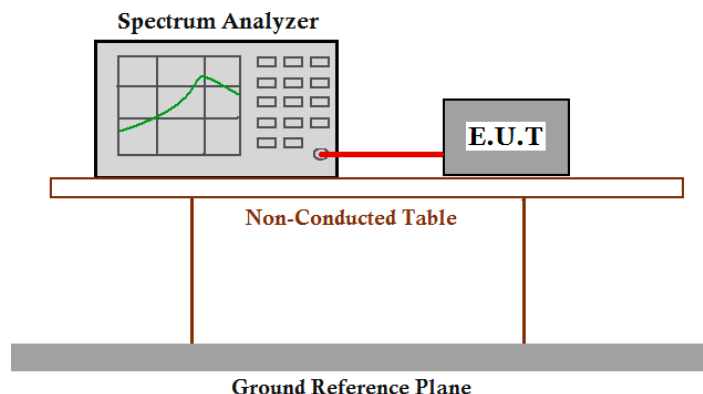
**Test Requirement:** FCC Part 15 C section 15.247

(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 hopping channel, whichever is greater. Alternatively, 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.

**Test Method:** ANSI C63.10: Clause 7.7.2

**Test Status:** Pre-test the EUT in hopping mode with different data packet. Compliance test in hopping with EDR mode (3DH5) as the worst case was found.  
Test the EUT in battery operation mode.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW  $\geq$  1% of the span, VBW  $\geq$  RBW, Sweep = auto; Detector Function = Peak. Trace = Max, hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.



**Test result:**

| Test Channel                                   | Carrier Frequencies Separated | Pass/Fail |
|------------------------------------------------|-------------------------------|-----------|
| Lower Channels<br>(channel 0 and channel 1)    | 1.002MHz                      | Pass      |
| Middle Channels<br>(channel 39 and channel 40) | 0.982MHz                      | Pass      |
| Upper Channels<br>(channel 77 and channel 78)  | 0.982MHz                      | Pass      |

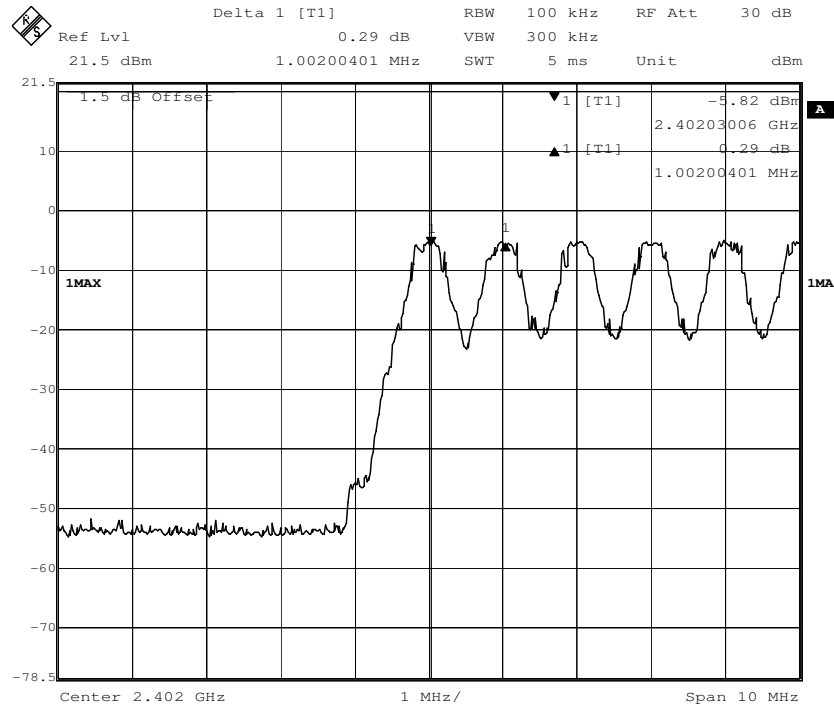
**Remark:**

- ① The limit is two-thirds of the 20dB bandwidth EDR(3DH5) mode due to the transmission power is less than 0.125 W shown on section 7.8 of this report.

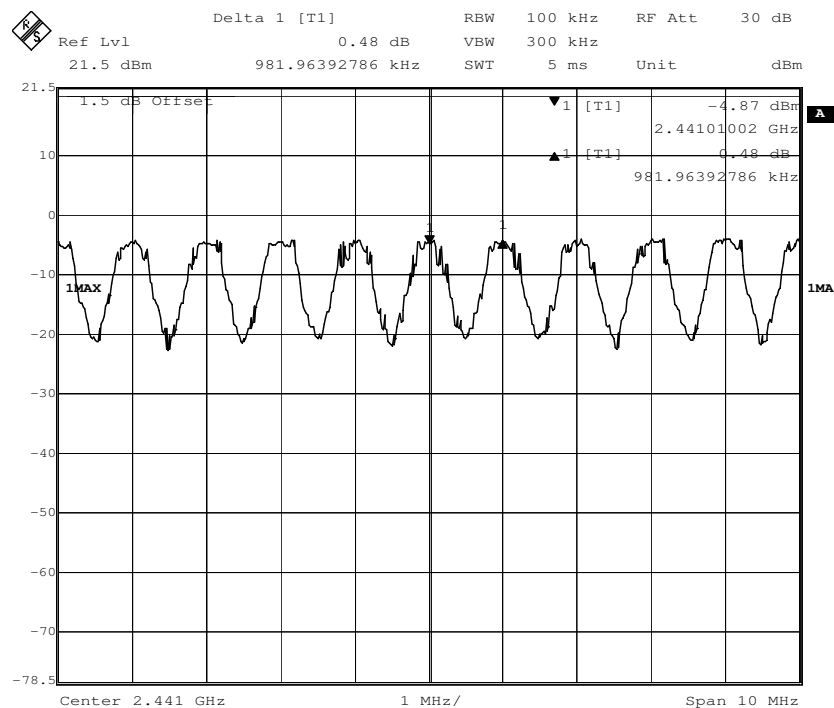


Result plot as follows:

Lowest Channels: **Carrier Frequencies Separated**

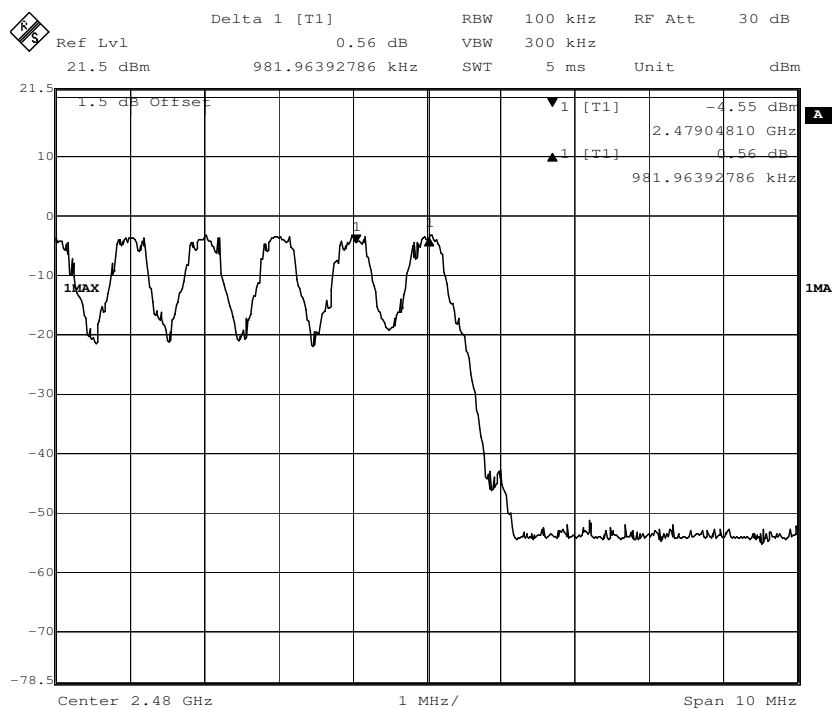


Middle Channels: **Carrier Frequencies Separated**





Highest Channels: **Carrier Frequencies Separated**



**Test result: The unit does meet the FCC requirements.**

## 7.5 Hopping Channel Number

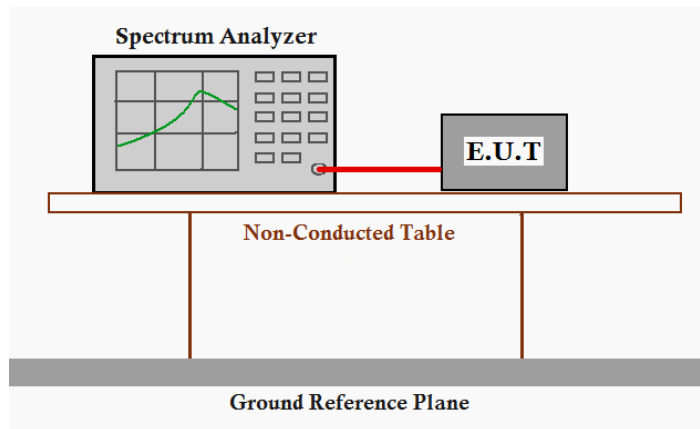
**Test Requirement:** FCC Part15 C section 15.247

(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

**Test Method:** ANSI C63.10: Clause 7.7.3

**Test Status:** Pre-test the EUT in hopping mode with different data packet. Compliance test in hopping with EDR mode (3DH5) as the worst case was found.  
Test the EUT in battery operation mode.

**Test Configuration:**

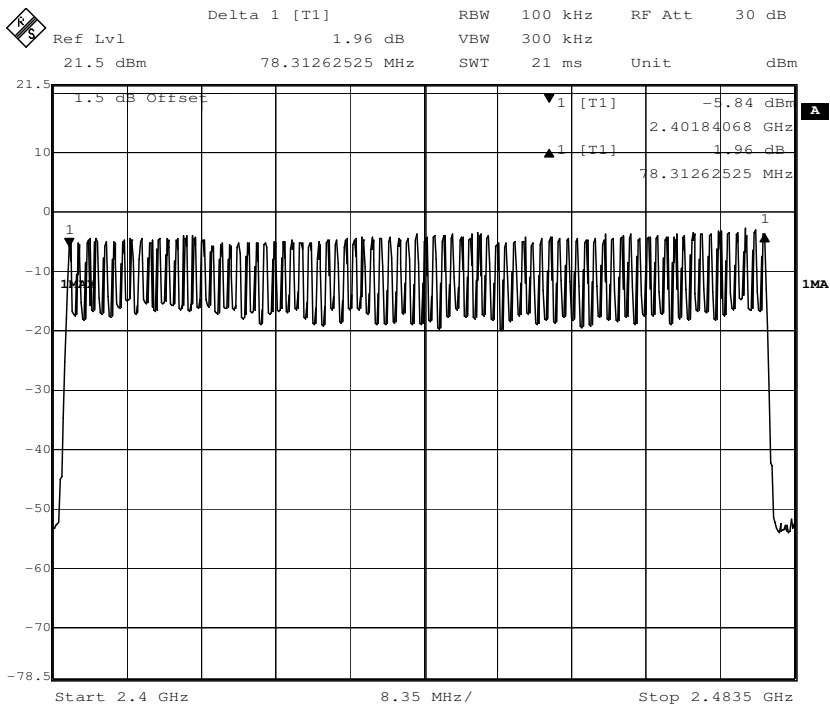


**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: start frequency = 2400 MHz. stop frequency = 2483.5 MHz. Submit the test result graph.



Test result: Total channels are 79 channels.



Test result: The unit does meet the FCC requirements.

## 7.6 Dwell Time

**Test Requirement:** FCC Part 15 C section 15.247

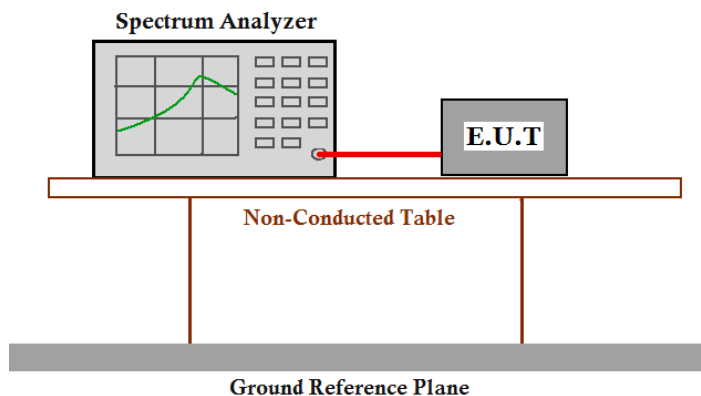
(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

**Test Method:** ANSI C63.10: Clause 7.7.4

**Test Status:** Test the EUT in hopping mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in hopping mode with EDR mode (3DH1, 3DH3 and 3DH5) as the worst case was found.

Test the EUT in battery operation mode.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
  2. Set spectrum analyzer span = 0. centered on a hopping channel;
  3. Set RBW = 1 MHz and VBW = 1 MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold;
  4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). Repeat this test for each variation.
- The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.



