

# TEST REPORT

**Report number** : KR22-SRT0001  
**Issue date** : 2022-01-11

**Applicant** : DREAMUS COMPANY  
5, Bangbae-ro 18gil, Seocho-gu, Seoul,  
Republic of Korea  
TEL : +82 2-3019-7542  
FAX : +82 2-3019-7576

**Equipment under test (EUT)** : KANN MAX

**Model name** : PPM44

**Date of test** : 2022.01.03 ~ 2022.01.04

**Test place** : KCTL Inc.  
65 Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-  
do, Korea

**Test results** : PASS

The results in this report are applicable only to the equipment tested.  
This report shall not be re-produced except in full without the written approval of **KCTL Inc.**

**Tested by;**



Hosung Lee

**Approved by;**



Heesu Ahn

## 1. Summary of Test

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### 1. Purpose of test

Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment  
2.4GHz Band wide band low power data communication System

### 2. Standards

Certification Ordinance Article 2 Clause 1 Item19

#### 1) Test Methods

Ministry of Internal Affairs and Communications Notification Article 88 Appendix 43

#### 2) Deviation from standards

None

### 3. List of applied test to the EUT

| Article 88<br>Appendix 43 | Classification of EUT                 | Condition | Result |
|---------------------------|---------------------------------------|-----------|--------|
| 3                         | Frequency Tolerance                   | Conducted | PASS   |
| 4                         | Occupied Bandwidth                    | Conducted | PASS   |
| 4                         | Spread Bandwidth                      | Conducted | PASS   |
| 5                         | Unwanted (Spurious) Emission Strength | Conducted | PASS   |
| 6                         | RF Output Power Tolerance             | Conducted | PASS   |
| 7                         | Secondary Emitted Radio Wave Strength | Conducted | PASS   |
| 13                        | Time of occupancy hopping frequency   | Conducted | PASS   |
| 13                        | Spreading Factor                      | Conducted | PASS   |
| 12                        | Interference Prevention Function      | Conducted | PASS   |

#### 1) Test set up

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#### 2) Modification to the EUT by laboratory

None

## 1. Test Information

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1. Applicant

DREAMUS COMPANY

5, Bangbae-ro 18gil, Seocho-gu, Seoul, Republic of Korea

2. Equipment under test

KANN MAX

3. Model number

PPM44

4. Serial number

N/A

5. Size

(W) 68.3 x (D) 23.1 x (H) 117.05

6. Terminal limitation

-10°C to 50°C

7. RF Specification Frequency range

2402-2480MHz

8. Number of RF Channels

79 Channels

9. Modulation method

FHSS(GFSK,  $\pi/4$ -DQPSK, 8DPSK)

10. Data rate

1, 2, 3Mbps

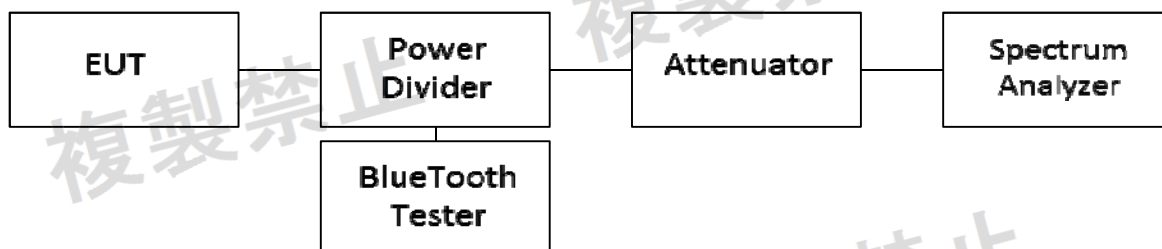
10. Variation of the family model(s)

None

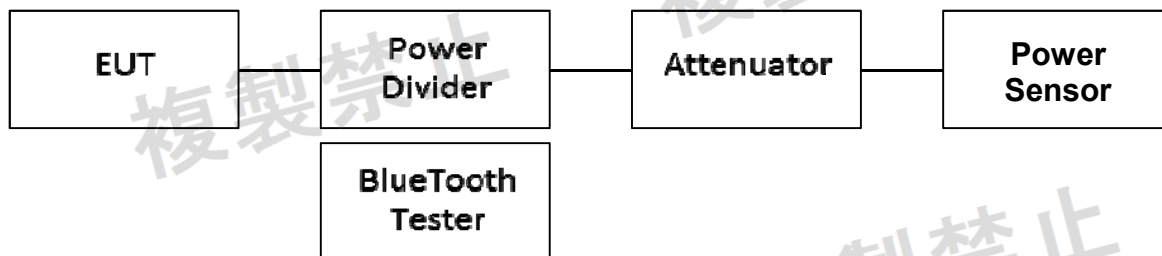
## 2. Configuration of equipment

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1. Occupied Bandwidth, Spread bandwidth, Unwanted(Spurious) emission strength, Secondary emitted radio wave strength, Time of occupancy hopping frequency, Frequency tolerance



