

# Test Report

FCC ID: 2AJMUC-93

Date of issue: Aug. 31, 2016

|                     |                                                                     |
|---------------------|---------------------------------------------------------------------|
| Sample Description: | bluetooth speaker                                                   |
| Model(s):           | C-93                                                                |
| Applicant:          | ShenZhen ChuangYunDa Electronic Technology Co., LTD                 |
| Address:            | 3F Block C, FuRiSheng Industry, FuYong Town, BaoAn, Shenzhen 518300 |
| Date of Test:       | Aug. 05. 2016 to Aug. 31, 2016                                      |

Shenzhen Microtest Co., Ltd.  
<http://www.mtitest.com>

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## Table of Contents

|                                                 |          |
|-------------------------------------------------|----------|
| <b>1 General description.....</b>               | <b>5</b> |
| 1.1 Feature of equipment under test (EUT) ..... | 5        |
| 1.2 Operation channel list.....                 | 5        |
| 1.3 Test Frequency Channel.....                 | 5        |
| 1.4 EUT operation mode .....                    | 5        |
| 1.5 Test conditions.....                        | 5        |
| 1.6 Ancillary equipment list.....               | 6        |
| 1.7 Measurement uncertainty .....               | 6        |
| <b>2 Testing site.....</b>                      | <b>7</b> |
| <b>3 List of test equipment .....</b>           | <b>8</b> |
| <b>4 Test Result .....</b>                      | <b>9</b> |
| 4.1 Antenna requirement .....                   | 9        |
| 4.2 Conducted emission .....                    | 10       |
| 4.3 Peak output power .....                     | 13       |
| 4.4 20dB emission bandwidth.....                | 17       |
| 4.5 Carrier frequency separation .....          | 21       |
| 4.6 Number of hopping channel .....             | 25       |
| 4.7 Time of occupancy (dwell time) .....        | 27       |
| 4.8 Band edge emission .....                    | 29       |
| 4.9 Radiated emission .....                     | 33       |

| TEST RESULT CERTIFICATION  |                                                                     |
|----------------------------|---------------------------------------------------------------------|
|                            |                                                                     |
| <b>Applicant's name:</b>   | ShenZhen ChuangYunDa Electronic Technology Co., LTD                 |
| Address:                   | 3F Block C, FuRiSheng Industry, FuYong Town, BaoAn, Shenzhen 518300 |
| <b>Manufacture's Name:</b> | ShenZhen ChuangYunDa Electronic Technology Co., LTD                 |
| Address:                   | 3F Block C, FuRiSheng Industry, FuYong Town, BaoAn, Shenzhen 518300 |
|                            |                                                                     |
| Product name:              | bluetooth speaker                                                   |
| Trademark:                 | /                                                                   |
| Model name:                | C-93                                                                |
| <b>Standards:</b>          | FCC Part 15.247                                                     |
| <b>Test Procedure:</b>     | ANSI C63.10-2013<br>FCC public notice DA 00-705                     |

*This device described above has been tested by Shenzhen Toby Technology Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.*

|              |                          |
|--------------|--------------------------|
| Tested by:   | <i>David Chen</i>        |
|              | David Chen Aug. 31, 2016 |
| Reviewed by: | <i>Leon Chen</i>         |
|              | Leon Chen Aug. 31, 2016  |
| Approved by: | <i>Ares Liu</i>          |
|              | Ares Liu Aug. 31, 2016   |

## SUMMARY OF TEST RESULT

| Item | FCC Part No.              | Description of Test                                      | Result |
|------|---------------------------|----------------------------------------------------------|--------|
| 1    | 15.203                    | Antenna requirement                                      | Pass   |
| 2    | 15.207                    | AC power line conducted emission                         | Pass   |
| 3    | 15.247(b)(1)              | Peak output power                                        | Pass   |
| 4    | 15.247(a)(1)              | 20dB emission bandwidth                                  | Pass   |
| 5    | 15.247(a)(1)              | Carrier frequency separation                             | Pass   |
| 6    | 15.247(a)1                | Number of hopping channel                                | Pass   |
| 7    | 15.247(a)(1)              | Time of occupancy (dwell time)                           | Pass   |
| 8    | 15.247(d)                 | Band edge spurious emission, conducted spurious emission | Pass   |
| 9    | 15.247(d), 15.205, 15.209 | Radiated emission                                        | Pass   |

## 1 General description

### 1.1 Feature of equipment under test (EUT)

|                        |                                   |
|------------------------|-----------------------------------|
| Product name:          | bluetooth speaker                 |
| Model name:            | C-93                              |
| Tx/Rx frequency range: | Tx/Rx: 2402MHz~2480MHz            |
| Bluetooth version:     | V2.1 + EDR                        |
| Modulation Type:       | GFSK, $\pi/4$ -DQPSK, 8DPSK       |
| Power Source:          | 3.7VDC (Li-on Battery)            |
| Antenna Designation:   | PCBA antenna (Antenna Gain: 2dBi) |

### 1.2 Operation channel list

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 0       | 2402MHz   | 20      | 2422MHz   | 40      | 2442MHz   |
| 1       | 2403MHz   | 21      | 2423MHz   | 41      | 2443MHz   |
| ---     | ---       | ---     | ---       | ---     | ---       |
| ---     | ---       | ---     | ---       | ---     | ---       |
| 18      | 2420MHz   | 38      | 2440MHz   | 77      | 2479MHz   |
| 19      | 2421MHz   | 39      | 2441MHz   | 78      | 2480MHz   |

### 1.3 Test Frequency Channel

|        |         |
|--------|---------|
| Low    | 2402MHz |
| Middle | 2441MHz |
| High   | 2480MHz |

### 1.4 EUT operation mode

During testing, RF test program provided by the manufacture to control the Tx operation followed the test requirement.

### 1.5 Test conditions

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

- Temperature: 20°C~30°C
- Humidity: 30%~70%
- Atmospheric pressure: 98kPa~101kPa

## 1.6 Ancillary equipment list

| Equipment | Model                   | S/N | Manufacturer | Certificate type |
|-----------|-------------------------|-----|--------------|------------------|
| Adapter   | ADS-6MA-06<br>05050EPCU | /   | NEXGO        | FCC VOC          |

## 1.7 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %,  $U=2 \times U_c(y)$

|                                  |                    |
|----------------------------------|--------------------|
| RF frequency                     | $1 \times 10^{-7}$ |
| RF power, conducted              | $\pm 1$ dB         |
| Conducted emission(150kHz~30MHz) | $\pm 2.5$ dB       |
| Radiated emission(30MHz~1GHz)    | $\pm 4.2$ dB       |
| Radiated emission (above 1GHz)   | $\pm 4.3$ dB       |
| Temperature                      | $\pm 1$ degree     |
| Humidity                         | $\pm 5$ %          |

## 2 Testing site

|                        |                                                                                                                  |
|------------------------|------------------------------------------------------------------------------------------------------------------|
| Test Site              | Shenzhen Toby Technology Co., Ltd.                                                                               |
| Test Site Location     | 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Shenzhen, Guangdong, China |
| FCC Registration No.:  | 811562                                                                                                           |
| CNAS Registration No.: | CNAS L5813                                                                                                       |

### 3 List of test equipment

For AC power line conducted emission:

| Equipment         | Manufacturer | Model      | Serial No. | Calibration Due |
|-------------------|--------------|------------|------------|-----------------|
| LISN              | R&S          | ENV216     | 101313     | 2016.12.06      |
| LISN              | SCHWARZBECK  | NNLK 8129  | 8129245    | 2016.12.25      |
| Pulse Limiter     | SCHWARZBECK  | VTSD 9561F | 9716       | 2016.12.25      |
| Test Cable        | N/A          | N/A        | C01        | 2016.12.06      |
| EMI Test Receiver | R&S          | ESCI       | 101160     | 2016.12.06      |

For Radiated emission:

| Equipment               | Manufacturer     | Model       | Serial No. | Calibration Due |
|-------------------------|------------------|-------------|------------|-----------------|
| Log-Bicon Antenna       | MESS-ELEKTRO NIK | VULB 9160   | 3058       | 2016.12.11      |
| Horn Antenna            | Schwarzbeck      | BBHA 9120D  | 631        | 2016.12.05      |
| Horn Antenna            | Schwarzbeck      | BBHA 9170   | 373        | 2016.12.05      |
| Test Cable              | United Microwave | 57793       | 1m         | 2016.12.05      |
| Test Cable              | United Microwave | A30A30-5006 | 10m        | 2016.12.05      |
| Microwave Pre-amplifier | Agilent          | 8449B       | 3008A01714 | 2016.12.05      |
| Pre-Amplifier           | Anritsu          | MH648A      | M09961     | 2016.12.05      |
| EMI Test Receiver       | R&S              | ESCI-7      | 101318     | 2016.12.05      |
| Spectrum analyzer       | Agilent          | E4470B      | MY41441082 | 2017.06.01      |

For RF conducted emission:

| Equipment         | Manufacturer | Model  | Serial No. | Calibration Due |
|-------------------|--------------|--------|------------|-----------------|
| Spectrum analyzer | Agilent      | E4470B | MY41441082 | 2017.06.01      |

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

## **4 Test Result**

### **4.1 Antenna requirement**

#### **4.1.1 Requirement defined in FCC 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

#### **4.1.2 EUT antenna description**

The Bluetooth antenna of EUT is an internal permanently attached antenna (PCBA antenna), the maximum gain is 2dBi. So the antenna meets the requirement of this part.