**Test Result:**

The test period:  $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

|                                |   |       |      |   |    |   |             |   |            |
|--------------------------------|---|-------|------|---|----|---|-------------|---|------------|
| <b>1. Channel 0: 2.402GHz</b>  |   |       |      |   |    |   |             |   |            |
| 3DH1 time slot                 | = | 0.421 | (ms) | * | 33 | * | (31.6/3.16) | = | 138.930 ms |
| 3DH3 time slot                 | = | 1.683 | (ms) | * | 16 | * | (31.6/3.16) | = | 269.280 ms |
| 3DH5 time slot                 | = | 2.931 | (ms) | * | 11 | * | (31.6/3.16) | = | 322.410 ms |
| <b>2. Channel 39: 2.441GHz</b> |   |       |      |   |    |   |             |   |            |
| 3DH1 time slot                 | = | 0.431 | (ms) | * | 33 | * | (31.6/3.16) | = | 142.230 ms |
| 3DH3 time slot                 | = | 1.683 | (ms) | * | 16 | * | (31.6/3.16) | = | 269.280 ms |
| 3DH5 time slot                 | = | 2.931 | (ms) | * | 11 | * | (31.6/3.16) | = | 322.410 ms |
| <b>3. Channel 78: 2.480GHz</b> |   |       |      |   |    |   |             |   |            |
| 3DH1 time slot                 | = | 0.431 | (ms) | * | 33 | * | (31.6/3.16) | = | 142.230 ms |
| 3DH3 time slot                 | = | 1.683 | (ms) | * | 16 | * | (31.6/3.16) | = | 269.280 ms |
| 3DH5 time slot                 | = | 2.946 | (ms) | * | 11 | * | (31.6/3.16) | = | 324.060 ms |

The average time of occupancy in the specified 31.6 second period is equal to pulse width\*(# of pulse in observation period)\*(test period / observation period)

The results are not greater than 0.4 seconds.

**The unit does meet the FCC requirements.**

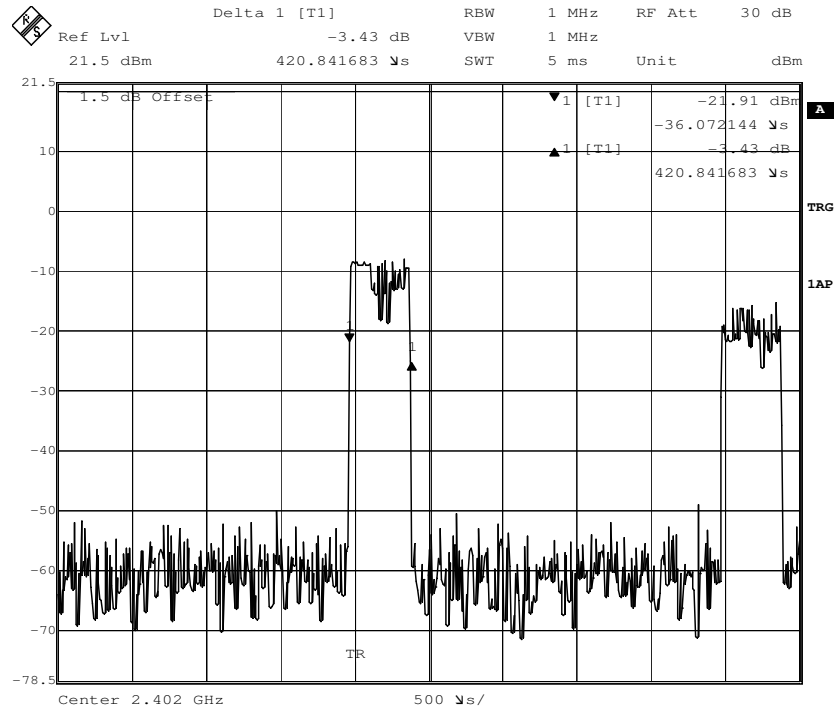


Result plot as follows:

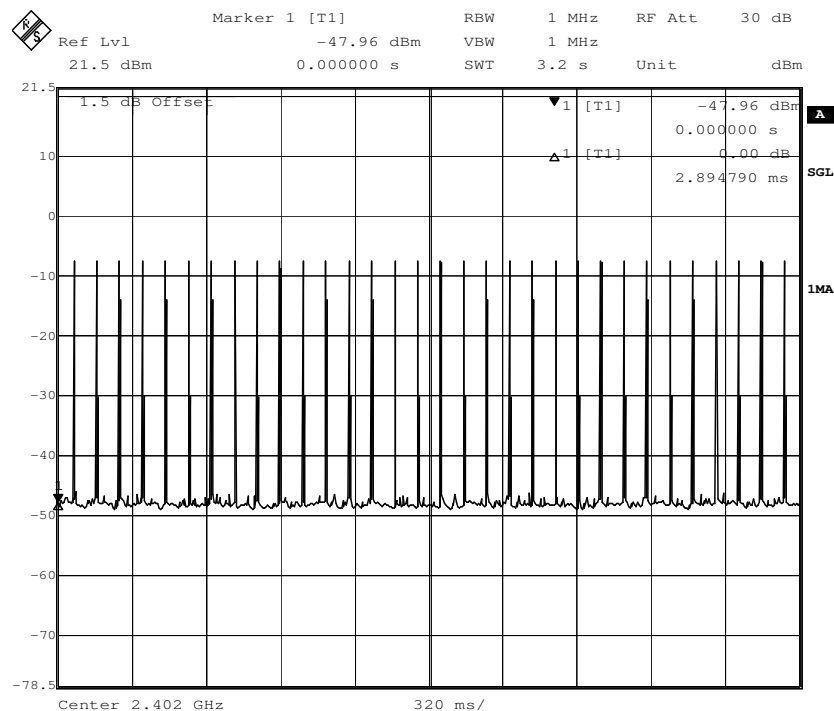
1. Lowest channel (2.402 GHz):

(1). 3DH1

Pulse Width:

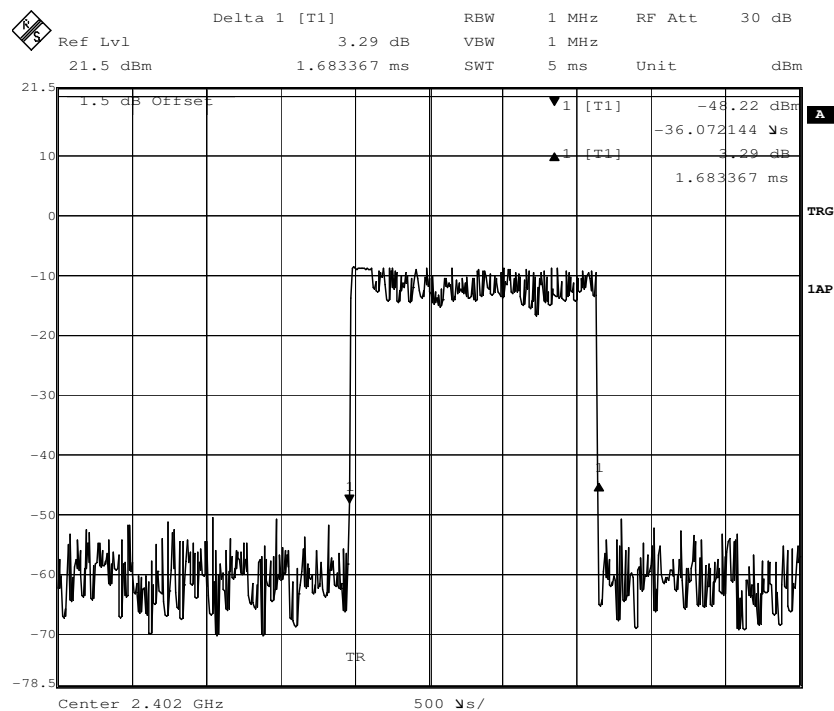


Number of Pulses in 3.16 S observation period:

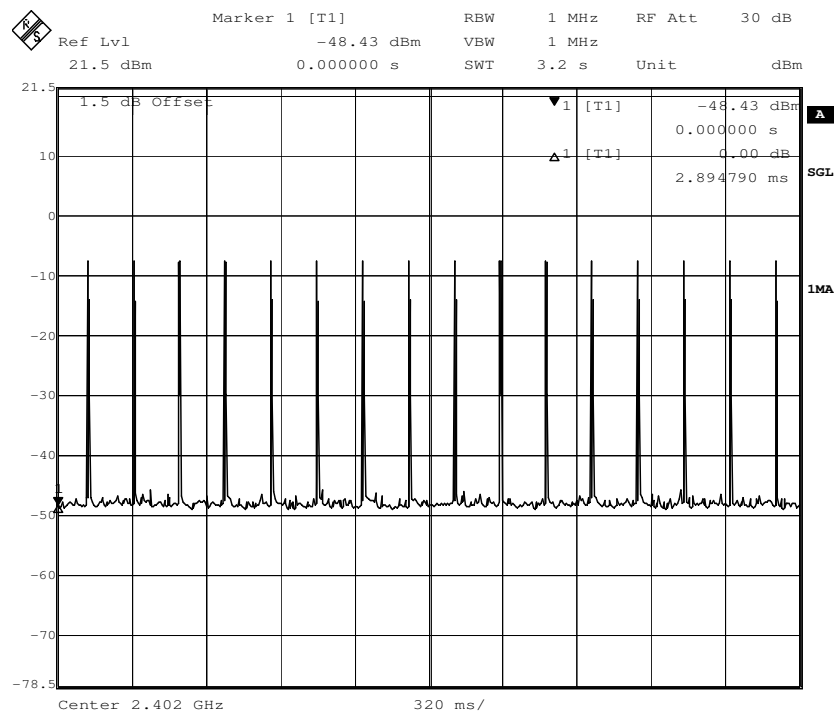




(2) 3DH3  
Pulse Width:

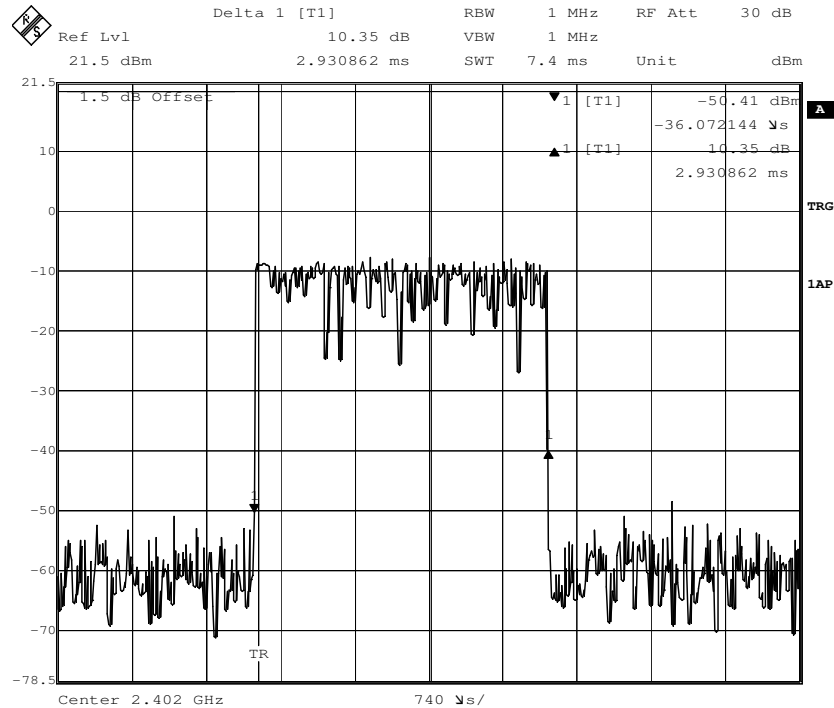


Number of Pulses in 3.16 S observation period:

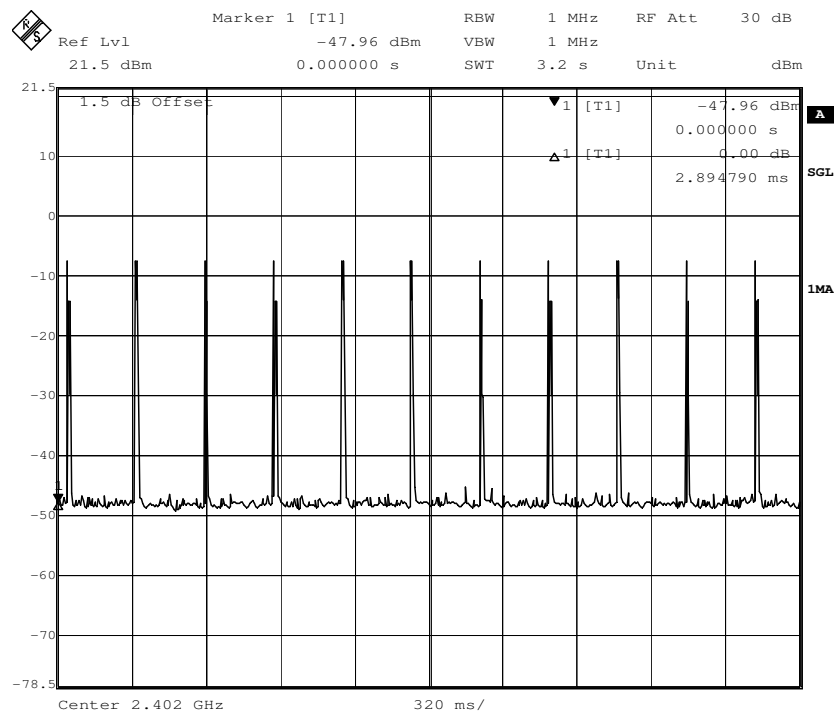


(3) 3DH5

Pulse Width:



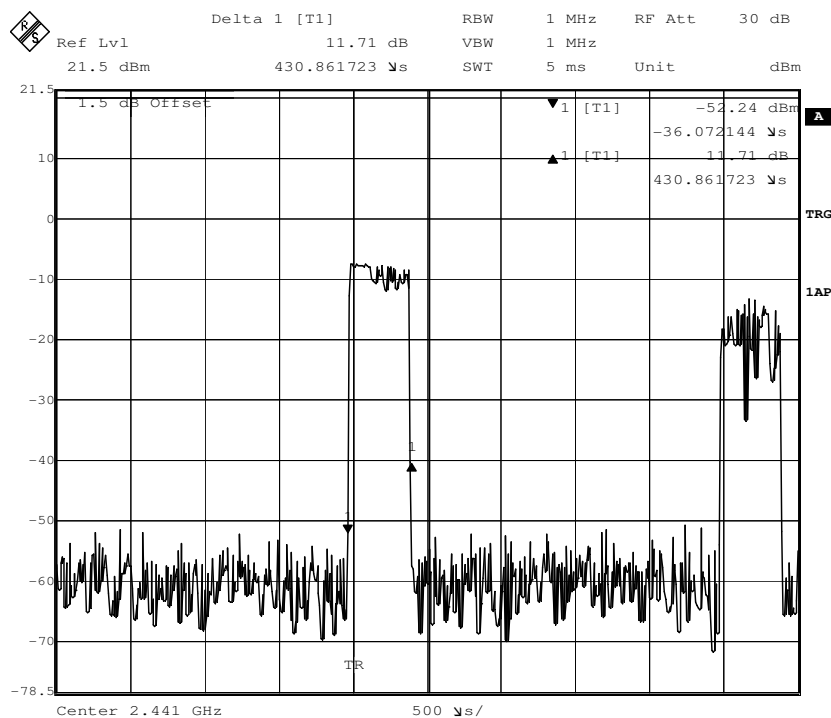
Number of Pulses in 3.16 S observation period:



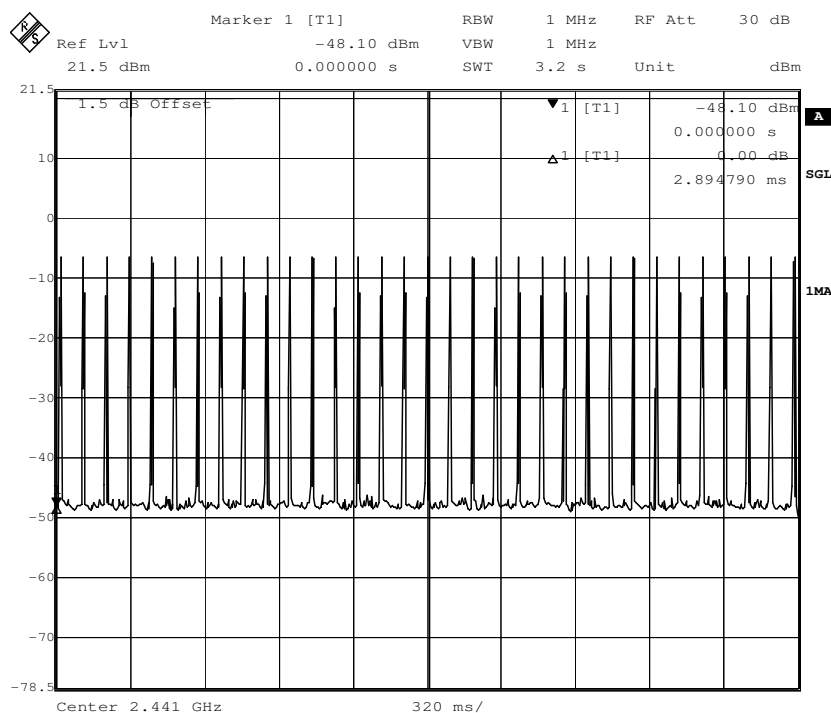
## 2. Middle Channel (2.441 GHz):

(1). 3DH1

Pulse Width:

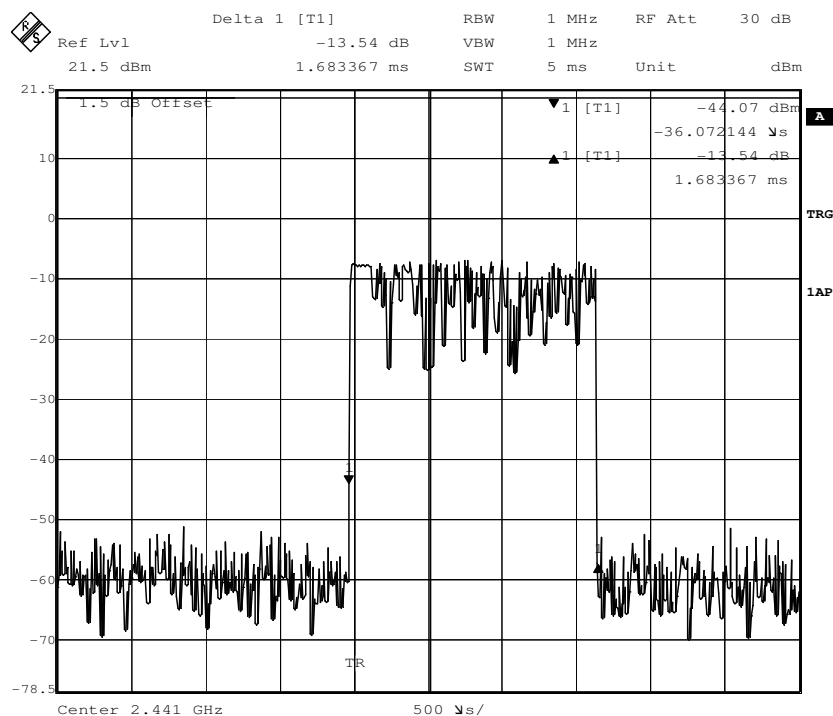


Number of Pulses in 3.16 S observation period:

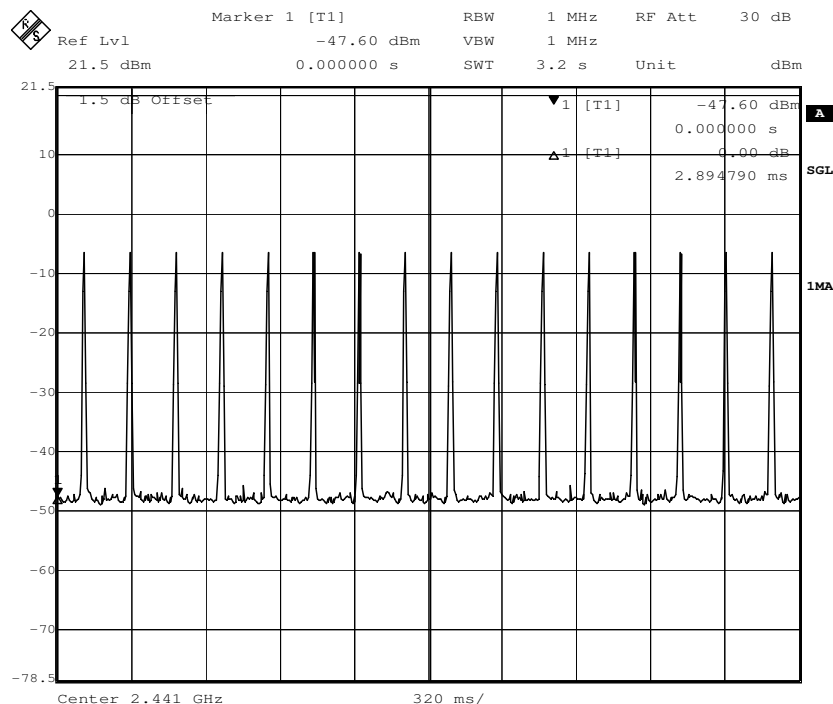




(2) 3DH3  
Pulse Width:

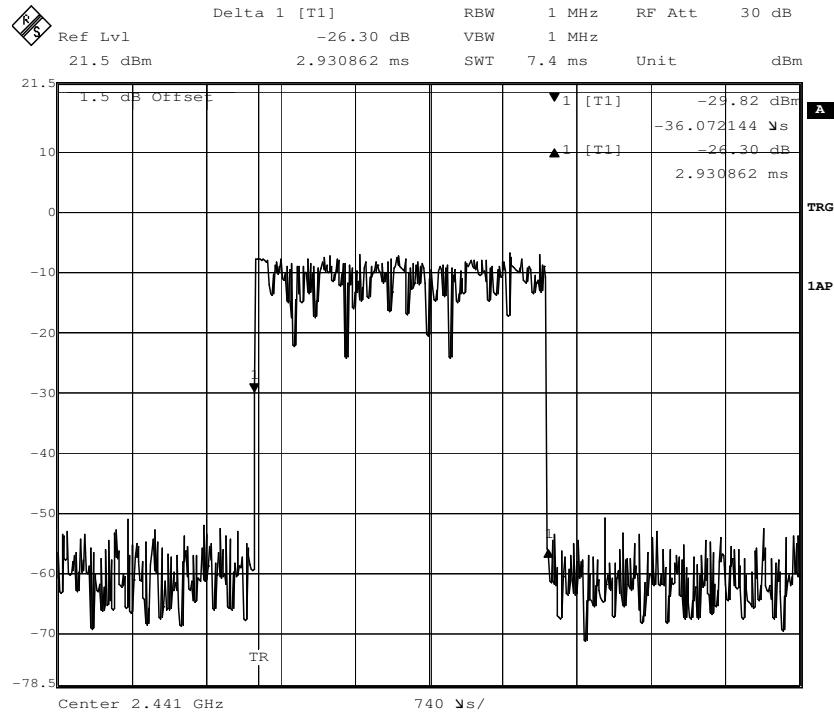


Number of Pulses in 3.16 S observation period:

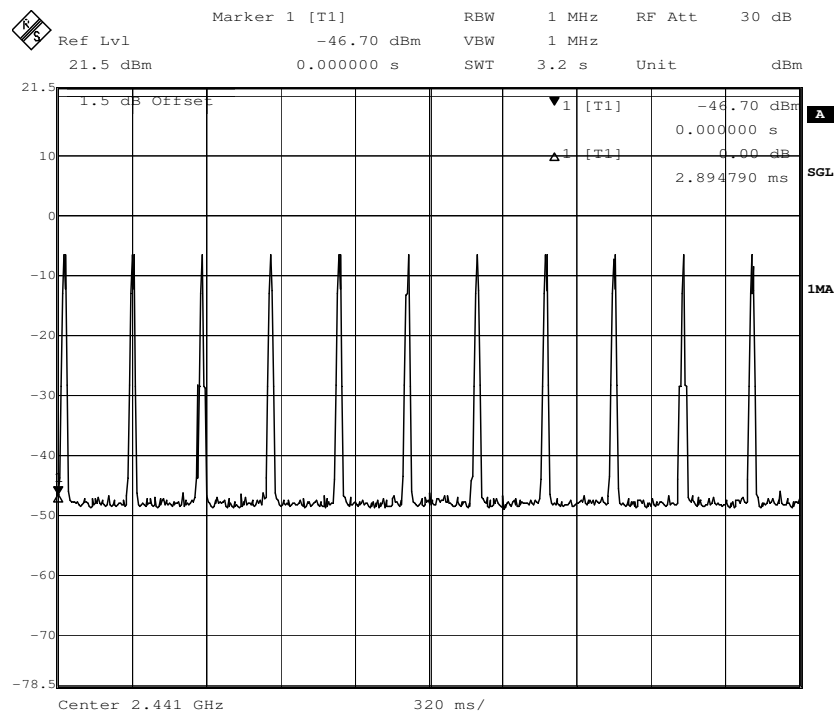


(3) 3DH5

Pulse Width:



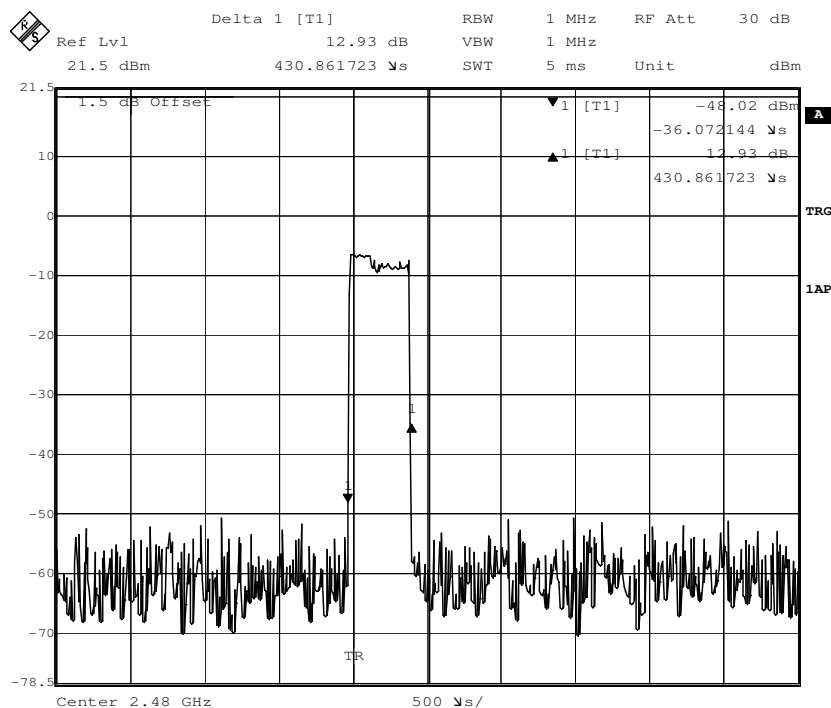
Number of Pulses in 3.16 S observation period:



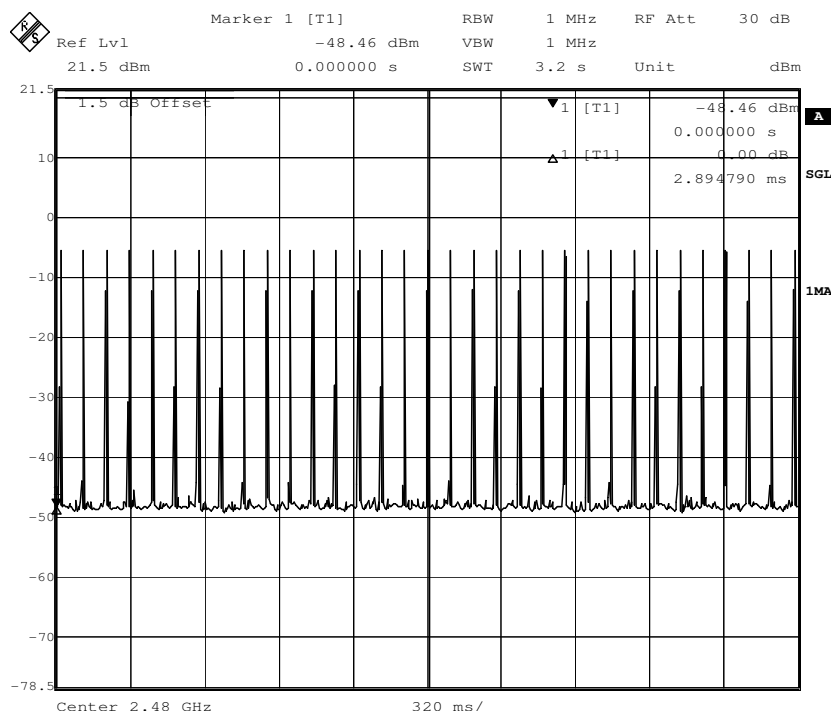
### 3. Highest Channel (2.480 GHz):

(1). 3DH1

Pulse Width:

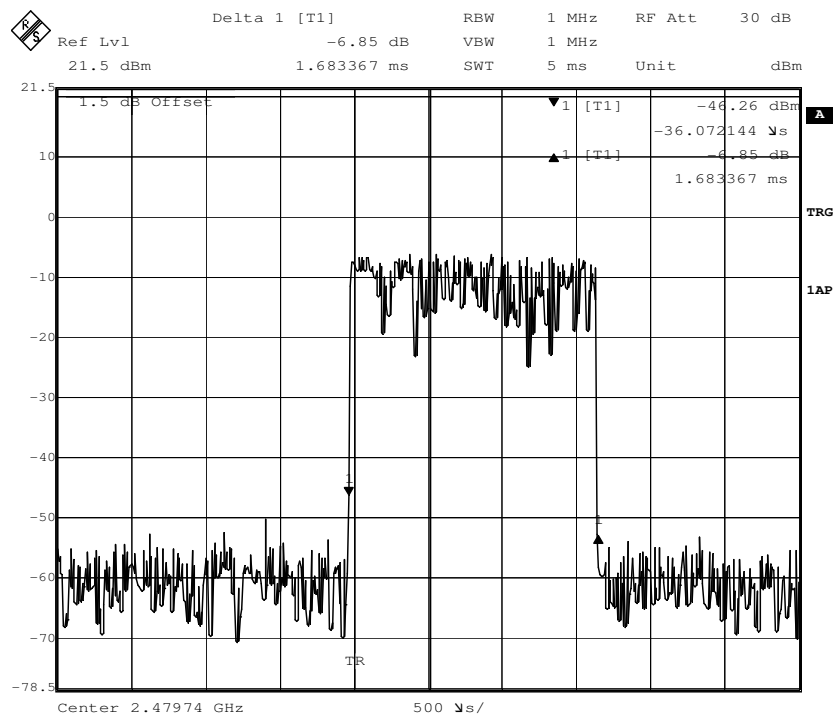


Number of Pulses in 3.16 S observation period:

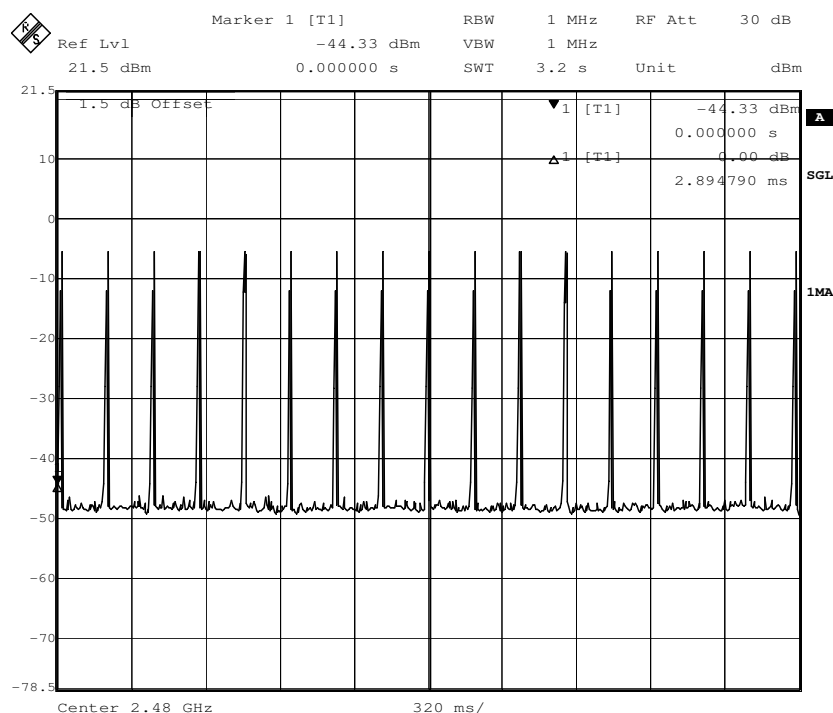




(2) 3DH3  
Pulse Width:



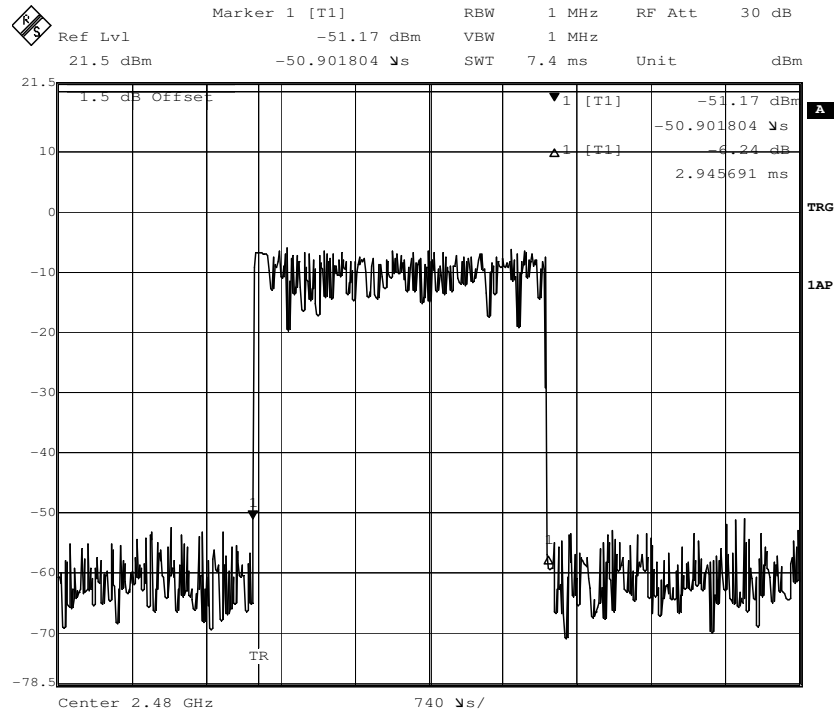
Number of Pulses in 3.16 S observation period:



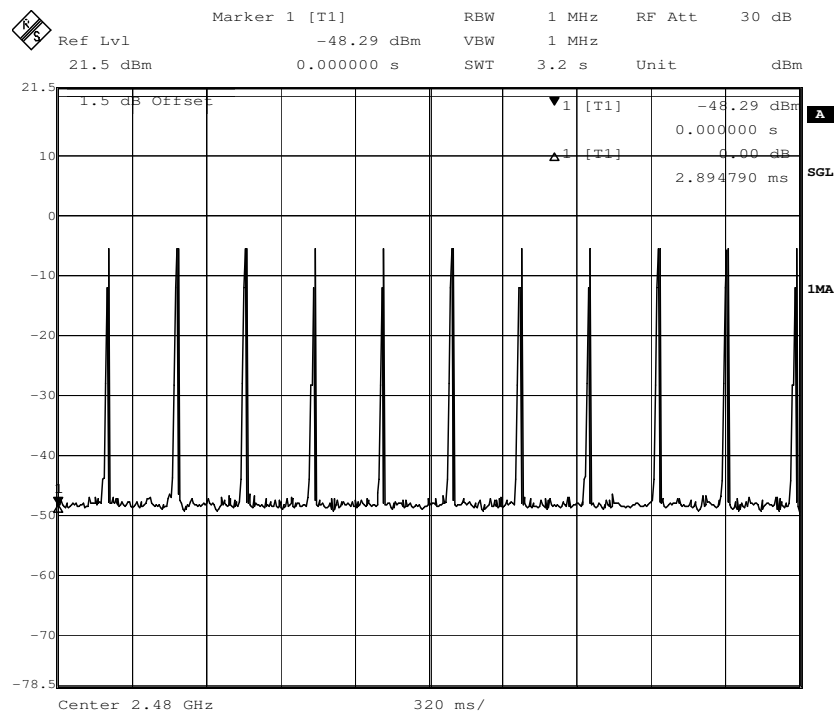


(3) 3DH5

Pulse Width:



Number of Pulses in 3.16 S observation period:



## **7.7 Pseudorandom Frequency Hopping Sequence**

### **7.7.1 Standard requirement**

15.247(a)(1) requirement:

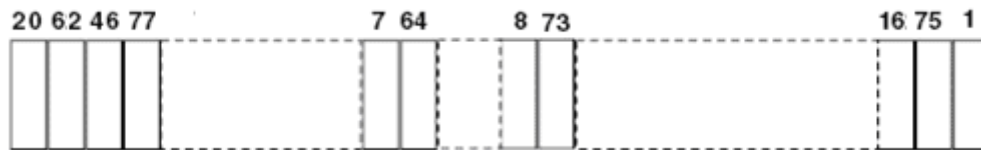
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. 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 Pseudorandom 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 hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

## 7.7.2 Other requirements Frequency Hopping Spread Spectrum System

| Test Requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 47 CFR Part 15C Section 15.247 (a)(1), (h) requirement: |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| <p>The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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 hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.</p> <p>Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.</p> <p>The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.</p> |                                                         |
| Compliance for section 15.247(a)(1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                         |
| <p>According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.</p> <ul style="list-style-type: none"> <li>• Number of shift register stages: 9</li> <li>• Length of pseudo-random sequence: <math>2^9 - 1 = 511</math> bits</li> <li>• Longest sequence of zeros: 8 (non-inverted signal)</li> </ul> <div data-bbox="280 1816 1337 1966" data-label="Diagram"> </div> <p style="text-align: center;"><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                         |

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.

#### **Compliance for section 15.247(g)**

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

#### **Compliance for section 15.247(h)**

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

## 7.8 Maximum Peak Output Power

**Test Requirement:** FCC Part 15 C section 15.247

(b)(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

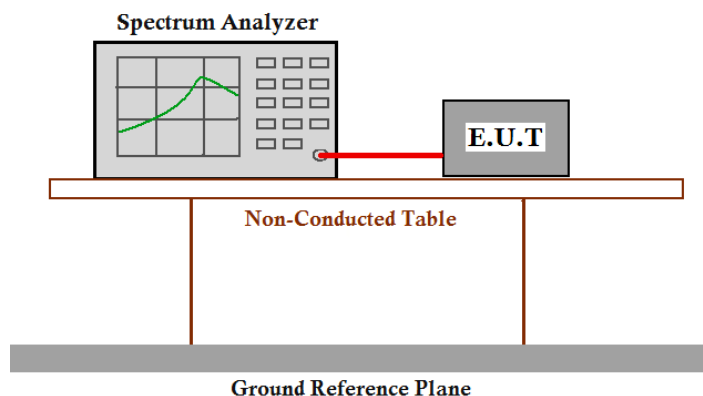
Refer to the result "Hopping channel number" of this document. The 1 watt (30.0 dBm) limit applies.

**Test Method:** ANSI C63.10: Clause 6.10.1

**Test Limit:**

**Test mode:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal (DH5) and EDR mode (3DH5) as the worst case was found. Test the EUT in battery operation mode.

**Test Configuration:**



**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2 MHz. VBW = 2 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.