2. RF output power tolerance



Heesu Ahn

### 3. Test results (Rated voltage)

S/N : N/A

|                          |              |            |            |
|--------------------------|--------------|------------|------------|
| Environment of test room | Date of test | 2022-01-03 | 2022-01-04 |
|                          | Temperature  | 21 °C      | 20 °C      |
|                          | Humidity     | 49 %       | 50 %       |

|                          |               |                |
|--------------------------|---------------|----------------|
| Peak Antenna Gain        | -1.25         | dBi            |
| Declaration Output Power | 0.100         | mW/MHz         |
| Declaration Output Power | -10.00        | dBm/MHz        |
| <b>E.I.R.P.</b>          | <b>-11.25</b> | <b>dBm/MHz</b> |
| Input Power Voltage      | 3.80          | VDC            |

|                                          |          |          |
|------------------------------------------|----------|----------|
| Tested Circuit Insertion Loss            | 0        | dB       |
| Frequency equal to the Transmission rate | 1        | MHz      |
| Transmission Time                        | ON TIME  | 2.869 ms |
|                                          | OFF TIME | 0.891 ms |
|                                          | Ratio    | 0.763    |
| Packet Type (Mode)                       | DH5      | mode     |
| Transmit Speed                           | 1        | MHz      |

Using TDF and offset function in Spectrum Analyzer.  
Measurement of plots are included Loss value.  
(Att : 10dB + Cable loss + EUT cable: 0.5dB offset )

|                                                                |                                                                                                                                                                                                                                 |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test category :                                                | 2.4GHz Band Low-Power Data Communication System (BluetoothV5.0+BDR                                                                                                                                                              |
| The reason why the tests are performed only at rated voltage : | The fluctuation of input voltage to the circuit of the radio part of the equipment to be tested is identified as being less than $\pm 1$ % when input voltage from an external supply into the equipment fluctuates $\pm 10$ %. |

|                                       |                     |          |          |           |             |                                 |                    |
|---------------------------------------|---------------------|----------|----------|-----------|-------------|---------------------------------|--------------------|
| Measurement Frequency                 | MHz                 | 2402     | 2441     | 2480      | Result      | Limit                           | Note               |
| Channel Number                        | Ch.                 | 0        | 39       | 78        | ---         | ---                             |                    |
| Frequency Measurements                | MHz                 | 2402.010 | 2441.020 | 2480.020  | ---         | ---                             |                    |
| Frequency Tolerance                   | ppm                 | 4.163    | 8.173    | 8.044     | <b>PASS</b> | $\pm 50 \times 10^{-6}$ (50ppm) |                    |
| Occupied Bandwidth                    | MHz                 | ---      | 78.12    | ---       | <b>PASS</b> | 83.5MHz or below                |                    |
| Spread Bandwidth                      | MHz                 | ---      | 70.93    | ---       | <b>PASS</b> | 500kHz or more                  |                    |
| RF Output Power                       | mW/MHz              | 0.048    | 0.073    | 0.077     | <b>PASS</b> | 3mW/MHz or below                |                    |
| RF Output Power Tolerance             | %                   | -51.76   | -26.55   | -23.43    | <b>PASS</b> | +20 to -80%                     |                    |
| Unwanted (Spurious) Emission Strength | 30 to 2387MHz       | uW/MHz   | ---      | 0.024     | <b>PASS</b> | 2.5uW/MHz or below              |                    |
|                                       |                     | MHz      | ---      | 848.200   | ----        |                                 |                    |
|                                       | 2387 to 2400MHz     | uW/MHz   | ---      | 2.3714    | <b>PASS</b> | 25uW/MHz or below               |                    |
|                                       |                     | MHz      | ---      | 2399.981  | ----        |                                 |                    |
|                                       | 2483.5 to 2496.5MHz | uW/MHz   | ---      | 0.0239    | <b>PASS</b> | 25uW/MHz or below               |                    |
|                                       |                     | MHz      | ---      | 2485.065  | ----        |                                 |                    |
|                                       | 2496.5 to 12500MHz  | uW/MHz   | ---      | 0.1403    | <b>PASS</b> | 2.5uW/MHz or below              |                    |
|                                       |                     | MHz      | ---      | 10546.500 | ----        |                                 |                    |
| Secondary Emitted Radio Wave Strength | 30 to 1000MHz       | nW       | ---      | 0.0274    | <b>PASS</b> | 4nW or below                    |                    |
|                                       |                     | MHz      | ---      | 885.170   | ----        |                                 |                    |
|                                       | 1000 to 12500MHz    | nW       | ---      | 1.1272    | <b>PASS</b> | 20nW or below                   |                    |
|                                       |                     | MHz      | ---      | 11322.000 | ----        |                                 |                    |
| Time of occupancy hopping frequency   | sec                 | ---      | 0.0029   | ---       | <b>PASS</b> | 0.4sec or below                 |                    |
|                                       | sec                 | ---      | 0.2534   | ---       | <b>PASS</b> | 0.4sec or below                 | 0.4sec×Spread rate |
| Spreading Factor                      | ---                 |          | 70.9300  |           | <b>PASS</b> | 5 or more                       |                    |
| Interference Prevention Function      |                     |          | Good     |           | <b>PASS</b> |                                 |                    |