## 4.2 Conducted emission

### 4.2.1. Limit

| Frequency<br>(MHz) | Limit      |          |
|--------------------|------------|----------|
|                    | Quasi-peak | Average  |
| 0.15-0.5           | 66 to 56   | 56 to 46 |
| 0.5-5              | 56         | 46       |
| 5-30               | 60         | 50       |

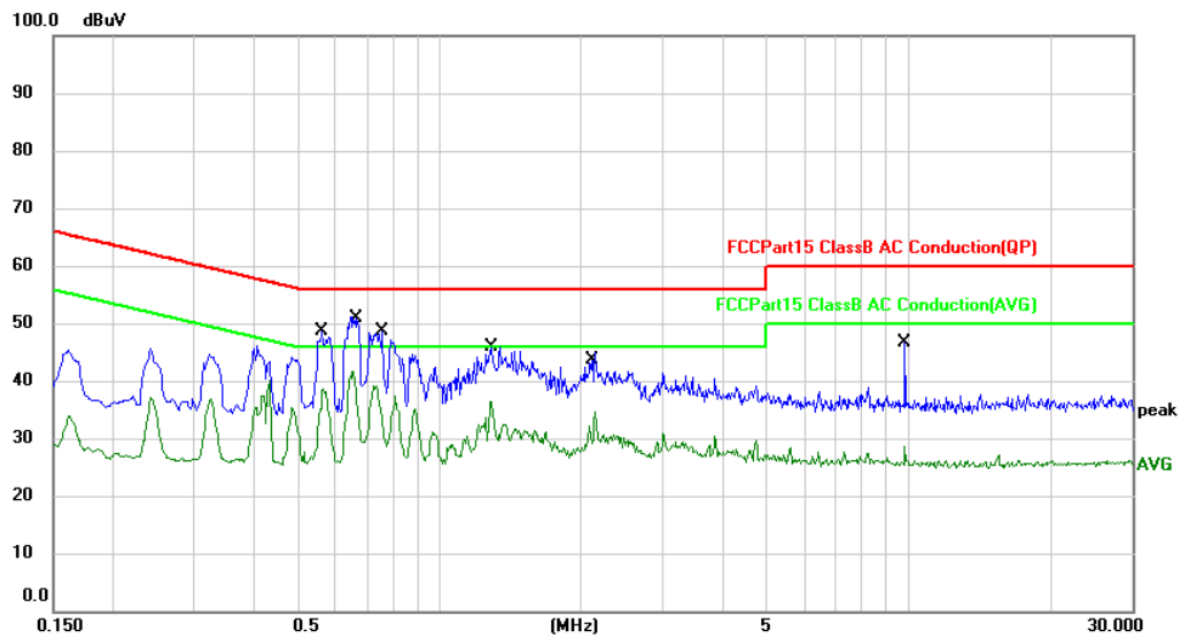
Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

### 4.2.2. Test method

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN is at least 80 cm from nearest part of EUT chassis.
5. The resolution bandwidth of EMI test receiver is set at 9kHz.

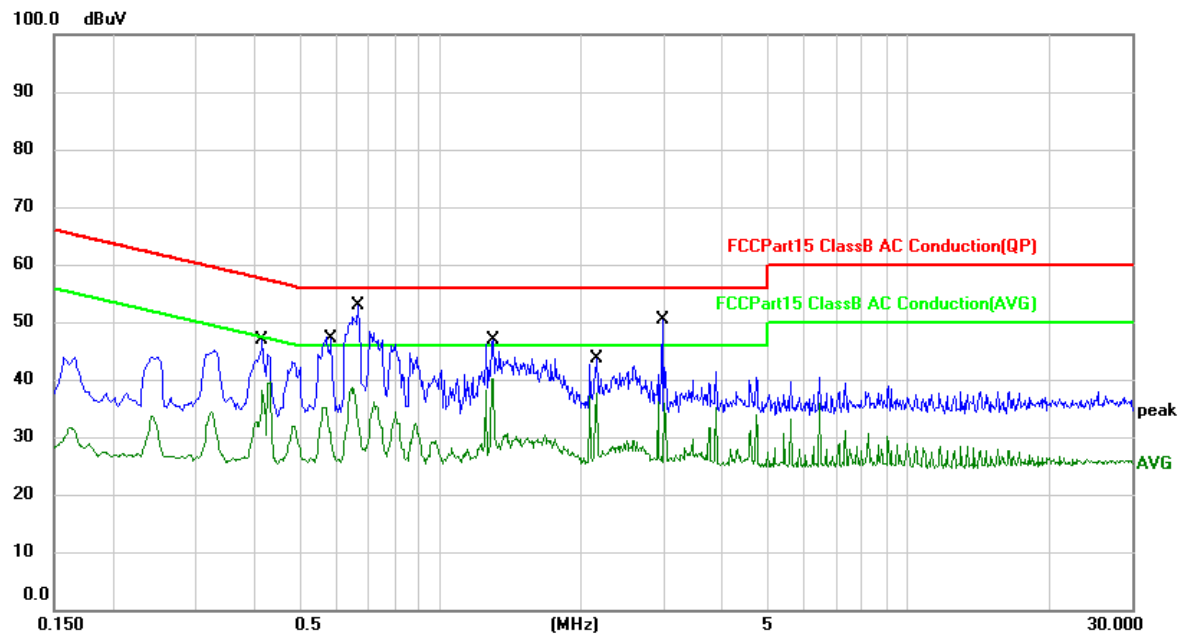
### 4.2.3. Test Result

|               |              |                    |              |
|---------------|--------------|--------------------|--------------|
| Temperature:  | 24°C         | Relative Humidity: | 58%          |
| Pressure:     | 101kPa       | Polarization:      | L            |
| Test voltage: | AC 120V/60Hz | Test mode:         | Transmitting |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBμV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBμV | Limit<br>dBμV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.5576       | 12.77                    | 30.02                   | 42.79                    | 56.00         | -13.21     | QP       |         |
| 2   |     | 0.5576       | 6.33                     | 30.02                   | 36.35                    | 46.00         | -9.65      | AVG      |         |
| 3   |     | 0.6591       | 14.24                    | 30.02                   | 44.26                    | 56.00         | -11.74     | QP       |         |
| 4   | *   | 0.6591       | 7.31                     | 30.02                   | 37.33                    | 46.00         | -8.67      | AVG      |         |
| 5   |     | 0.7500       | 14.26                    | 30.02                   | 44.28                    | 56.00         | -11.72     | QP       |         |
| 6   |     | 0.7500       | 4.22                     | 30.02                   | 34.24                    | 46.00         | -11.76     | AVG      |         |
| 7   |     | 1.2827       | 10.90                    | 30.02                   | 40.92                    | 56.00         | -15.08     | QP       |         |
| 8   |     | 1.2827       | 5.52                     | 30.02                   | 35.54                    | 46.00         | -10.46     | AVG      |         |
| 9   |     | 2.0904       | 7.17                     | 30.02                   | 37.19                    | 56.00         | -18.81     | QP       |         |
| 10  |     | 2.0904       | 2.06                     | 30.02                   | 32.08                    | 46.00         | -13.92     | AVG      |         |
| 11  |     | 9.8387       | 0.32                     | 30.10                   | 30.42                    | 60.00         | -29.58     | QP       |         |
| 12  |     | 9.8387       | -4.64                    | 30.10                   | 25.46                    | 50.00         | -24.54     | AVG      |         |

|               |              |                    |              |
|---------------|--------------|--------------------|--------------|
| Temperature:  | 24°C         | Relative Humidity: | 58%          |
| Pressure:     | 101kPa       | Polarization:      | N            |
| Test voltage: | AC 120V/60Hz | Test mode:         | Transmitting |



| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBμV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBμV | Limit<br>dBμV | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1   |     | 0.4196       | 9.91                     | 30.02                   | 39.93                    | 57.46         | -17.53     | QP       |         |
| 2   |     | 0.4196       | 6.80                     | 30.02                   | 36.82                    | 47.46         | -10.64     | AVG      |         |
| 3   |     | 0.5839       | 10.95                    | 30.02                   | 40.97                    | 56.00         | -15.03     | QP       |         |
| 4   |     | 0.5839       | 0.41                     | 30.02                   | 30.43                    | 46.00         | -15.57     | AVG      |         |
| 5   |     | 0.6677       | 15.74                    | 30.02                   | 45.76                    | 56.00         | -10.24     | QP       |         |
| 6   |     | 0.6677       | 3.30                     | 30.02                   | 33.32                    | 46.00         | -12.68     | AVG      |         |
| 7   |     | 1.2948       | 12.67                    | 30.02                   | 42.69                    | 56.00         | -13.31     | QP       |         |
| 8   | *   | 1.2948       | 9.60                     | 30.02                   | 39.62                    | 46.00         | -6.38      | AVG      |         |
| 9   |     | 2.1583       | 11.68                    | 30.02                   | 41.70                    | 56.00         | -14.30     | QP       |         |
| 10  |     | 2.1583       | 8.85                     | 30.02                   | 38.87                    | 46.00         | -7.13      | AVG      |         |
| 11  |     | 3.0210       | 10.01                    | 30.04                   | 40.05                    | 56.00         | -15.95     | QP       |         |
| 12  |     | 3.0210       | 6.26                     | 30.04                   | 36.30                    | 46.00         | -9.70      | AVG      |         |

## 4.3 Peak output power

### 4.3.1 Limits

Conducted peak output power limit is 125mW (21dBm)

### 4.3.2 Test Method

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured

VBW ≥ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.

### 4.3.3 Test Result

#### GFSK

| Frequency (MHz) | Peak output power (dBm) | Limit (dBm) |
|-----------------|-------------------------|-------------|
| 2402            | -2.859                  | 21          |
| 2441            | -2.002                  | 21          |
| 2480            | -1.242                  | 21          |

#### $\pi/4$ -DQPSK

| Frequency (MHz) | Peak output power (dBm) | Limit (dBm) |
|-----------------|-------------------------|-------------|
| 2402            | -3.818                  | 21          |
| 2441            | -2.014                  | 21          |
| 2480            | -1.6                    | 21          |

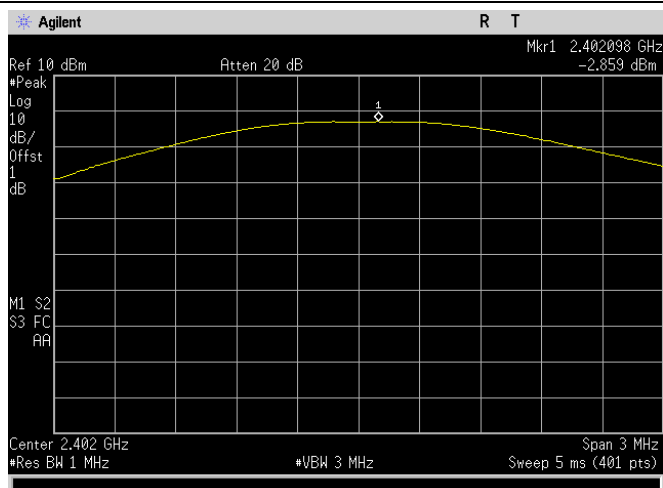
#### 8DPSK

| Frequency (MHz) | Peak output power (dBm) | Limit (dBm) |
|-----------------|-------------------------|-------------|
| 2402            | -3.646                  | 21          |
| 2441            | -2.195                  | 21          |
| 2480            | -1.533                  | 21          |