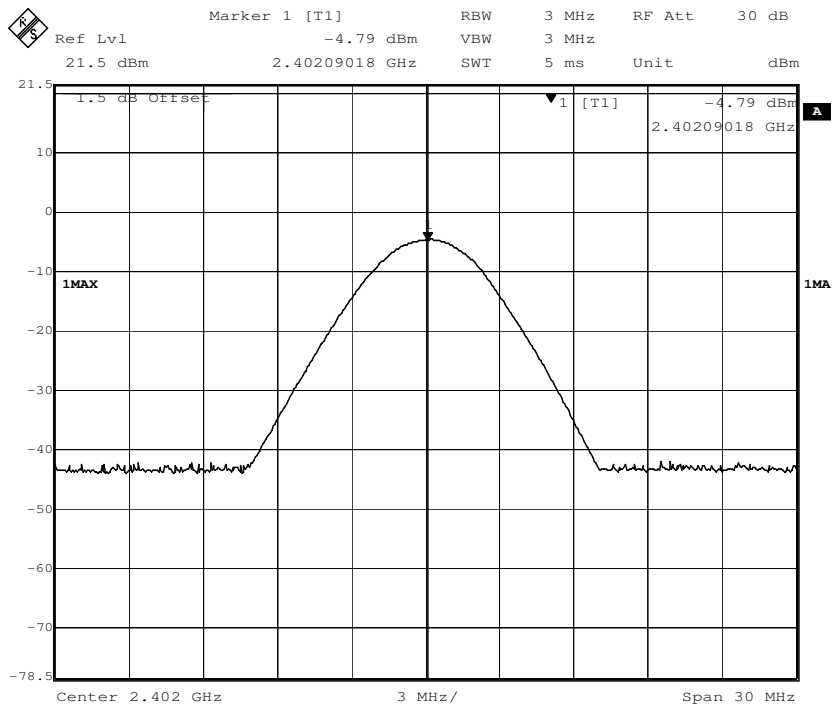
**Test Result:**

| Normal mode:                                          |                             |                    |              |        |
|-------------------------------------------------------|-----------------------------|--------------------|--------------|--------|
| Test Channel                                          | Fundamental Frequency (MHz) | Output Power (dBm) | Limit (dBm)  | Result |
|                                                       |                             |                    | Output Power |        |
| Lowest                                                | 2402                        | -4.79              | 30.0         | Pass   |
| Middle                                                | 2441                        | -3.83              | 30.0         | Pass   |
| Highest                                               | 2480                        | -3.00              | 30.0         | Pass   |
| EDR mode:                                             |                             |                    |              |        |
| Test Channel                                          | Fundamental Frequency (MHz) | Output Power (dBm) | Limit (dBm)  | Result |
|                                                       |                             |                    | Output Power |        |
| Lowest                                                | 2402                        | -6.80              | 30.0         | Pass   |
| Middle                                                | 2441                        | -5.83              | 30.0         | Pass   |
| Highest                                               | 2480                        | -4.94              | 30.0         | Pass   |
| Remark: cable loss=1.5 dB                             |                             |                    |              |        |
| Test result: The unit does meet the FCC requirements. |                             |                    |              |        |

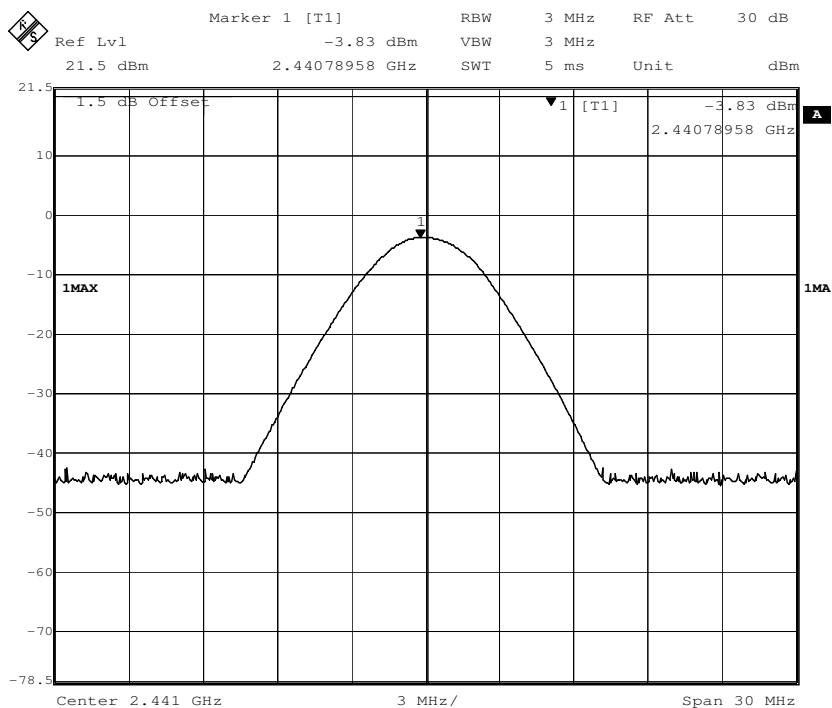
**Result plot as follows:**

**Normal mode:**

**Lowest Channel(2.402 MHz):**

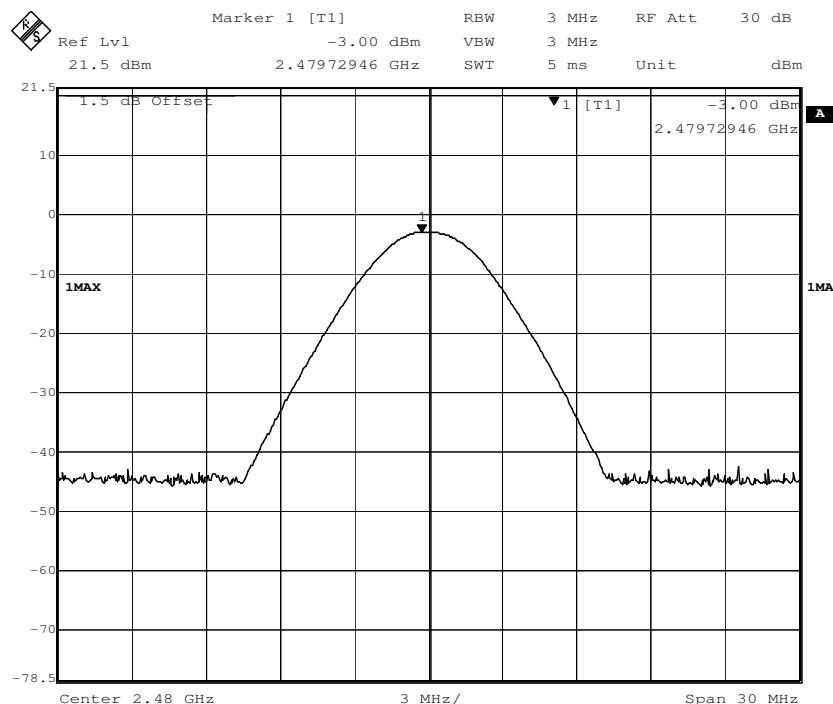


**Middle Channel(2.441 GHz):**



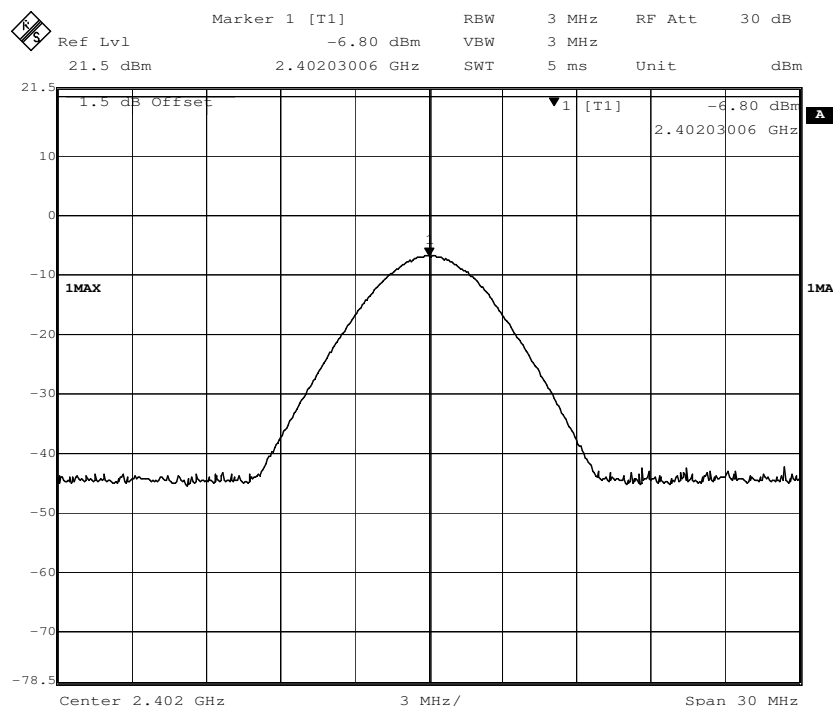


Highest Channel(2.480 GHz):



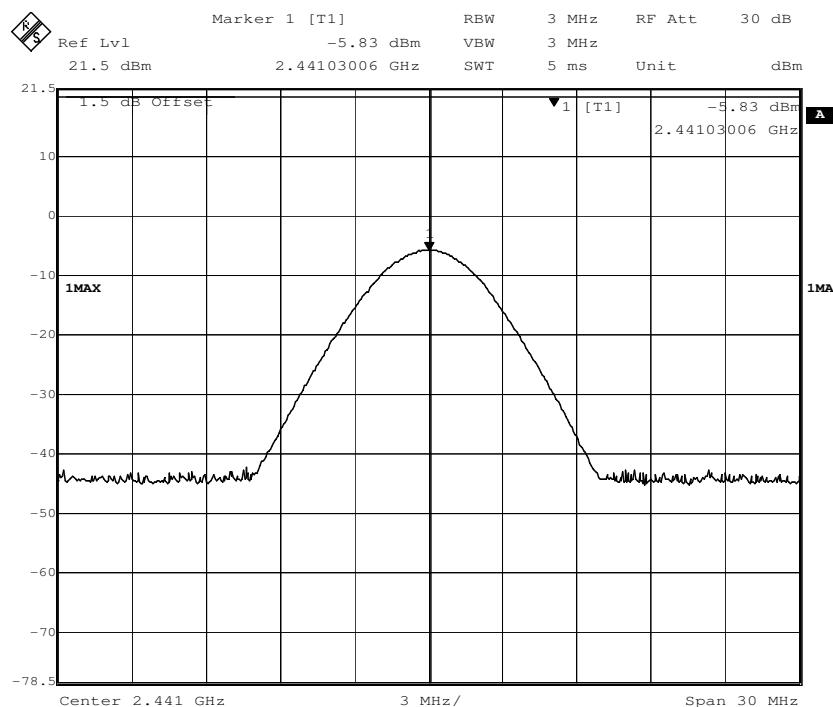
EDR mode:

Lowest channel(2.402 GHz):

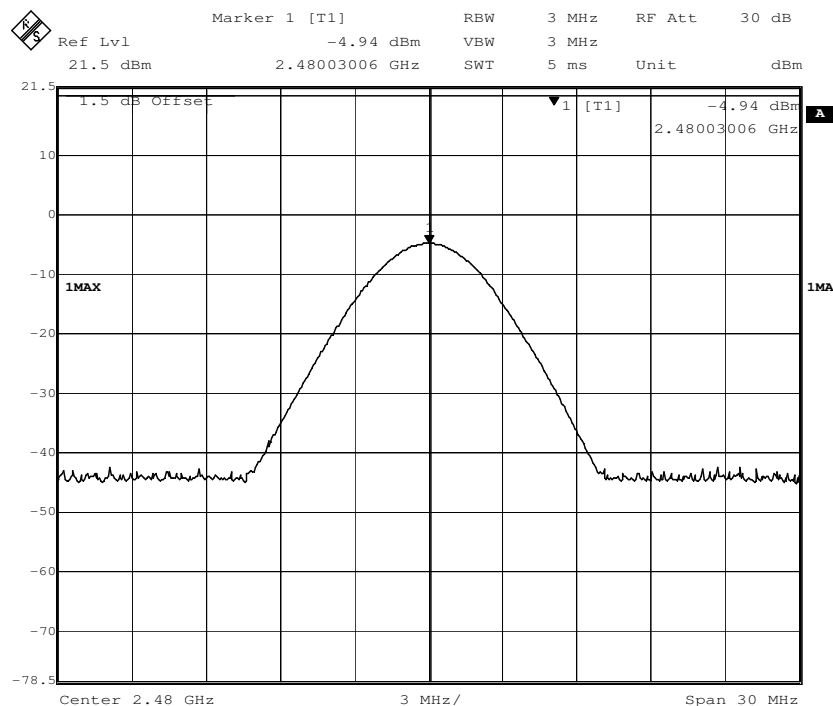




Middle channel(2.441 GHz):



Highest channel(2.480 GHz):



## 7.9 Conducted Spurious Emissions

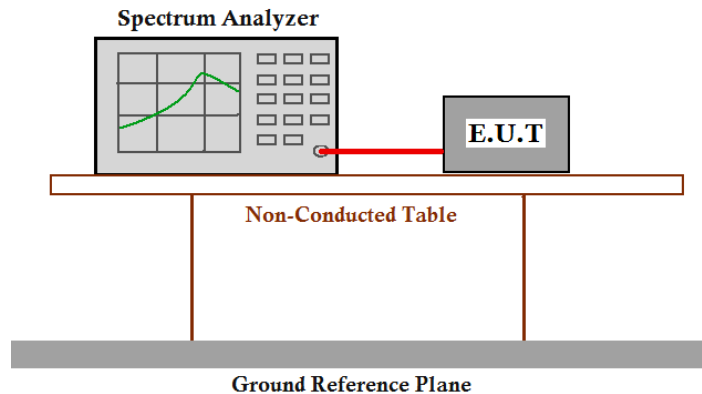
**Test Requirement:** FCC Part15 C section 15.247

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Based on either an RF conducted or a radiated measurement. Provided the transmitter demonstrates compliance with the peak conducted power limits.

**Test Method:** ANSI C63.10: Clause 6.7

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.  
Test the EUT in battery operation mode.