## 4. Measurement equipment list

| USE | Equipment             | Company                  | Model No.                            | Serial No.  | Calibrated by | Cal. Method | Cal. Date  | Cal. Due   |
|-----|-----------------------|--------------------------|--------------------------------------|-------------|---------------|-------------|------------|------------|
| X   | Spectrum analyzer     | Key Sight                | FSV30                                | 101437      | HCT           | (c)         | 2021.07.27 | 2022.07.27 |
| X   | DC Power Supply       | AGILENT                  | E3632A                               | KR94907664  | HCT           | (c)         | 2021.05.10 | 2022.05.10 |
| X   | Signal generator      | R & S                    | SMB100A                              | 176206      | HCT           | (c)         | 2021.01.20 | 2022.01.20 |
| X   | Attenuator            | API Inmet                | 40AH2W-10                            | 18          | HCT           | (c)         | 2021.05.11 | 2022.05.11 |
| X   | Attenuator            | R&S                      | DNF Dämpfungsglied 10 dB in N-50 Ohm | 31211       | HCT           | (c)         | 2021.05.11 | 2022.05.11 |
| X   | Bluetooth Tester      | TESCOM                   | TC-3000C                             | 3000C000270 | HCT           | (c)         | 2021.07.08 | 2022.07.28 |
| X   | Power Divider         | AeroFlex/ Weinschel, Inc | 1580-1                               | RZ184       | HCT           | (c)         | 2021.12.22 | 2022.12.22 |
| X   | Wideband Power Sensor | R&S                      | NRP-Z81                              | 102398      | HCT           | (c)         | 2021.05.11 | 2022.05.11 |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |
|     |                       |                          |                                      |             |               |             |            |            |

Note1: "X" used equipment.

Note2: The validity of measurement equipment is one year from the first day of the following month of the calibration date.

Note3:

Cal.Method ...

a) : Calibration conducted by the National Institute of Information and Communications Technology~ NICT~ or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

b) : Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)~Japan Calibration Service System~

c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.

d) : Calibration conducted by using other equipment that listed above from a) to c)