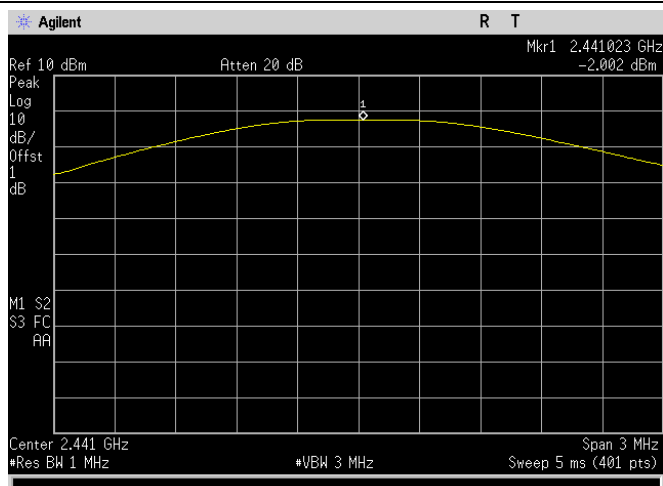
Test plots as below

# GFSK

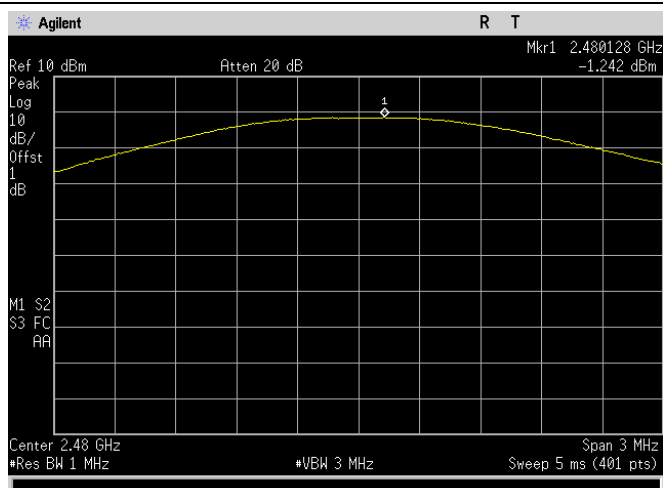
## 2402MHz



## 2441MHz

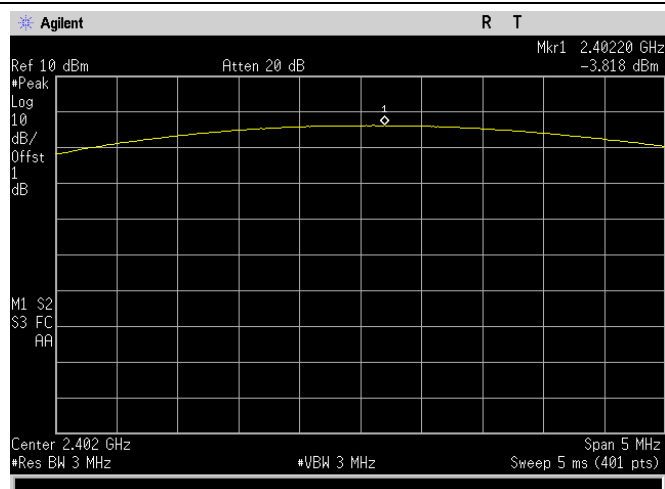


## 2480MHz

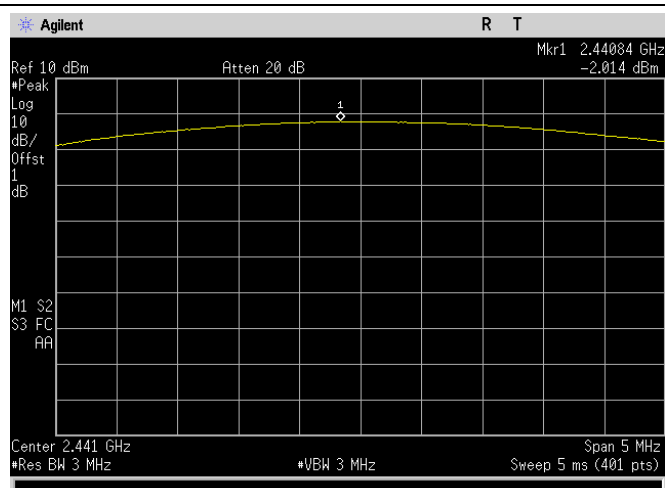


$\pi$  /4-DQPSK

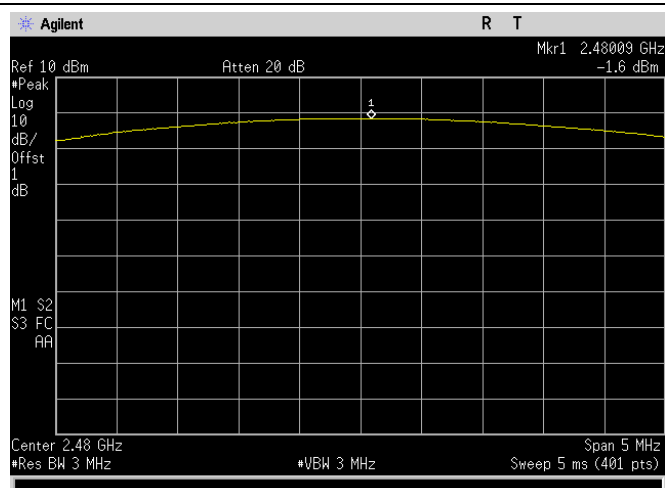
2402MHz



2441MHz

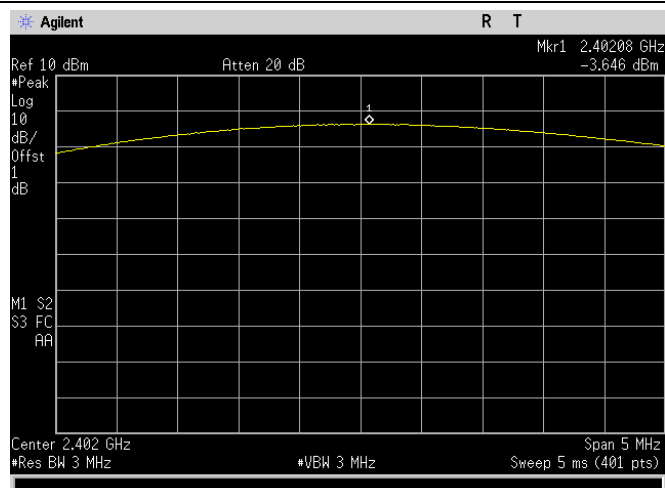


2480MHz

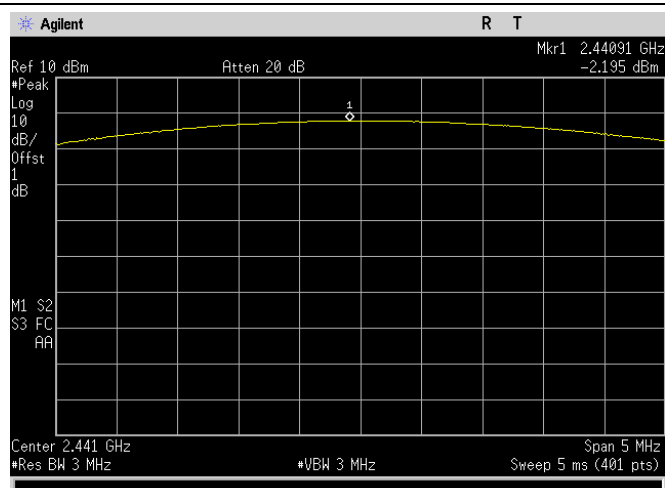


## 8DPSK

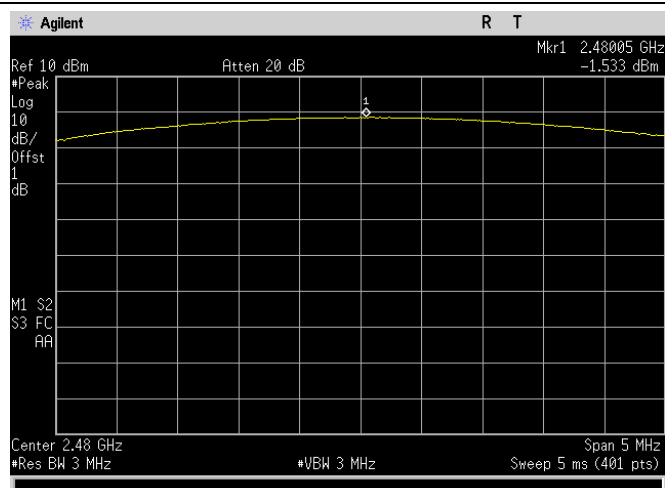
### 2402MHz



### 2441MHz



### 2480MHz



## 4.4 20dB emission bandwidth

### 4.4.1 Test method

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW  $\geq 1\%$  of the 20 dB bandwidth

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

### 4.4.2 Test result

#### GFSK

| Frequency (MHz) | 20dB emission bandwidth (MHz) |
|-----------------|-------------------------------|
| 2402            | 0.855                         |
| 2441            | 0.852                         |
| 2480            | 0.850                         |

#### $\pi/4$ -DQPSK

| Frequency (MHz) | 20dB emission bandwidth (MHz) |
|-----------------|-------------------------------|
| 2402            | 1.210                         |
| 2441            | 1.257                         |
| 2480            | 1.253                         |

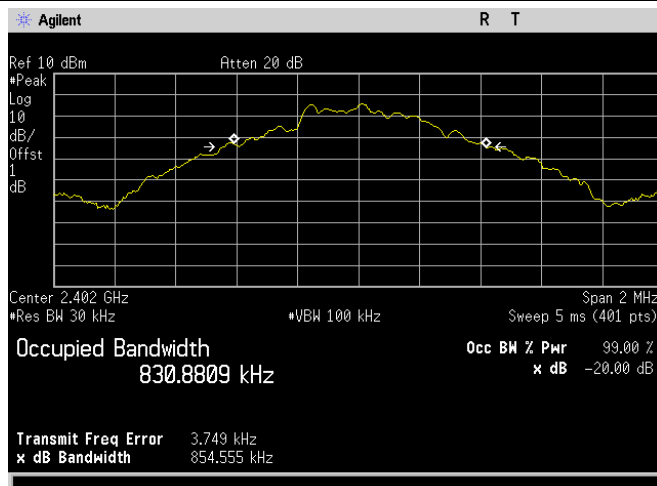
#### 8DPSK

| Frequency (MHz) | 20dB emission bandwidth (MHz) |
|-----------------|-------------------------------|
| 2402            | 1.214                         |
| 2441            | 1.222                         |
| 2480            | 1.226                         |