**Test Configuration:**



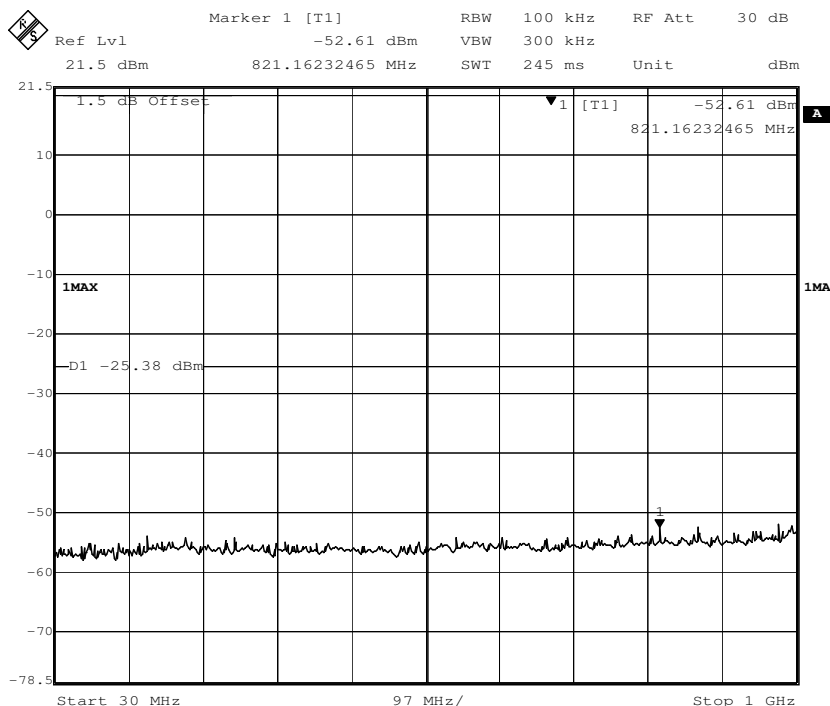
**Test Procedure:**

1. Remove the antenna from the EUT and then connect a low attenuation RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW  $\geq$  RBW. Sweep = auto; Detector Function = Peak (Max. hold).

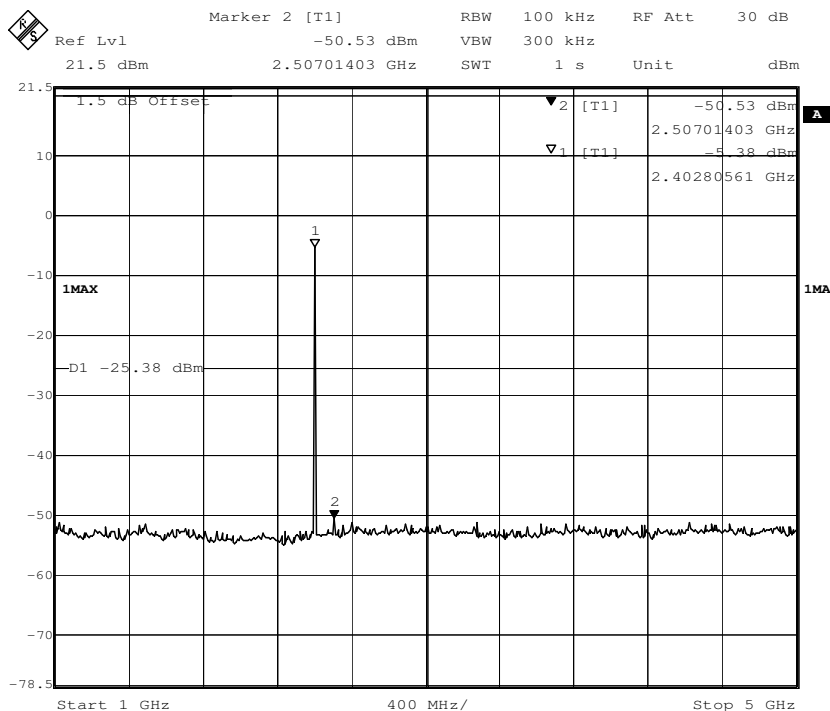


Result plot as follows:

Lowest Channel: 30 MHz to 1 GHz

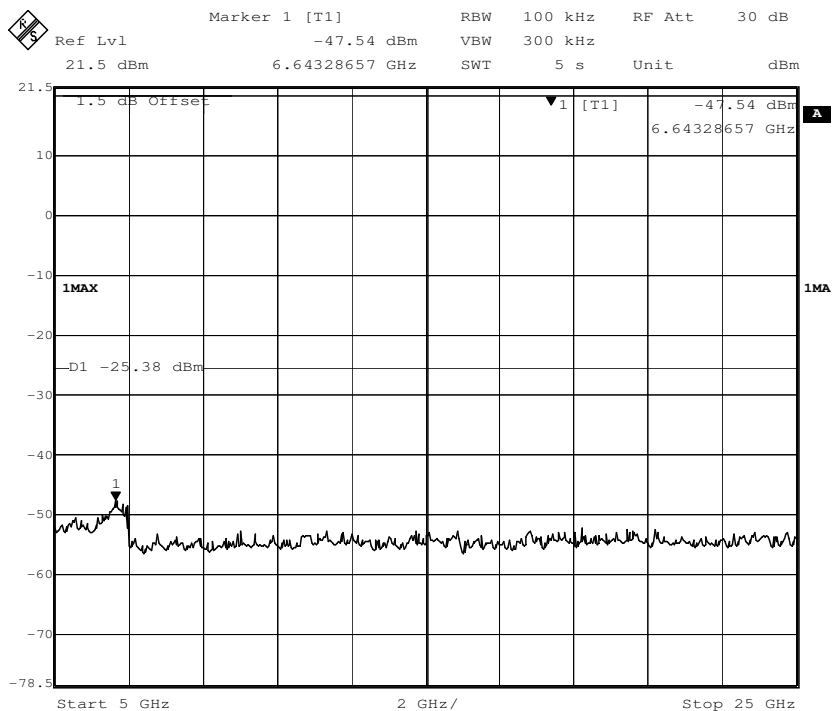


Lowest Channel: 1 GHz to 5 GHz

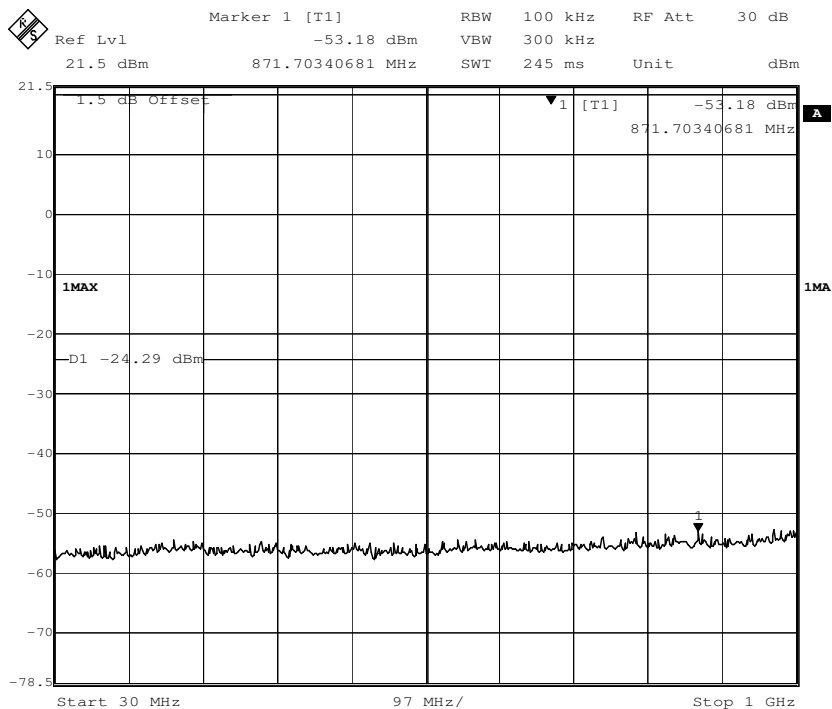




Lowest Channel: 5 GHz to 25 GHz

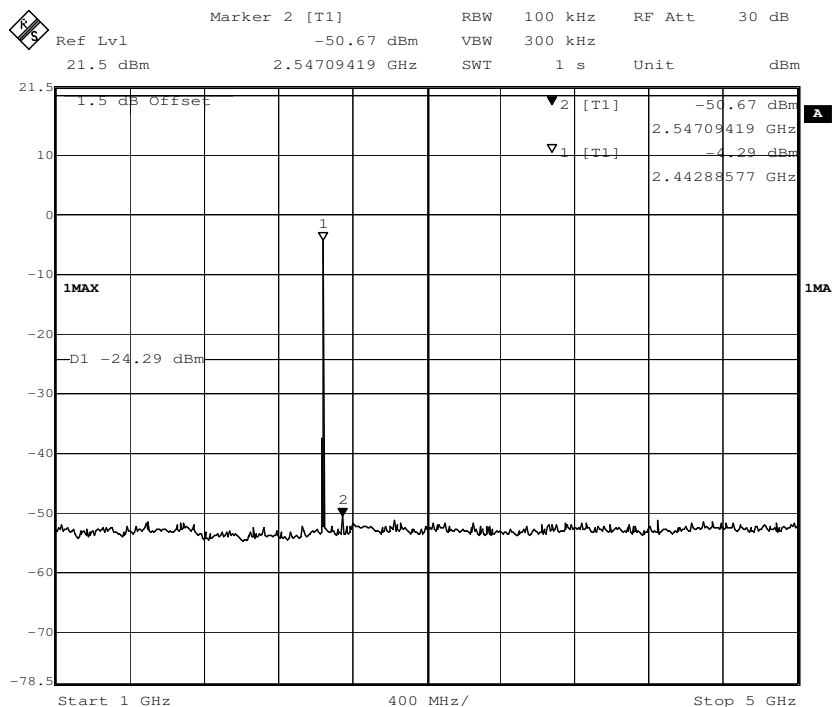


Middle Channel: 30 MHz to 1 GHz

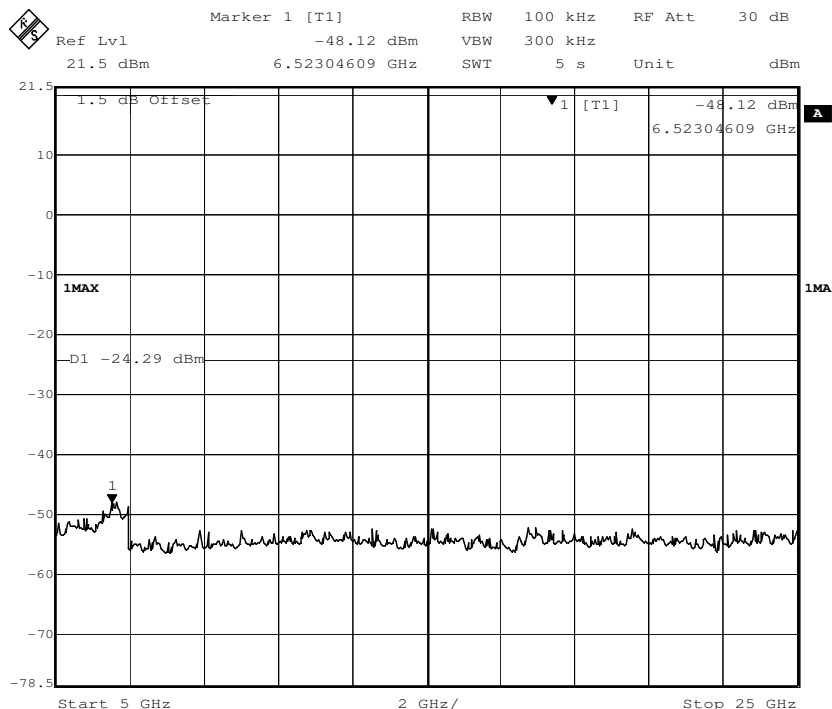




Middle Channel: 1 GHz to 5 GHz

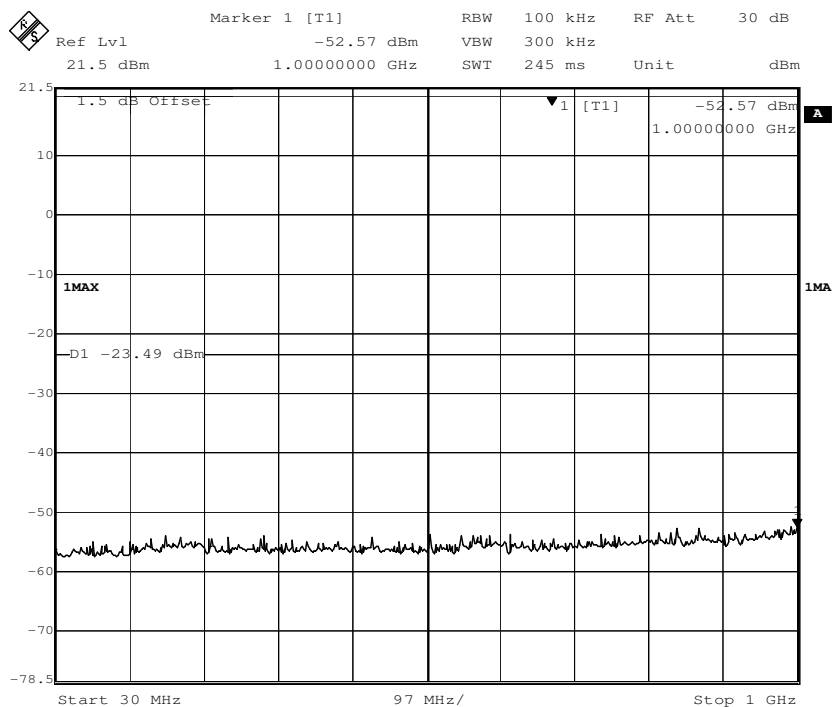


Middle Channel: 5 GHz to 25 GHz

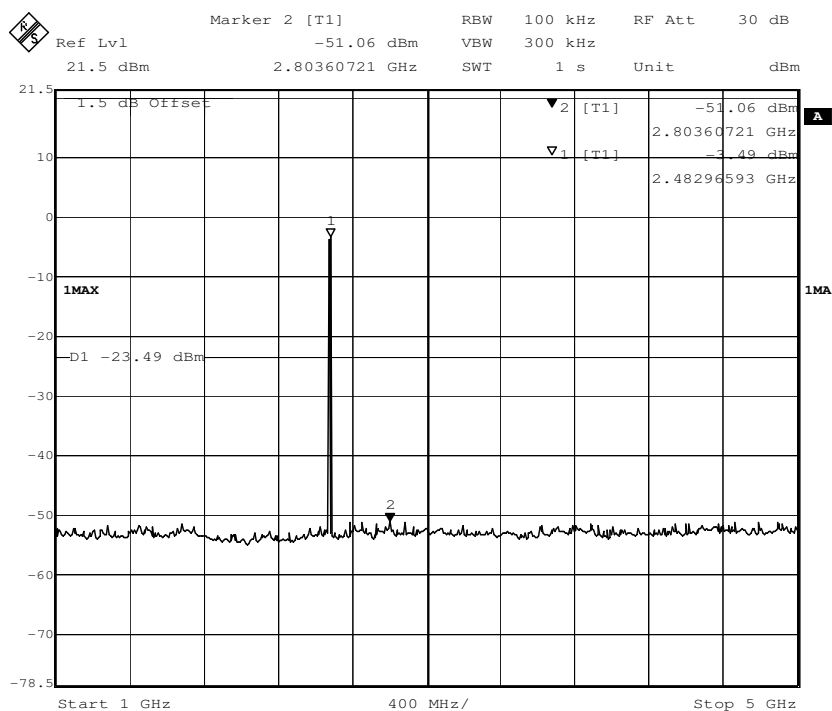




### Highest Channel: 30 MHz to 1 GHz

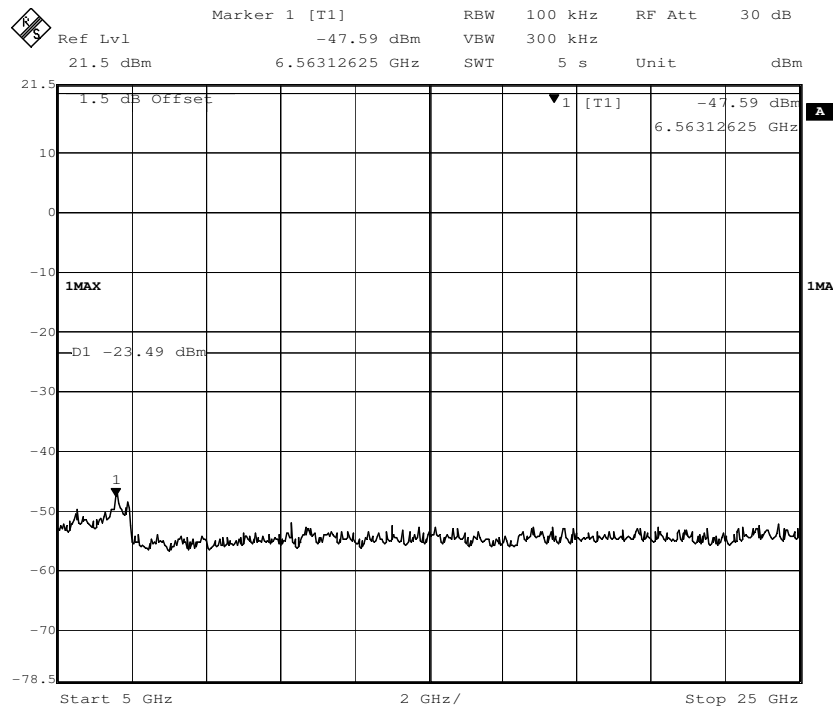


### Highest Channel: 1 GHz to 5 GHz





Highest Channel: 5 GHz to 25 GHz



## 7.10 Radiated Emissions which fall in the restricted bands

**Test Requirement:** FCC Part15 C Section 15.247

(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Test Method:** ANSI C63.10: Clause 6.4, 6.5 and 6.6

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), middle (2441 MHz) and highest (2480 MHz) channel with different data packet. Compliance test in continuous transmitting mode with normal mode (DH5) as the worst case was found.

Test the EUT in battery operation mode.

**Measurement Distance:** 3m (Full-Anechoic Chamber)

**Limit:** Section 15.209(a)

40.0 dB $\mu$ V/m between 30MHz & 88MHz;

43.5 dB $\mu$ V/m between 88MHz & 216MHz;

46.0 dB $\mu$ V/m between 216MHz & 960MHz;

54.0 dB $\mu$ V/m above 960MHz.

**Detector:** For PK value:

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

For AV value:

RBW = 1 MHz for  $f \geq 1$  GHz,

VBW =10 Hz

Sweep = auto

Detector function = peak

Trace = max hold

**Test Frequency Range** 30M~26GHz



**Test Result:**

**1. Lowest Channel**

30MHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

**Peak Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 45.09                | 43.94                   | 74.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 45.43                | 44.01                   | 74.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 45.25                | 44.19                   | 74.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 44.84                | 43.81                   | 74.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 46.11                | 44.96                   | 74.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 46.19                | 44.77                   | 74.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 46.64                | 45.58                   | 74.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 44.27                | 43.24                   | 74.00          | H                    |

**Average Measurement:**

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 41.11                | 39.96                   | 54.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 41.40                | 39.98                   | 54.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 39.83                | 38.77                   | 54.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 40.47                | 39.44                   | 54.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 41.86                | 40.71                   | 54.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 43.50                | 42.08                   | 54.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 41.09                | 40.03                   | 54.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 38.38                | 37.35                   | 54.00          | H                    |



## 2. Middle Channel

30MHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

### Peak Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 45.37                | 44.22                   | 74.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 45.39                | 43.97                   | 74.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 45.99                | 44.93                   | 74.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 45.35                | 44.32                   | 74.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 45.22                | 44.07                   | 74.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 45.16                | 43.74                   | 74.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 46.53                | 45.47                   | 74.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 44.00                | 42.97                   | 74.00          | H                    |

### Average Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 40.56                | 39.41                   | 54.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 40.69                | 39.27                   | 54.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 41.00                | 39.94                   | 54.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 41.74                | 40.71                   | 54.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 41.34                | 40.19                   | 54.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 40.72                | 39.30                   | 54.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 39.69                | 38.63                   | 54.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 38.02                | 36.99                   | 54.00          | H                    |



### 3. Highest Channel

30MHz~1000 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

The measurements with Log antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

#### Peak Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 44.85                | 43.70                   | 74.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 45.16                | 43.74                   | 74.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 45.66                | 44.60                   | 74.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 44.89                | 43.86                   | 74.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 45.06                | 43.91                   | 74.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 44.88                | 43.46                   | 74.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 45.56                | 44.50                   | 74.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 43.07                | 42.04                   | 74.00          | H                    |

#### Average Measurement:

| Frequency (MHz) | Antenna factors (dB/m) | Cable loss (dB) | Preamp factor (dB) | Reading Level (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Antenna polarization |
|-----------------|------------------------|-----------------|--------------------|----------------------|-------------------------|----------------|----------------------|
| 2310.00         | 27.93                  | 6.52            | 35.60              | 40.42                | 39.27                   | 54.00          | V                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 41.65                | 40.23                   | 54.00          | V                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 41.71                | 40.65                   | 54.00          | V                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 41.24                | 40.21                   | 54.00          | V                    |
| 2310.00         | 27.93                  | 6.52            | 35.60              | 40.50                | 39.35                   | 54.00          | H                    |
| 2390.00         | 27.63                  | 6.55            | 35.60              | 39.88                | 38.46                   | 54.00          | H                    |
| 2483.50         | 27.55                  | 6.99            | 35.60              | 41.50                | 40.44                   | 54.00          | H                    |
| 2500.00         | 27.55                  | 7.02            | 35.60              | 40.67                | 39.64                   | 54.00          | H                    |

Remark: No any other emission which falls in restricted bands can be detected and be reported.

**Test result: The unit does meet the FCC requirements.**



Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section. only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                        | MHz                   | MHz             | GHz           |
|----------------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15    |
| <sup>1</sup> 0.495 - 0.505 | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46   |
| 2.1735 - 2.1905            | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75   |
| 4.125 - 4.128              | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5   |
| 4.17725 - 4.17775          | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2     |
| 4.20725 - 4.20775          | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5     |
| 6.215 - 6.218              | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7   |
| 6.26775 - 6.26825          | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4  |
| 6.31175 - 6.31225          | 123 - 138             | 2200 - 2300     | 14.47 - 14.5  |
| 8.291 - 8.294              | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2  |
| 8.362 - 8.366              | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4   |
| 8.37625 - 8.38675          | 156.7 - 156.9         | 2655 - 2900     | 22.01 - 23.12 |
| 8.41425 - 8.41475          | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0   |
| 12.29 - 12.293             | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8   |
| 12.51975 - 12.52025        | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5  |
| 12.57675 - 12.57725        | 322 - 335.4           | 3600 - 4400     |               |
| 13.36 - 13.41              |                       |                 |               |

## 7.11 Band Edges Requirement

**Test Requirement:** FCC Part15 C section 15.247

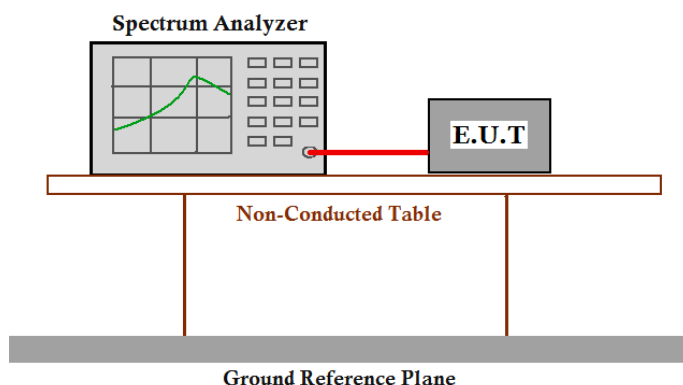
(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains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

**Frequency Band:** 2400 MHz to 2483.5 MHz

**Test Method:** ANSI C63.10: Clause 6.10.5.2

**Test Status:** Pre-test the EUT in continuous transmitting mode at the lowest (2402 MHz), and highest (2480 MHz) channel and hopping mode with different data packet. Compliance test in continuous transmitting mode with normal (DH5) and EDR mode (3DH5) as the worst case was found.  
Test the EUT in battery operation mode.

**Test Configuration:**



**Test Procedure:**

Use the following spectrum analyzer settings:

Span = 10MHz (wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.)

RBW = 100 kHz (1% of the span) and VBW = 300 kHz

Sweep = auto

Detector function = peak

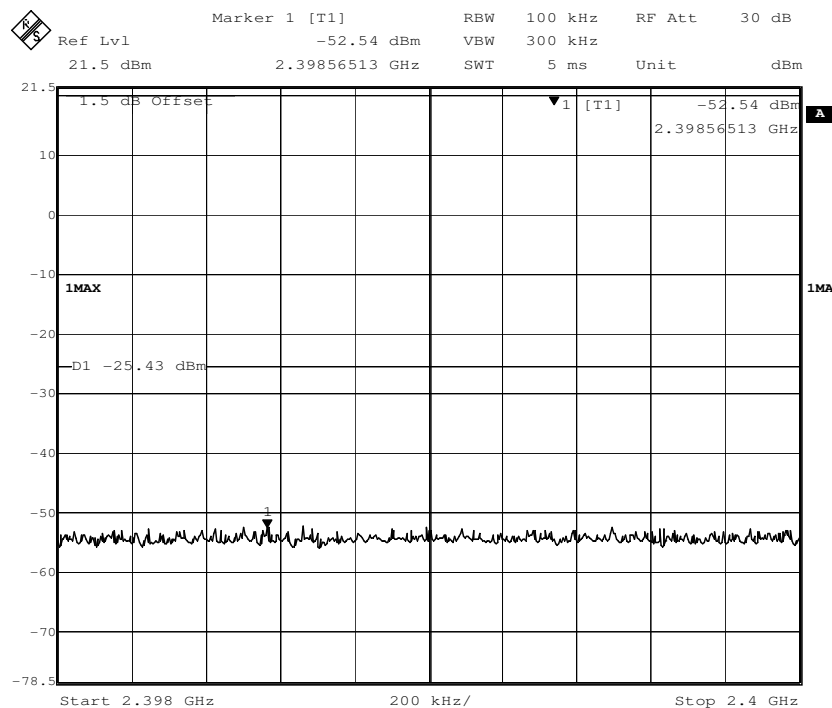
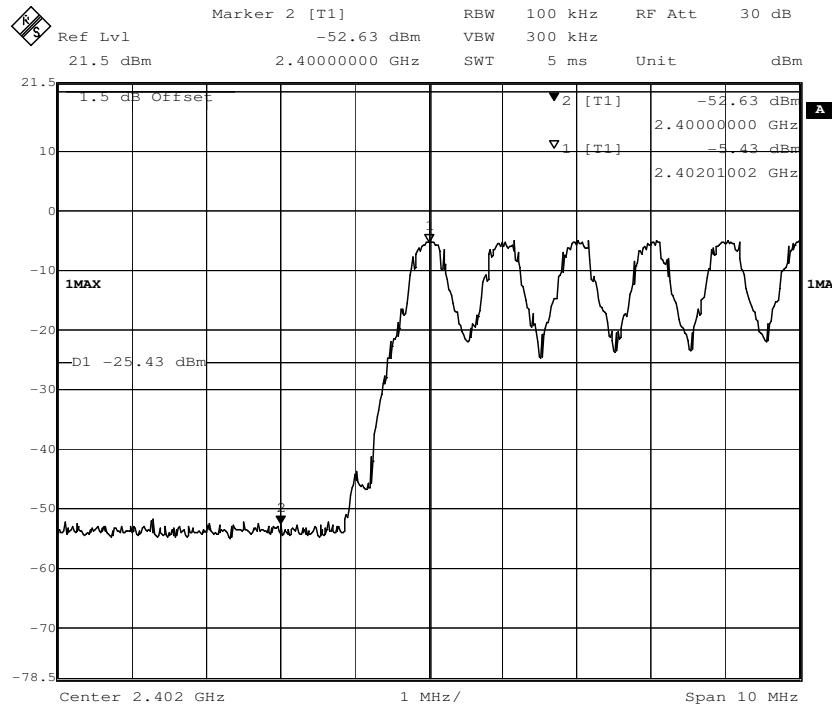
Trace = max hold

### Test Result:

Compare with the output power of the lowest frequency, the Lower Edges attenuated more than 20dB  
 Compare with the output power of the highest frequency, the Upper Edges attenuated more than 20dB.