## 5. Uncertainty

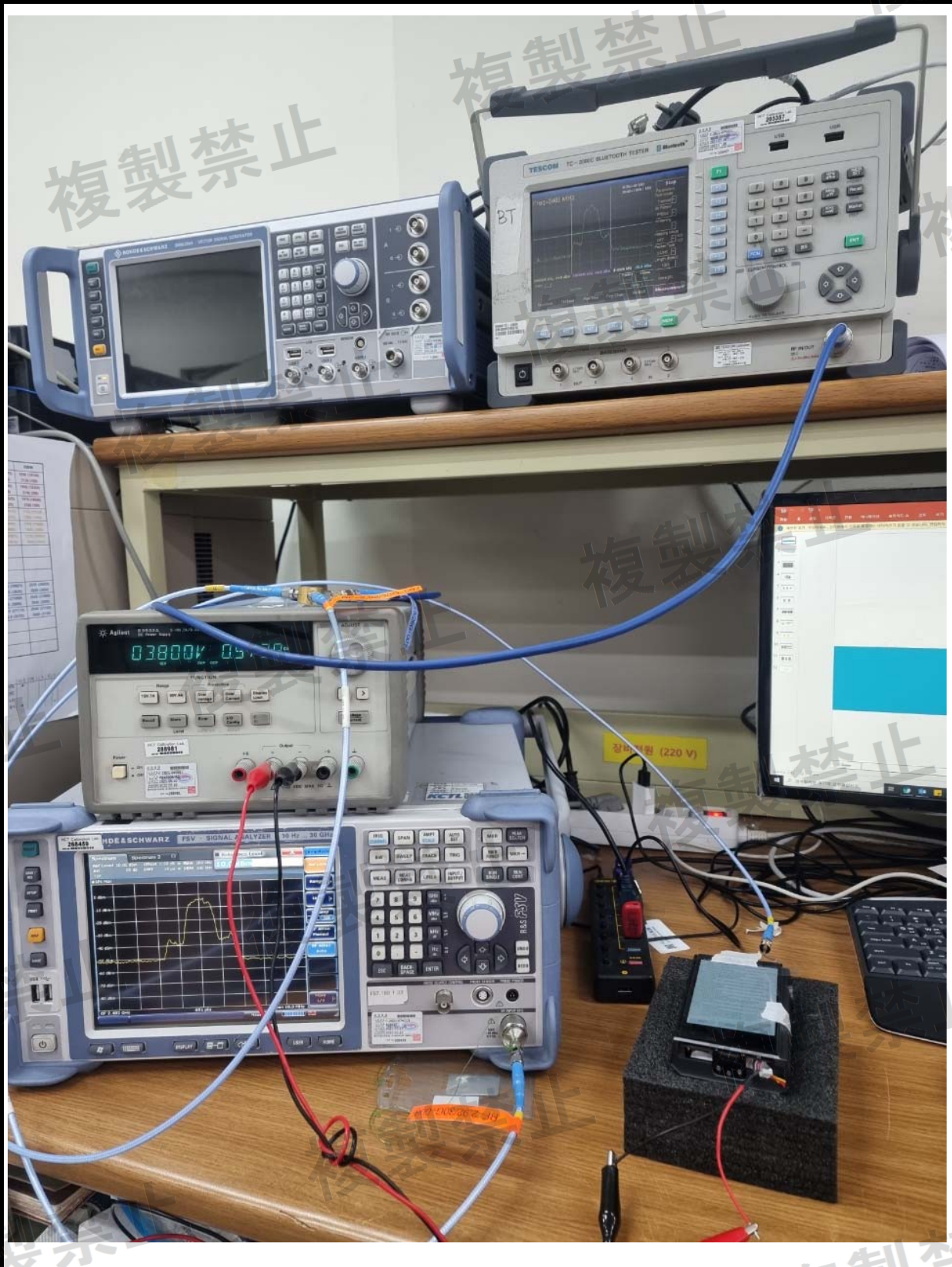
About uncertainty of measured value

| Parameter                    | Uncertainty  |
|------------------------------|--------------|
| Total RF power conducted     | $\pm 0.9$ dB |
| Spurious emissions conducted | $\pm 1.6$ dB |
| Temperature                  | $\pm 1.0$ °C |
| Humidity                     | $\pm 4.8$ %  |

| Judge | Measured value and standard limit value                                                                                                                                  |  |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| PASS  | <div> <div>Standard limit