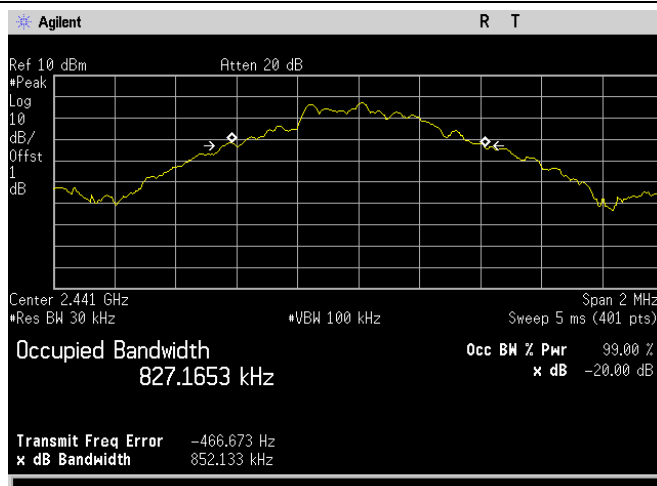
Test plots as below

GFSK

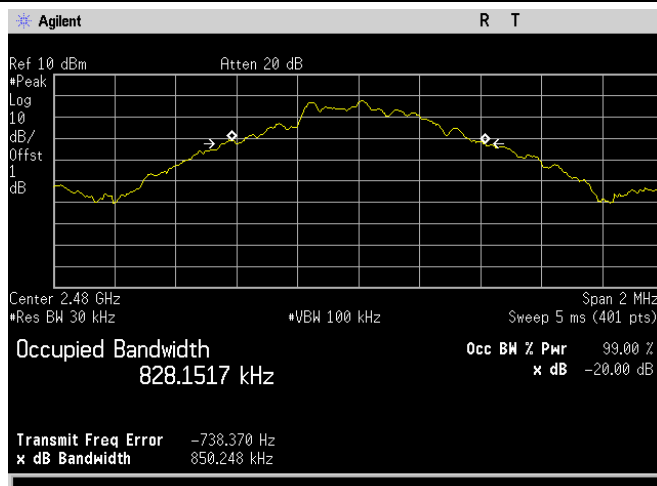
2402MHz



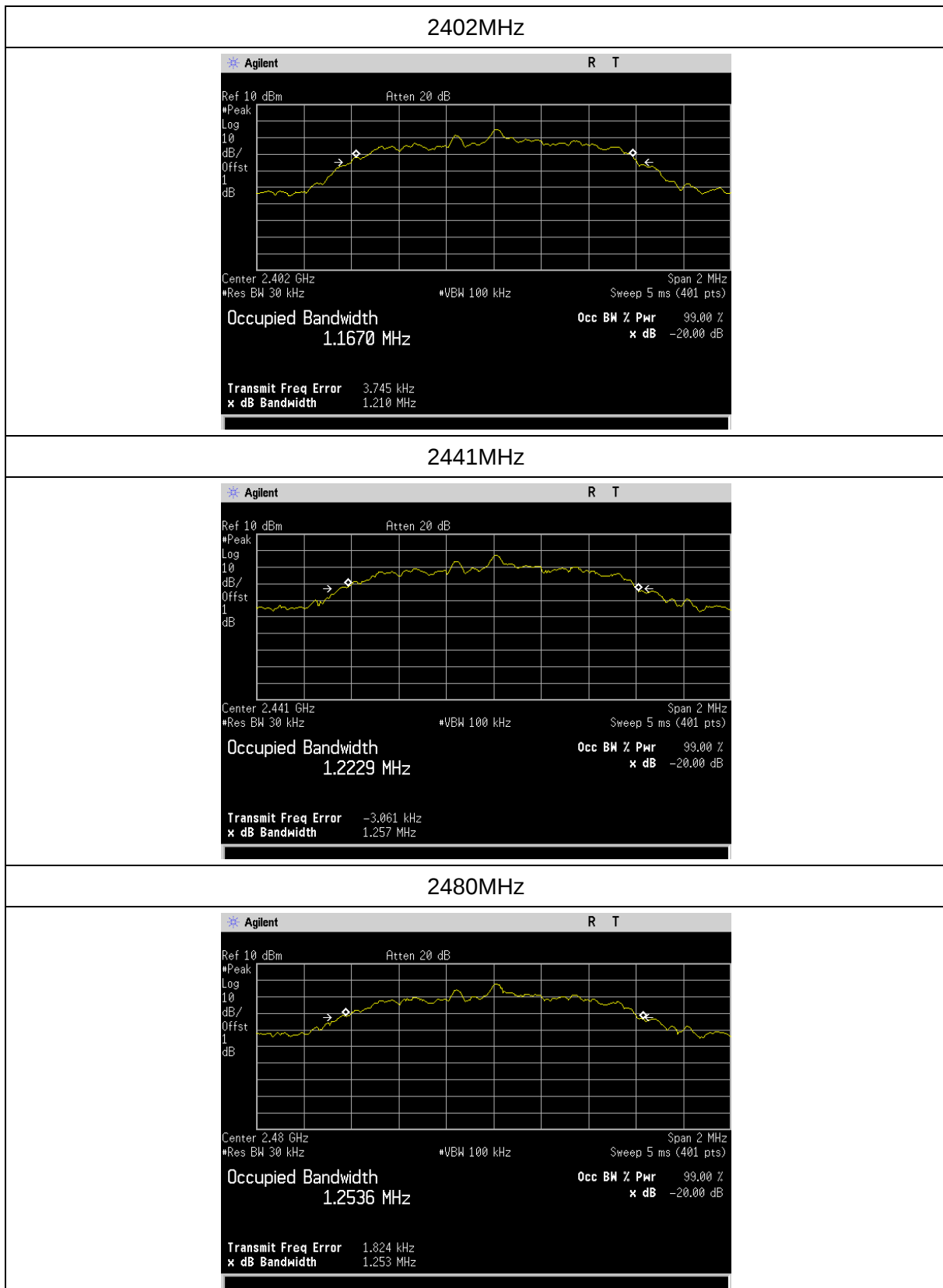
2441MHz



2480MHz

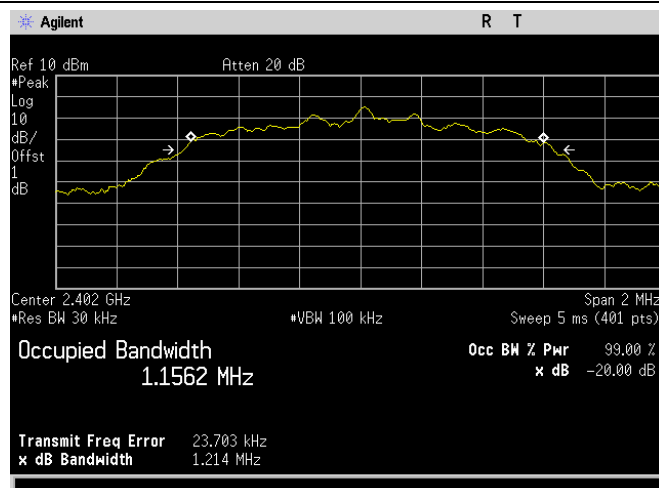


$\pi/4$ -DQPSK

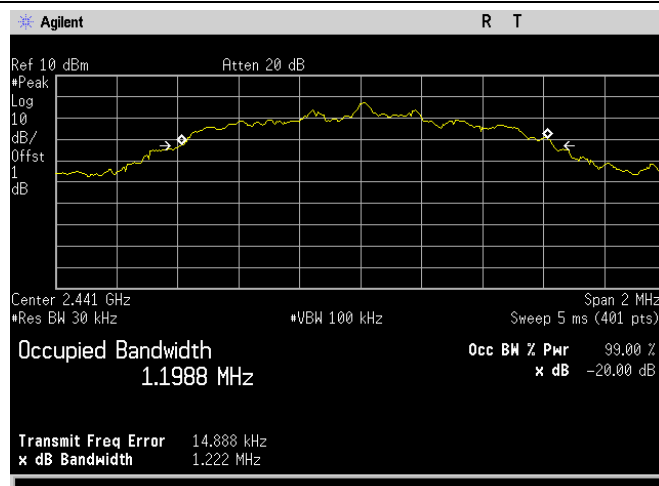


## 8DPSK

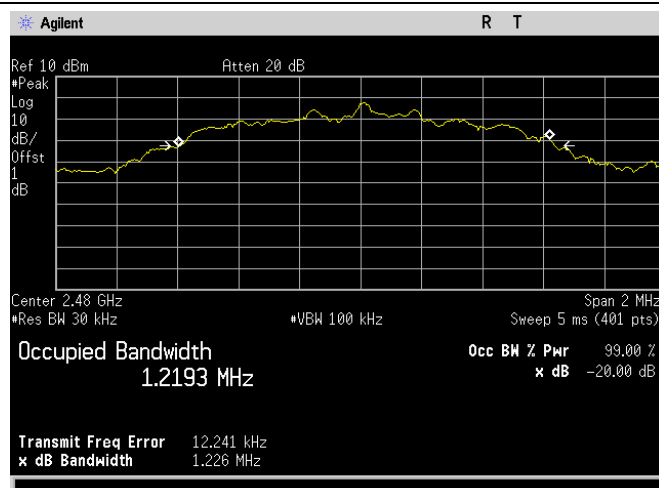
### 2402MHz



### 2441MHz



### 2480MHz



## 4.5 Carrier frequency separation

### 4.5.1 Limits

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.