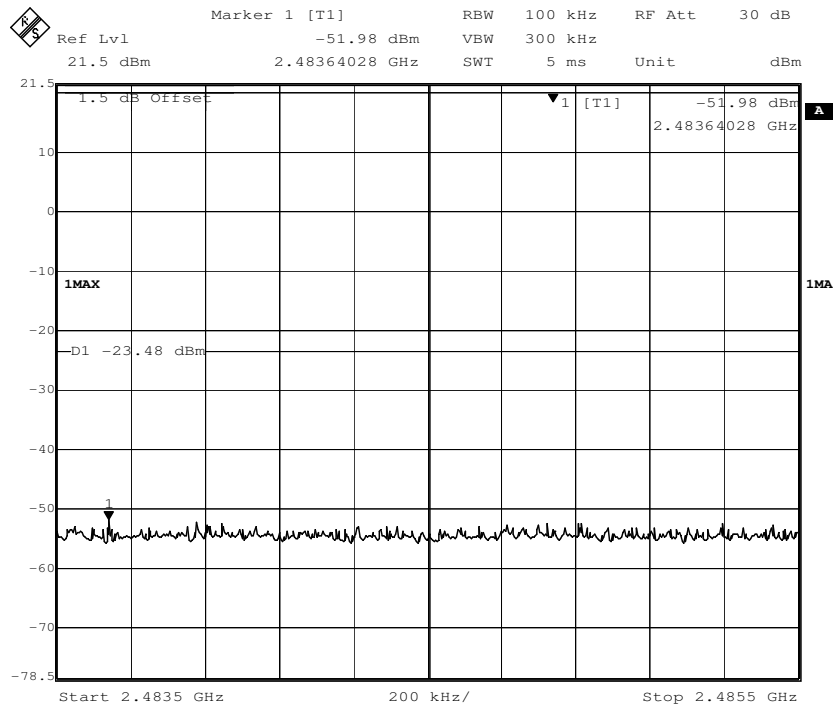
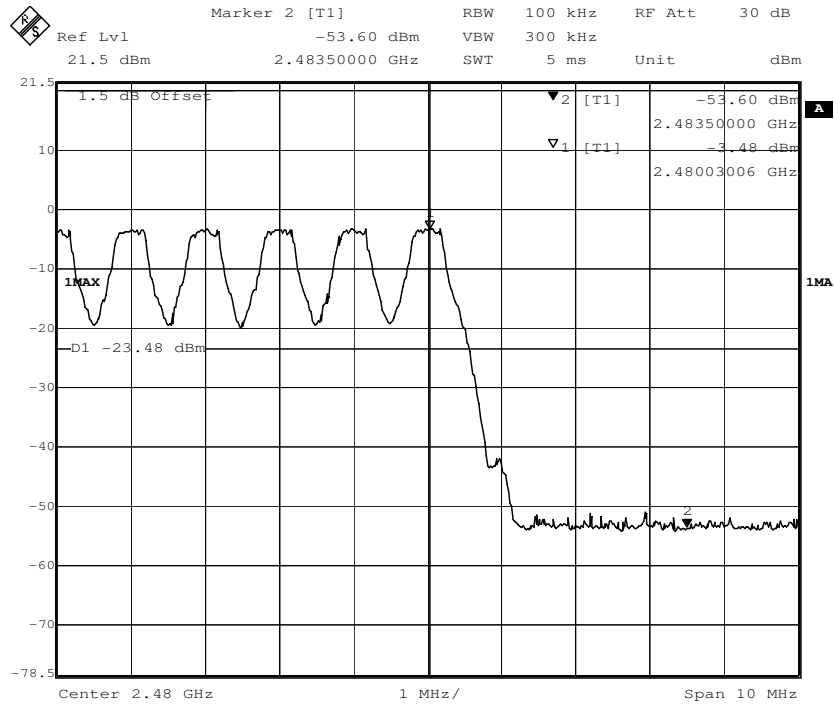
**Normal mode: DH5**

Lowest channel(2.402 GHz):





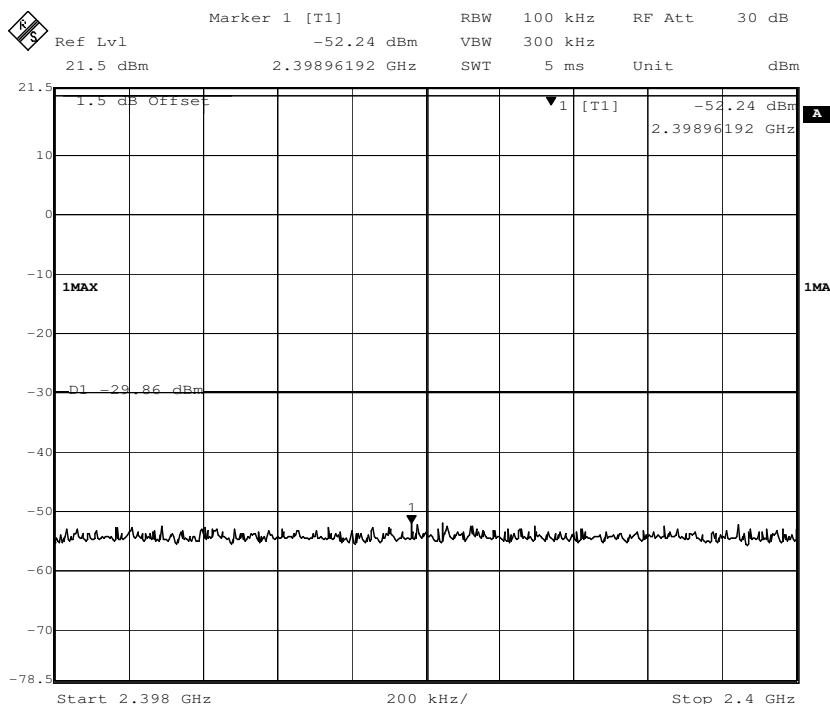
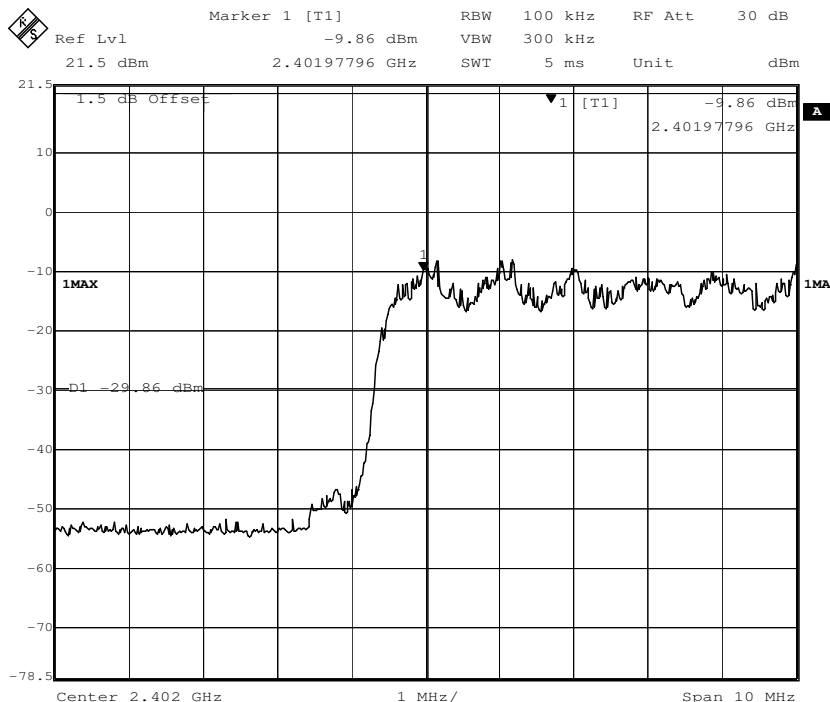
Highest Channel(2.480 GHz):





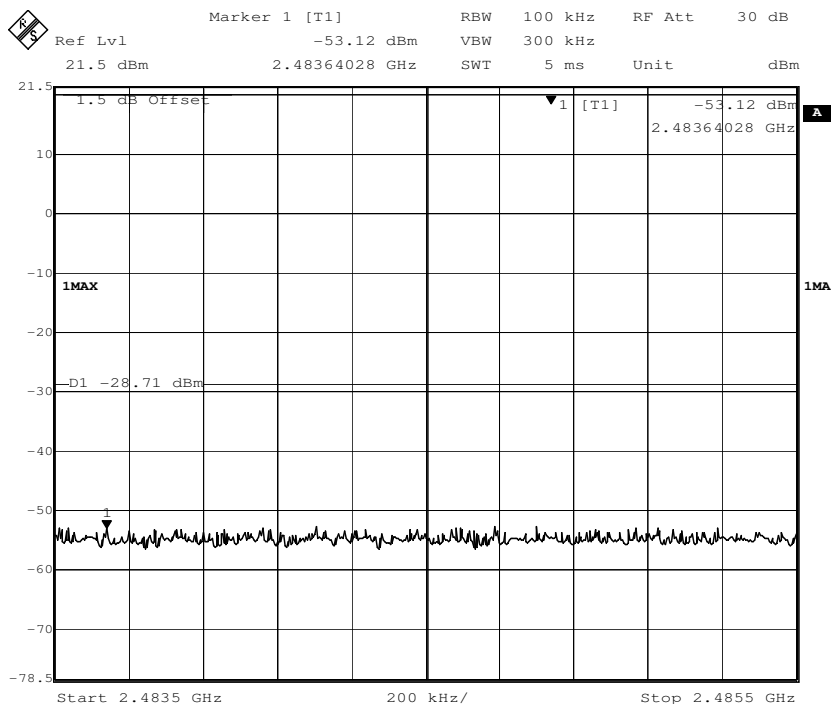
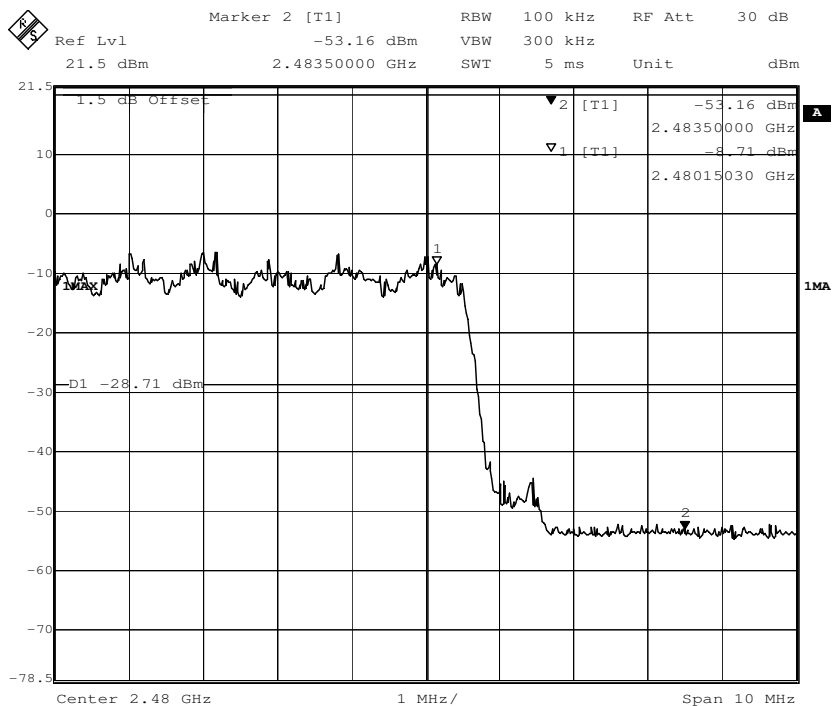
EDR mode: 3DH5

Lowest channel(2.402 GHz):





Highest Channel(2.480 GHz):



Test result: The unit does meet the FCC requirements.

--End of Report--