value</div> <div> <div>Case1</div> </div> <p>Even if it takes uncertainty into consideration, a standard limit value is fulfilled.</p> </div>  |  |
|       | <div> <div>Case2</div> </div> <p>Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.</p>  |  |
| FAIL  | <div> <div>Case3</div> </div> <p>Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.</p> |  |
|       | <div> <div>Case4</div> </div> <p>Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.</p>                                            |  |

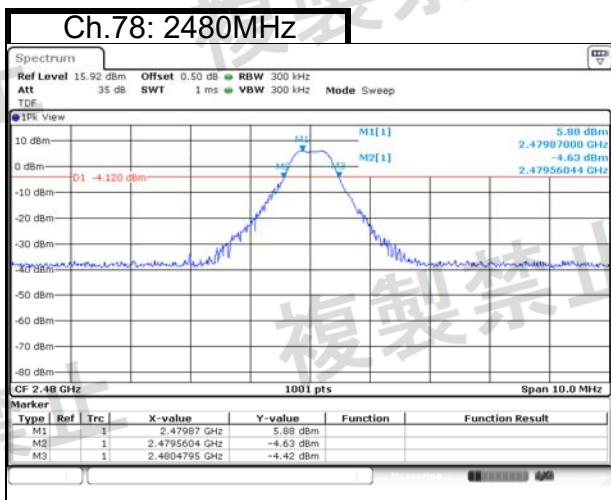
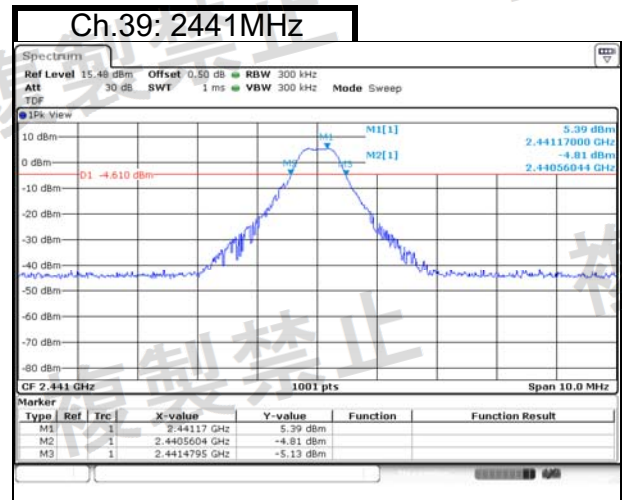
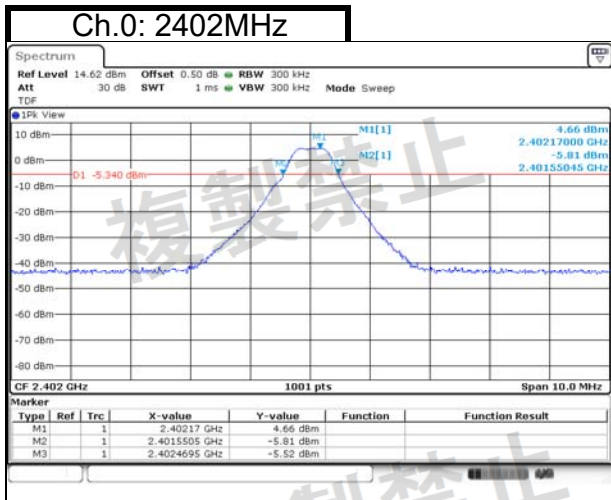
## 6. Photographs