### 4.5.2 Test method

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq 1\%$  of the span

Video (or Average) Bandwidth (VBW)  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

### 4.5.3 Test result

#### GFSK

| Channels (MHz) | Separation (MHz) | Limit (MHz) |
|----------------|------------------|-------------|
| 2402-2403      | 1.005            | 0.57        |
| 2441-2442      | 1.005            | 0.57        |
| 2479-2480      | 1.005            | 0.57        |

#### $\pi/4$ -DQPSK

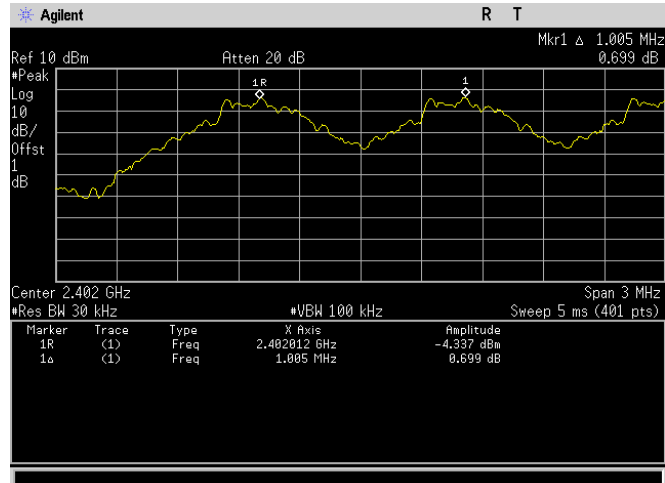
| Channels (MHz) | Separation (MHz) | Limit (MHz) |
|----------------|------------------|-------------|
| 2402-2403      | 1.005            | 0.838       |
| 2441-2442      | 1.005            | 0.838       |
| 2479-2480      | 1.005            | 0.838       |

#### 8DPSK

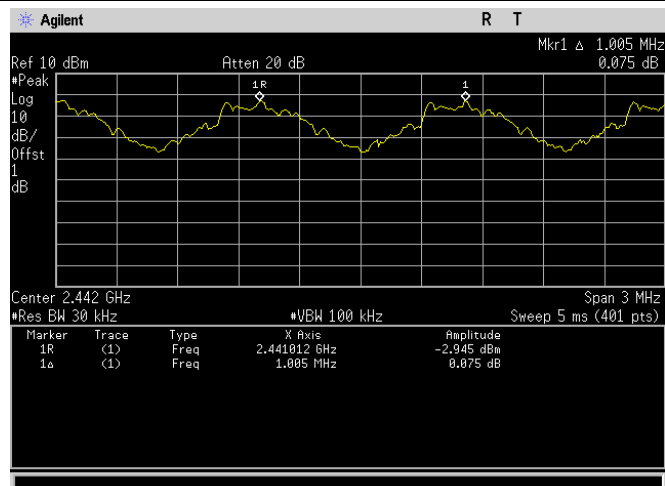
| Channels (MHz) | Separation (MHz) | Limit (MHz) |
|----------------|------------------|-------------|
| 2402-2403      | 1.005            | 0.817       |
| 2441-2442      | 0.998            | 0.817       |
| 2479-2480      | 1.005            | 0.817       |

GFSK

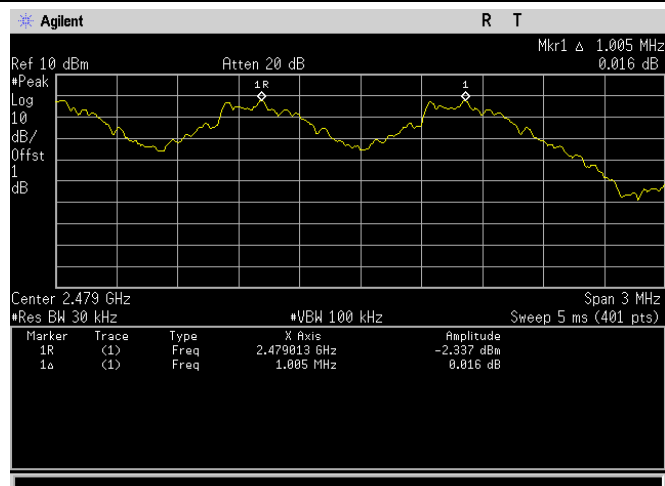
2402MHz~2403MHz



2441MHz~2442MHz

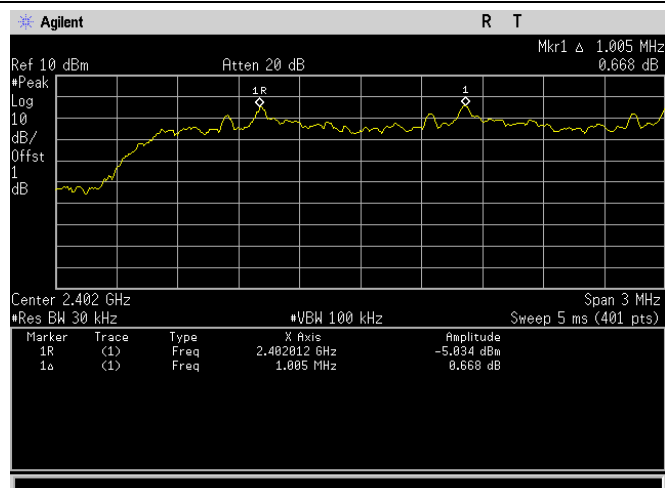


2479MHz~2480MHz

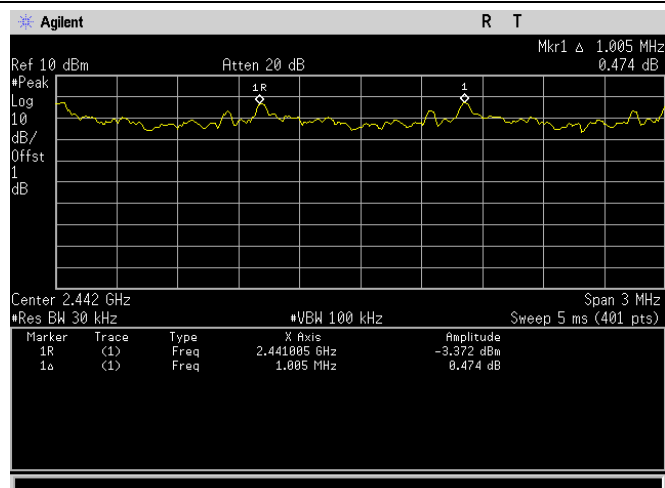


$\pi/4$ -DQPSK

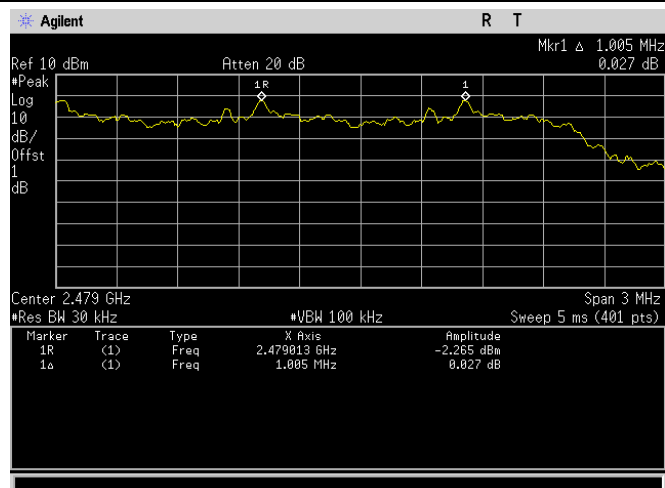
### 2402MHz~2403MHz



### 2441MHz~2442MHz

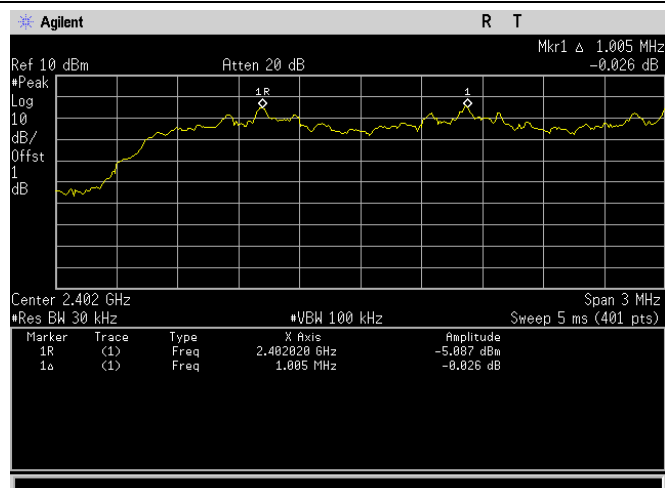


### 2479MHz~2480MHz

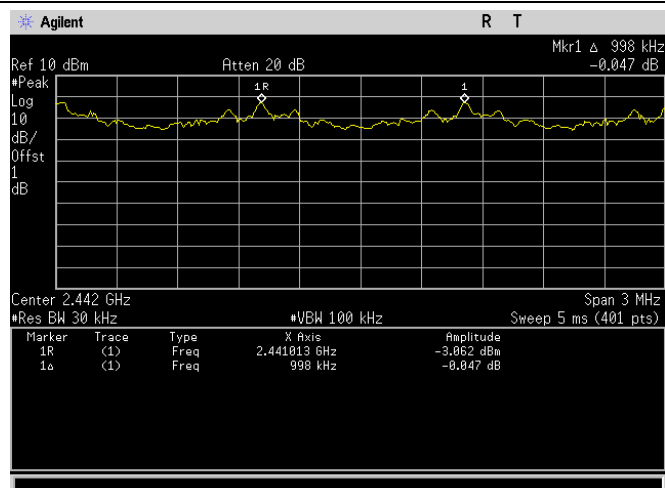


## 8DPSK

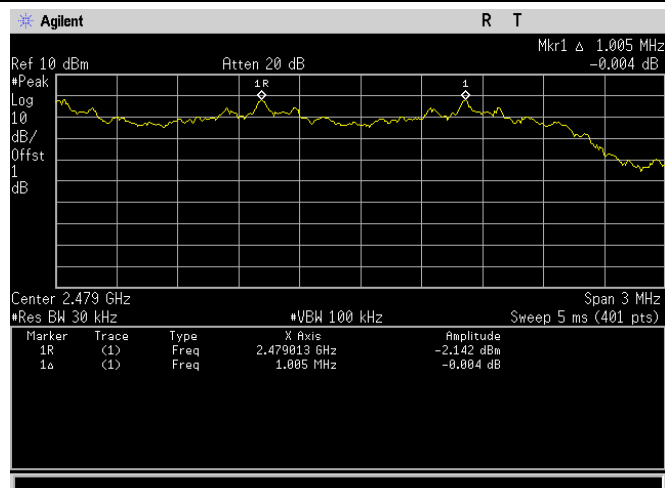
### 2402MHz~2403MHz



### 2441MHz~2442MHz



### 2479MHz~2480MHz



## 4.6 Number of hopping channel

### 4.6.1 Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### 4.6.2 Test method

The EUT must have its hopping function enabled. Use the following spectrum analyser settings:

Span = the frequency band of operation

RBW  $\geq 1\%$  of the span

VBW  $\geq$  RBW

Sweep = auto

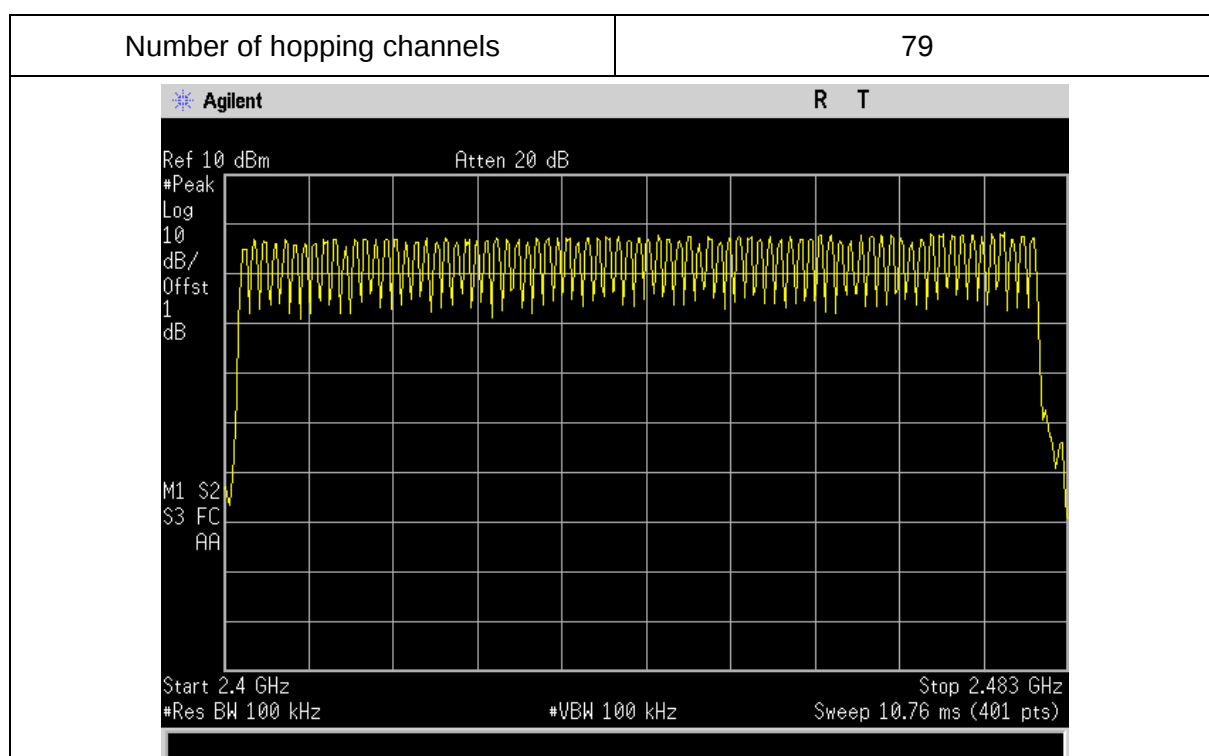
Detector function = peak

Trace = max hold

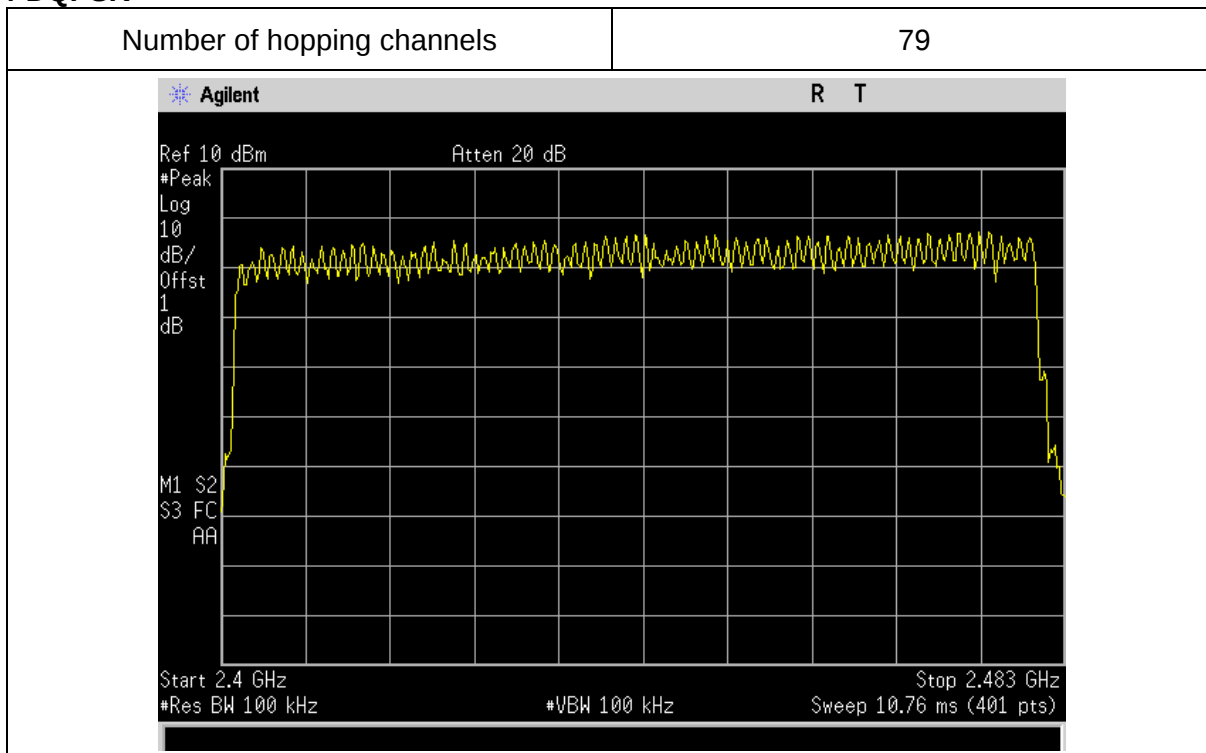
Allow the trace to stabilize. It

### 4.6.3 Test Result

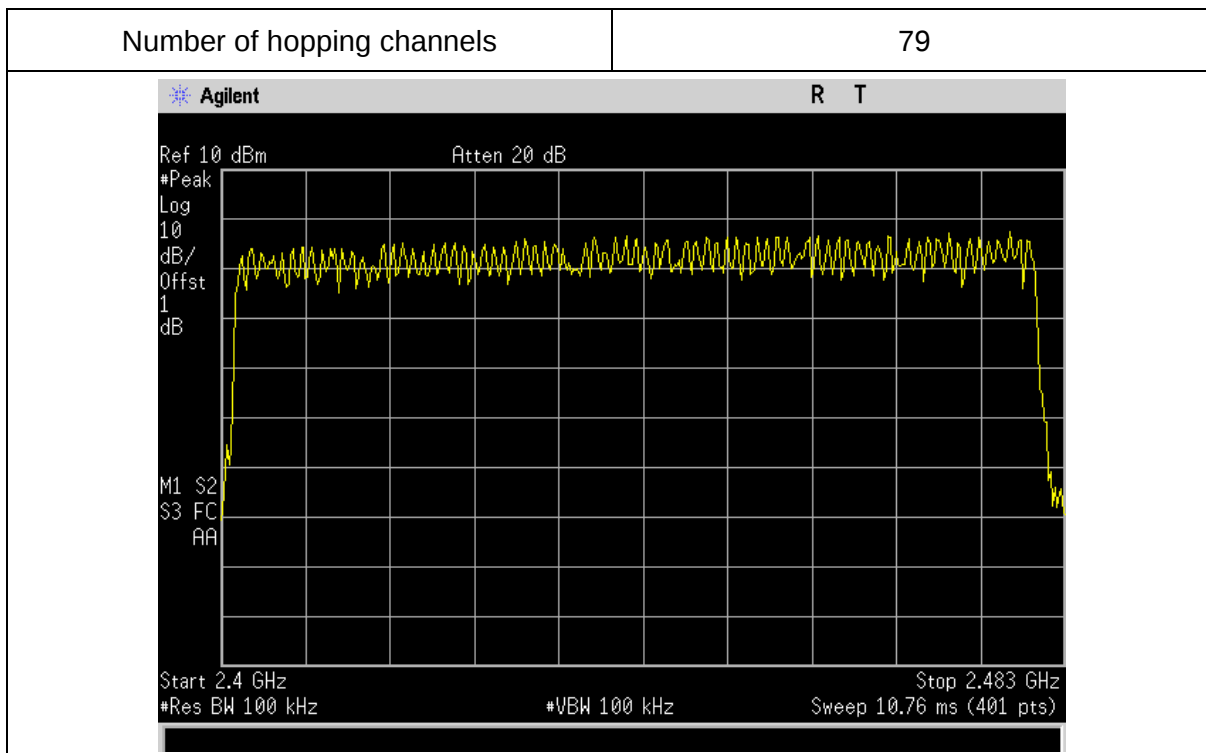
#### GFSK



### $\pi/4$ -DQPSK



### 8DPSK



## 4.7 Time of occupancy (dwell time)

### 4.7.1 Limit

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.

### 4.7.2 Test method

The EUT must have its hopping function enabled. Use the following spectrum analyser settings:

Span = zero span, centered on a hopping channel

RBW = 1 MHz

VBW  $\geq$  RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

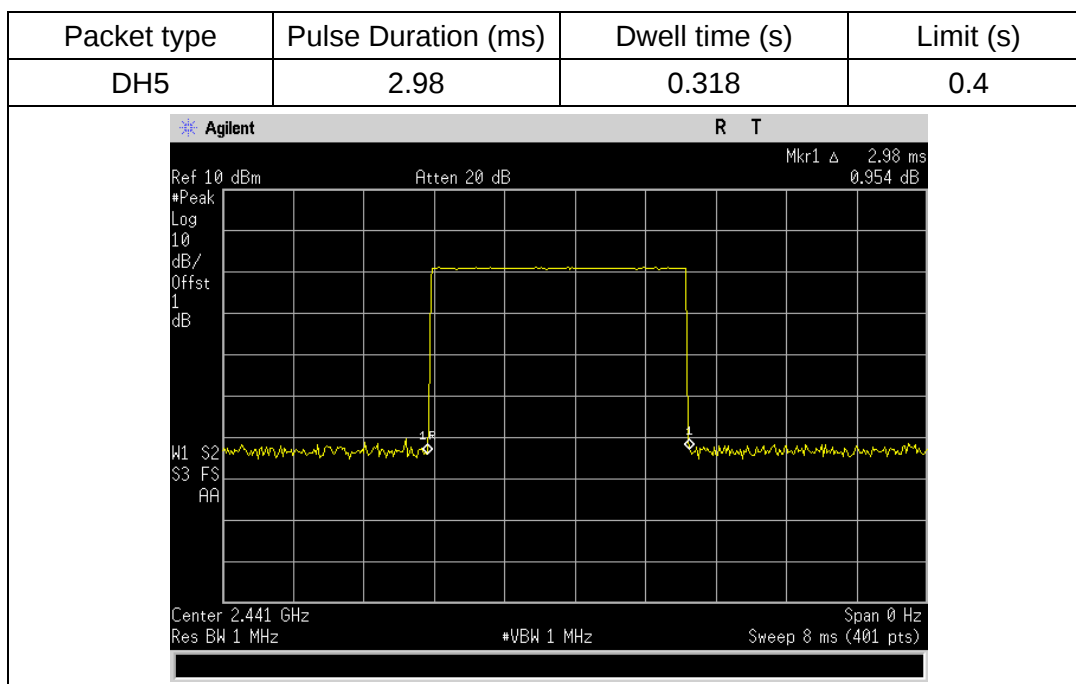
Detector function = peak

Trace = max hold

Use the marker-delta function to determine the dwell time.