Conducted Measurement Photo



## 7. Test chart

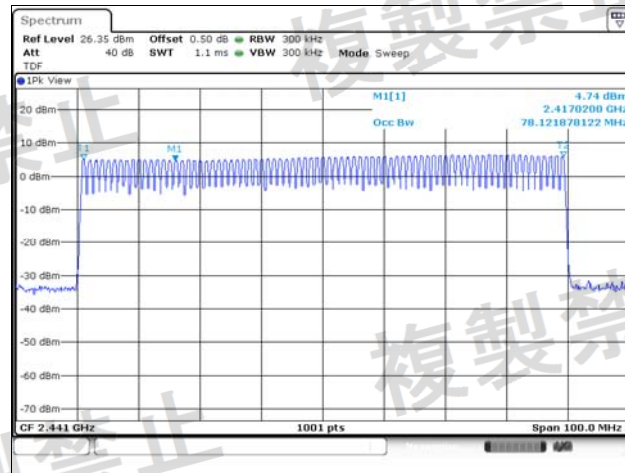
### 7.1 Frequency tolerance (Rated voltage)



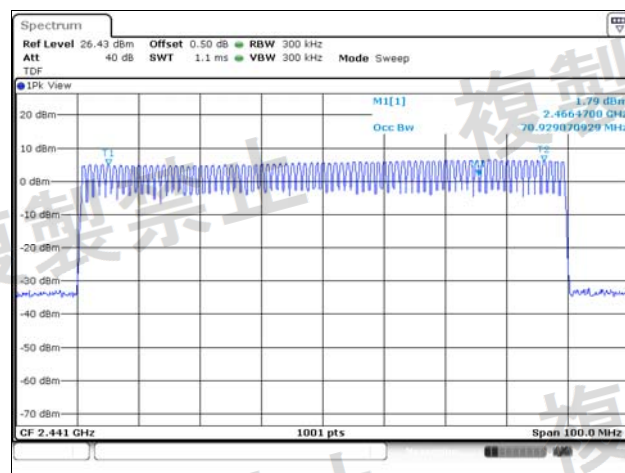
## 7. Test chart

### 7.2 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth

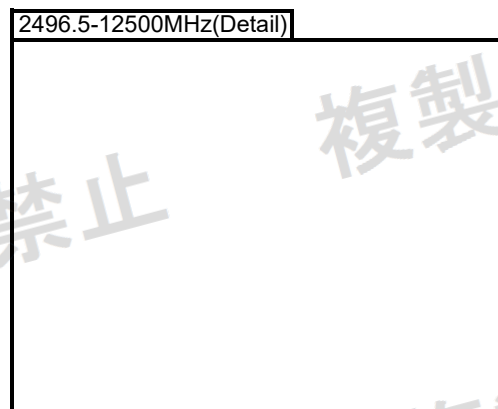
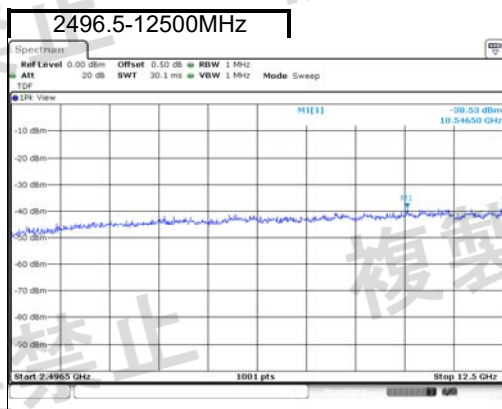
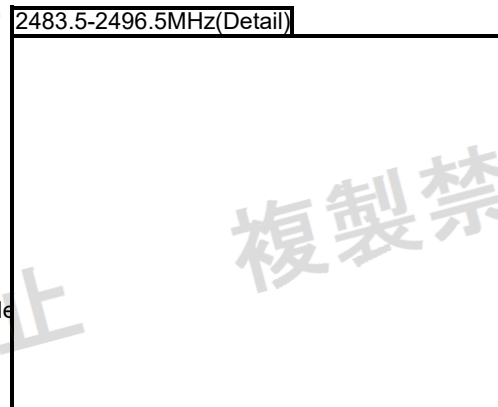
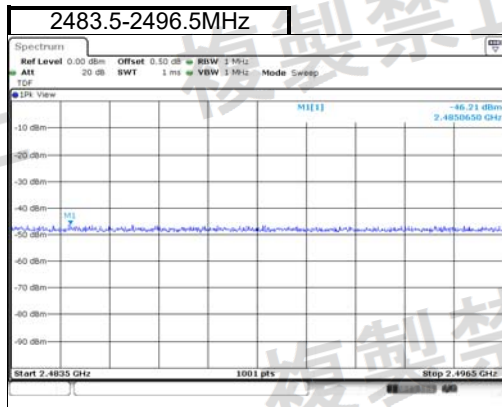
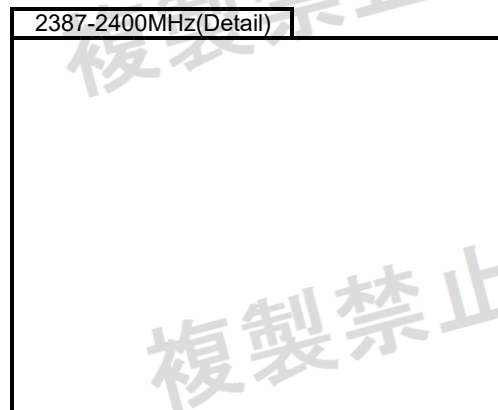
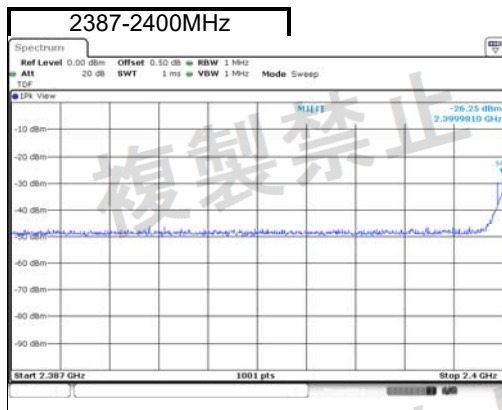
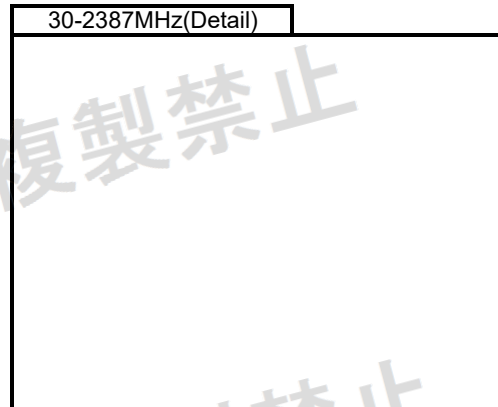
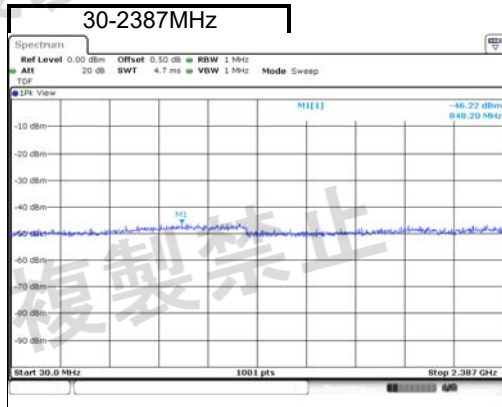


Spread bandwidth



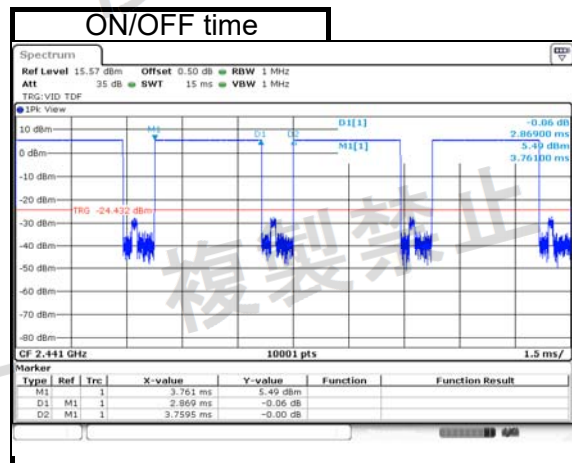
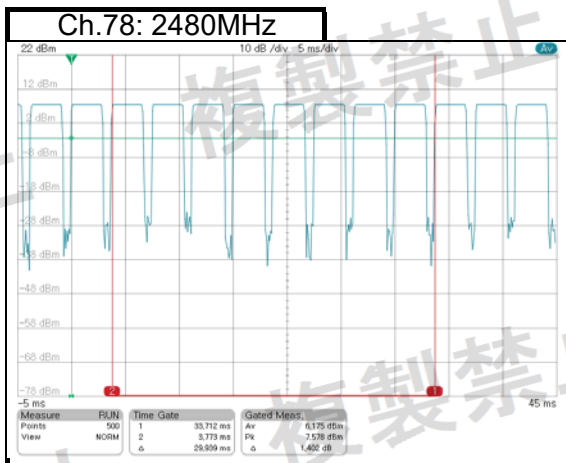
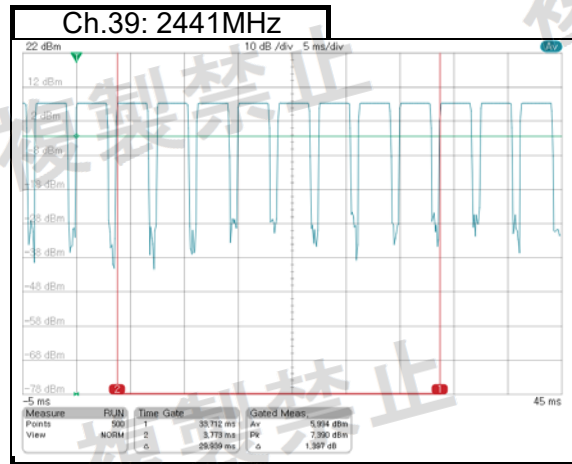
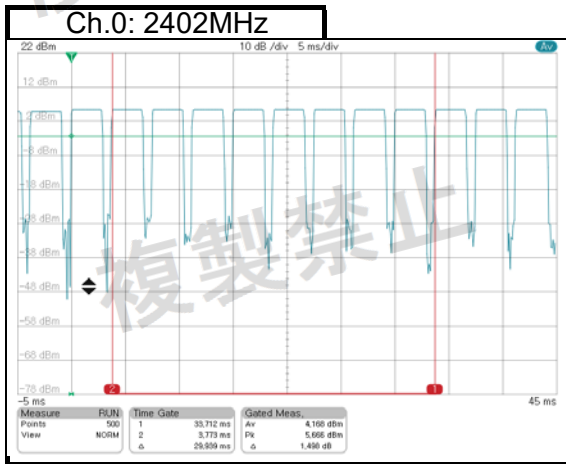
## 7. Test chart

### 7.3 Unwanted(Spurious) emission strength (Rated voltage)



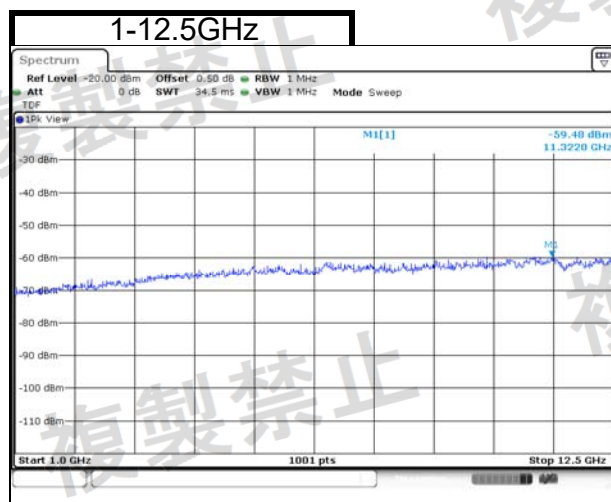
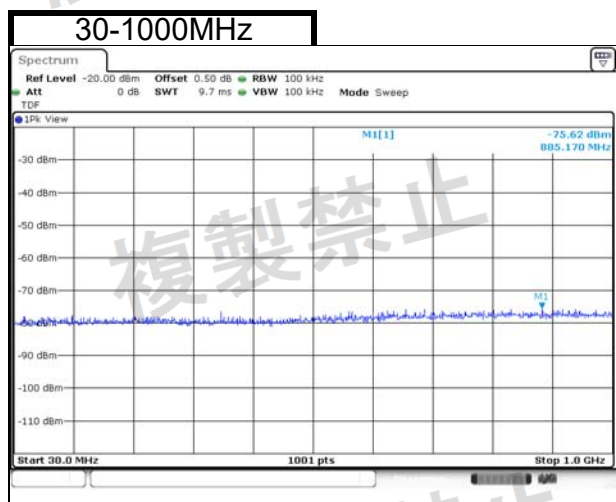
## 7. Test chart