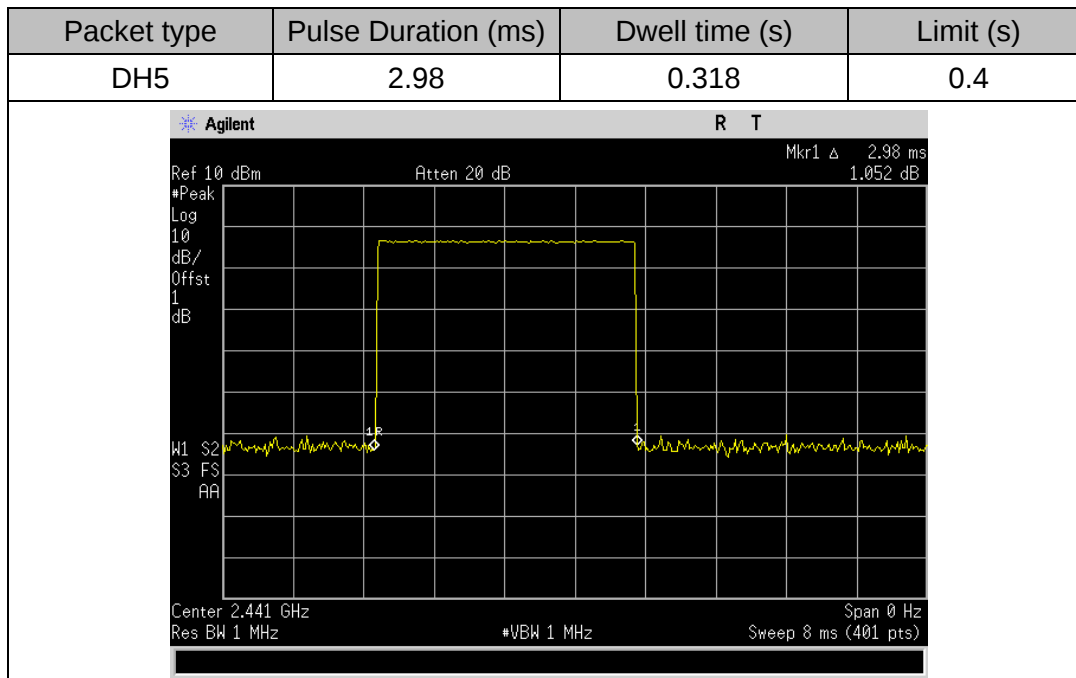
### 4.7.3 Test Result

#### GFSK



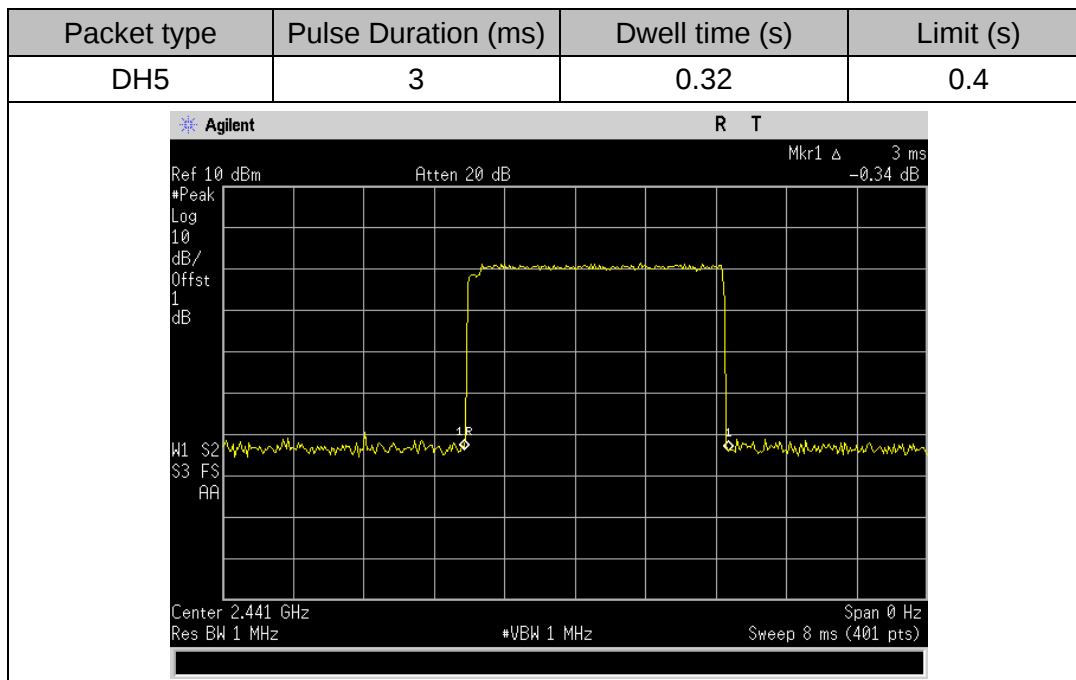
Note: for the worst mode of DH5 packet type, in normal hopping mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channel

### $\pi/4$ -DQPSK



Note: for the worst mode of DH5 packet type, in normal hopping mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channel

### 8DPSK



Note: for the worst mode of DH5 packet type, in normal hopping mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channel

## **4.8 Band edge emission**

### **4.8.1 Limit**

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

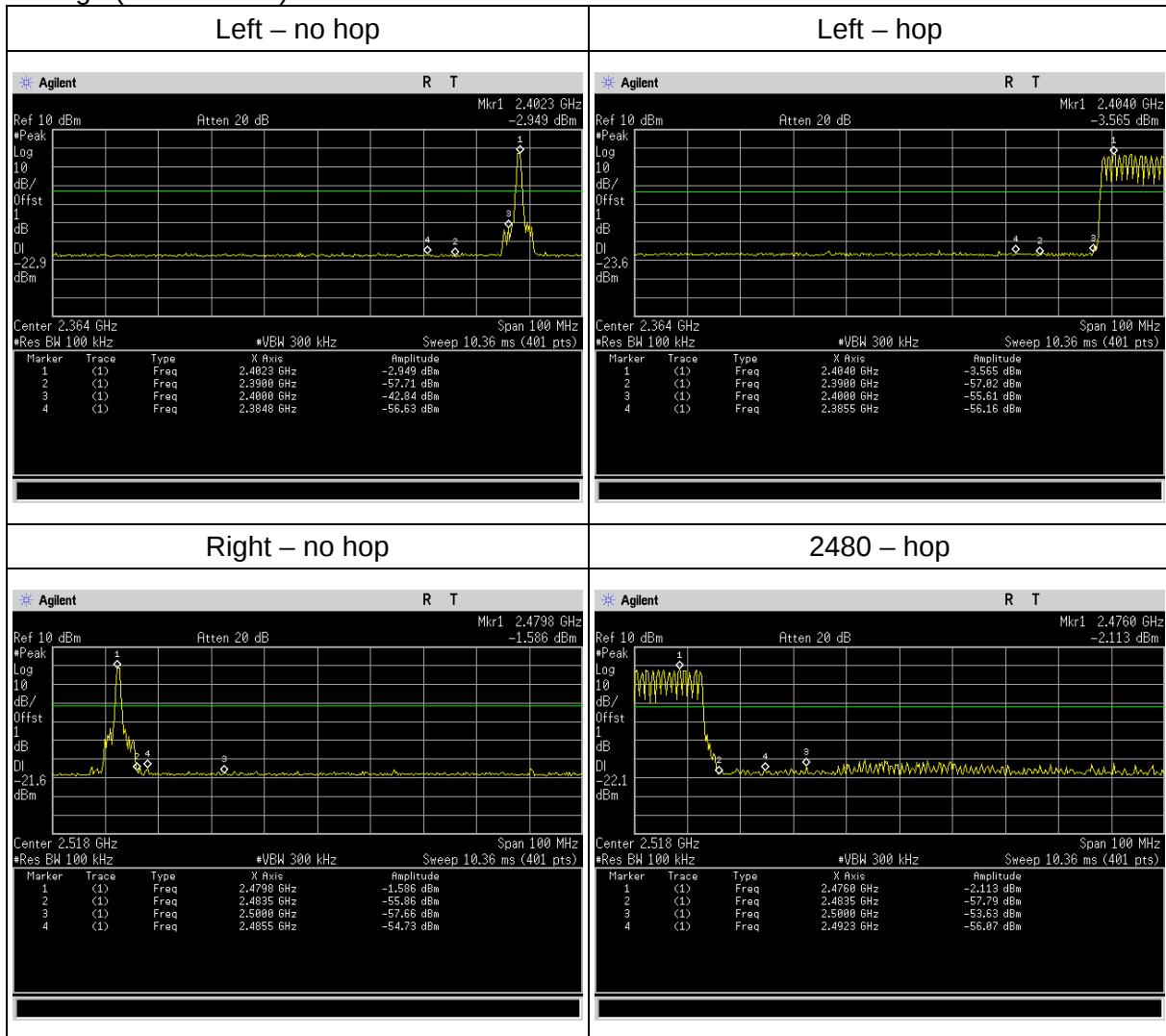
### **4.8.2 Test method**

Use the following spectrum analyser settings:

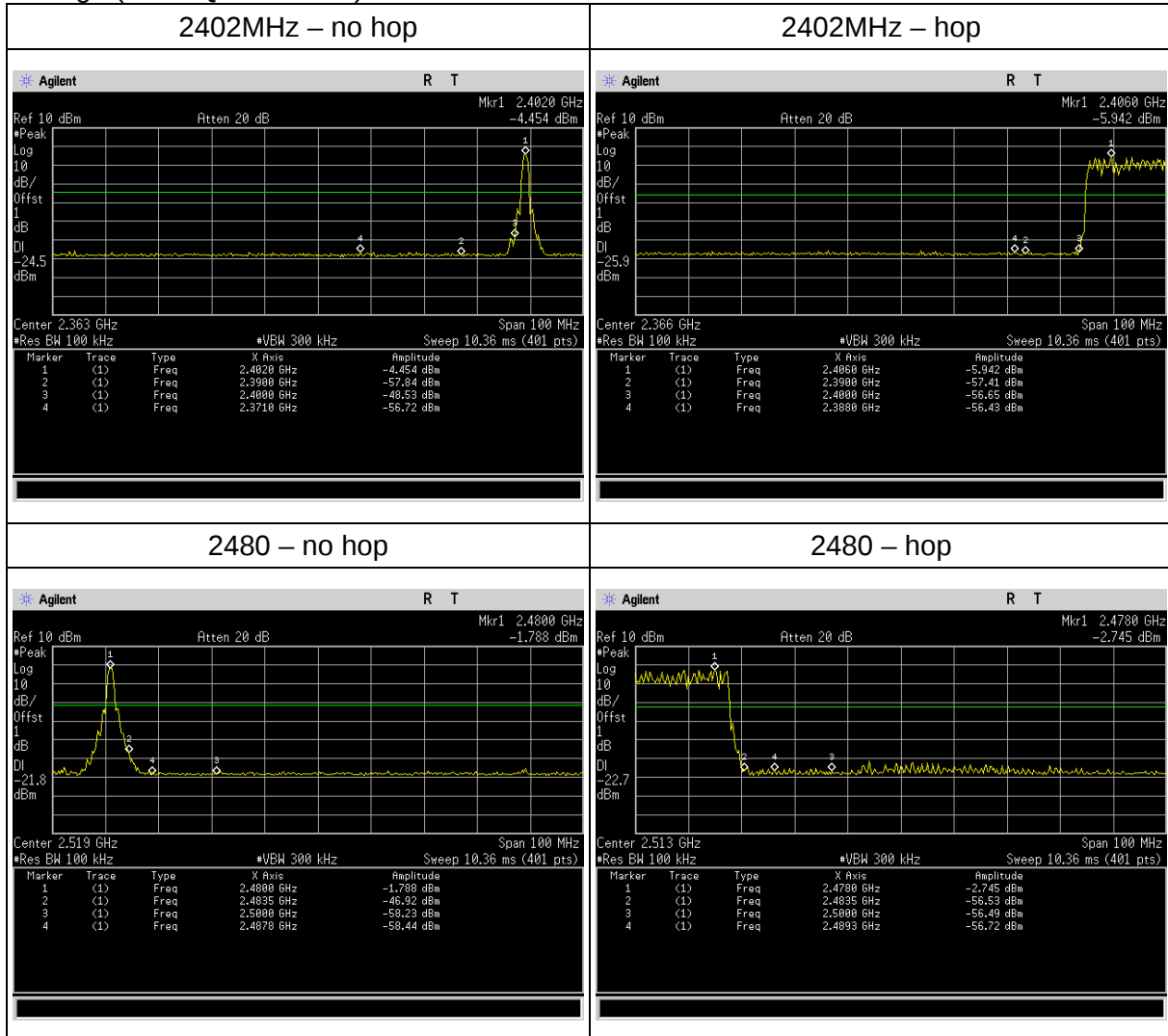
Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.

### **4.8.3 Test Result**

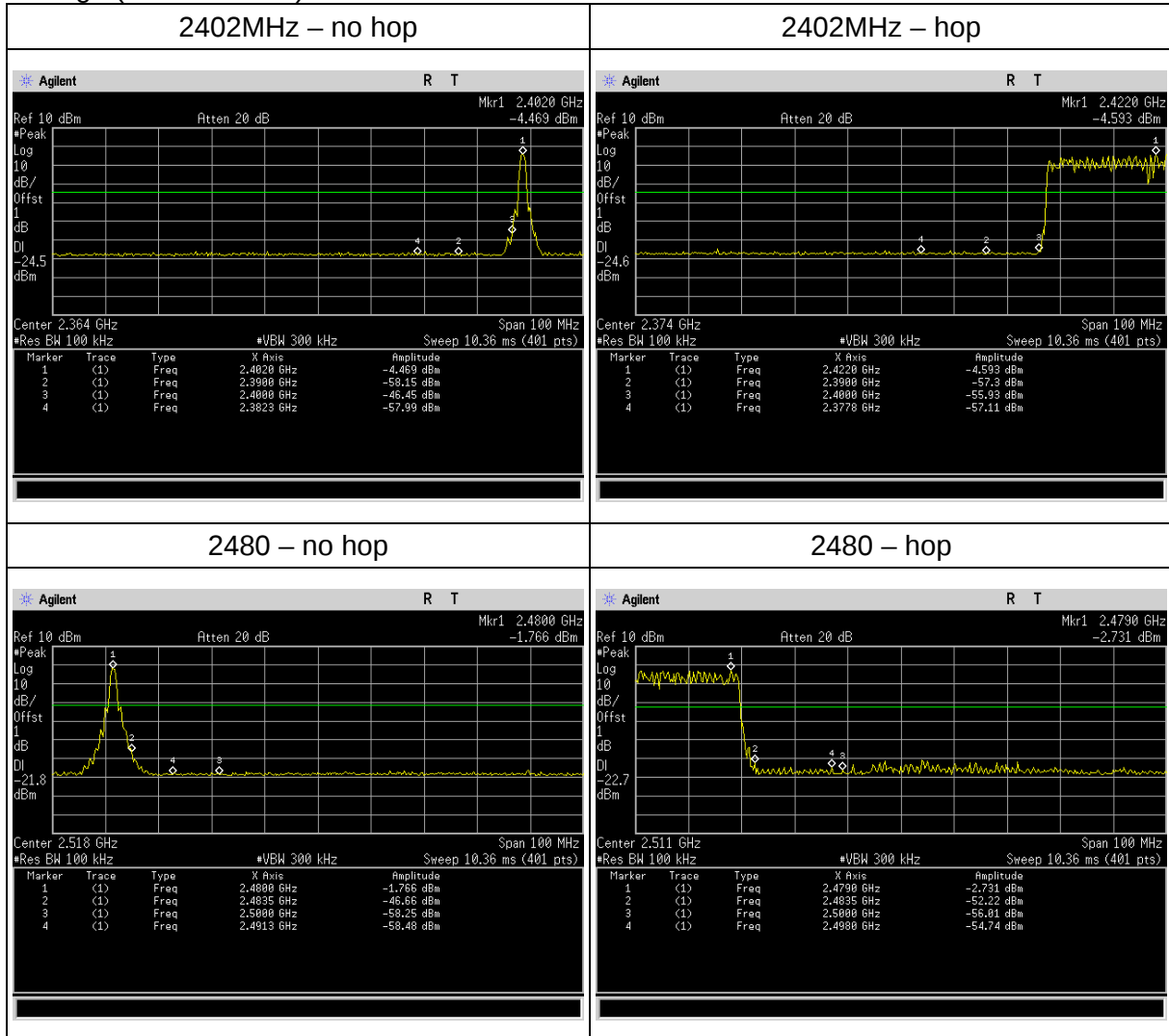
Band edge (GFSK mode)



Band edge ( $\pi/4$ -DQPSK mode)



Band edge (8DPSK mode)



## 4.9 Radiated emission

### 4.9.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

| Frequency (MHz) | Field strength $\mu\text{V/m}$ | Field strength $\text{dB}\mu\text{V/m}$ | Detector | Measurement distance |
|-----------------|--------------------------------|-----------------------------------------|----------|----------------------|
| 30-88           | 100                            | 40                                      | QP       | 3m                   |
| 88-216          | 150                            | 43.5                                    | QP       |                      |
| 216-960         | 200                            | 46                                      | QP       |                      |
| 960-1000        | 500                            | 46                                      | QP       |                      |
| Above 1000      | 500                            | 54                                      | AV       |                      |
| Above 1000      | 5000                           | 74                                      | PK       |                      |

#### Restricted bands defined in FCC 15.205:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 16.42-16.423        | 399.9-410     | 4.5-5.15    |
| 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         | 2690-2900     | 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     | Above 38.6  |
| 13.36-13.41       |                     |               |             |

#### 4.9.2 Test method

1. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
2. Use the following spectrum analyzer settings:  
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for  $f \geq 1\text{GHz}$ , 100 kHz for  $f < 1\text{GHz}$ , VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold
3. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209.

#### 4.9.3 Test Result

## Radiated emission (GFSK mode)

| Transmitter channel: 2402MHz |                   |                |        |          |        |
|------------------------------|-------------------|----------------|--------|----------|--------|
| Frequency                    | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz)                        | H / V             | dBµV/m         | dBµV/m |          |        |
| 276.12                       | V                 | 42.4           | 46     | QP       | Pass   |
| 276.12                       | H                 | 36.5           | 46     | QP       |        |
| 2390                         | V                 | 46.19          | 74     | PK       |        |
| 2390                         | H                 | 47.71          | 74     | PK       |        |
| 4804                         | V                 | 50.84          | 74     | PK       |        |
| 4804                         | H                 | 51.38          | 74     | PK       |        |
| Transmitter channel: 2441MHz |                   |                |        |          |        |
| Frequency                    | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz)                        | H / V             | dBµV/m         | dBµV/m |          |        |
| 276.12                       | V                 | 42.2           | 46     | QP       |        |
| 276.12                       | H                 | 36.8           | 46     | QP       |        |
| 4882                         | V                 | 50.1           | 74     | PK       |        |
| 4882                         | H                 | 51.21          | 74     | PK       |        |
| Transmitter channel: 2480MHz |                   |                |        |          |        |
| Frequency                    | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz)                        | H / V             | dBµV/m         | dBµV/m |          |        |
| 276.12                       | V                 | 42.7           | 46     | QP       |        |
| 276.12                       | H                 | 36.3           | 46     | QP       |        |
| 2483.5                       | V                 | 46.31          | 74     | PK       |        |
| 2483.5                       | H                 | 47.39          | 74     | PK       |        |
| 4960                         | V                 | 51.28          | 74     | PK       |        |
| 4960                         | H                 | 51.13          | 74     | PK       |        |

Note:

QP Emission Level= Antenna Factor +Cable Loss + Reading

PK Emission Level= Antenna Factor +Cable Loss - Amp. Factor + Reading

AV Emission Level= set the RBW/VBW to be 1MHz/10Hz to read the level.

If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

all three modes (GFSK, π/4-DQPSK and 8DPSK modes of EUT have been tested, only the data of worst case GFSK mode is reported.

----END OF REPORT----