### 7.4 RF output power tolerance (Rated voltage)



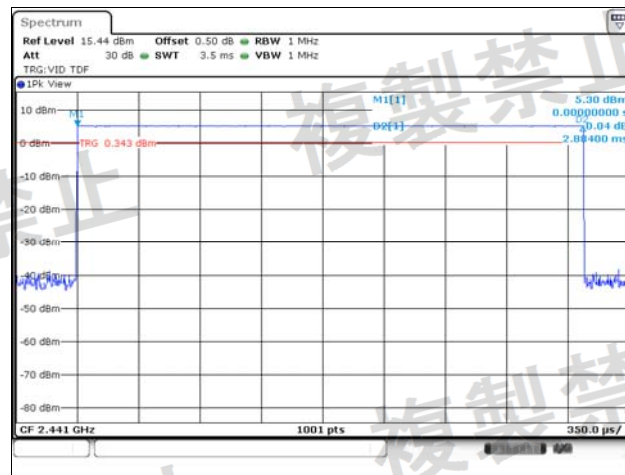
## 7. Test chart

### 7.5 Secondary emitted radio wave strength (Rated voltage)



## 7. Test chart

### 7.6 Time of occupancy hopping frequency (Rated voltage)



### 3. Test results (Rated voltage)

S/N : N/A

|                          |              |            |            |
|--------------------------|--------------|------------|------------|
| Environment of test room | Date of test | 2022-01-03 | 2022-01-04 |
|                          | Temperature  | 21 °C      | 20 °C      |
|                          | Humidity     | 49 %       | 50 %       |

|                          |              |                |
|--------------------------|--------------|----------------|
| Peak Antenna Gain        | -1.25        | dBi            |
| Declaration Output Power | 0.40         | mW/MHz         |
| Declaration Output Power | -3.98        | dBm/MHz        |
| <b>E.I.R.P.</b>          | <b>-5.23</b> | <b>dBm/MHz</b> |
| Input Power Voltage      | 3.80         | VDC            |

|                                          |          |       |      |
|------------------------------------------|----------|-------|------|
| Tested Circuit Insertion Loss            |          | 0     | dB   |
| Frequency equal to the Transmission rate |          | 1     | MHz  |
| Transmission Time                        | ON TIME  | 2.883 | ms   |
|                                          | OFF TIME | 0.863 | ms   |
|                                          | Ratio    | 0.770 |      |
| Packet Type (Mode)                       |          | DH5   | mode |
| Transmit Speed                           |          | 1     | MHz  |

Using TDF and offset function in Spectrum Analyzer.  
Measurement of plots are included Loss value.

(Att : 10dB + Divider : 6dB + Cable loss + EUT cable: 0.5dB offset )

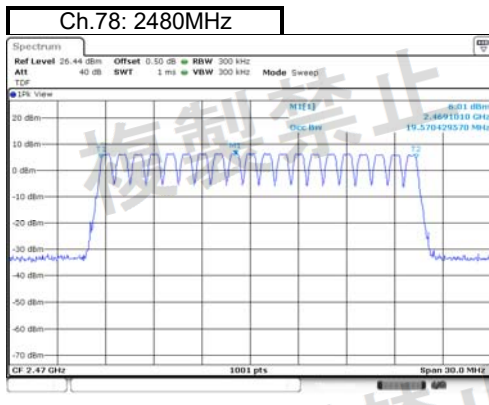
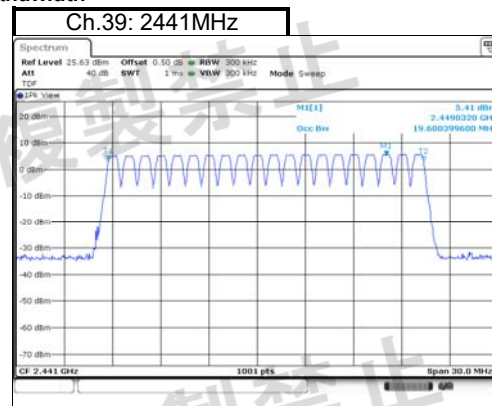
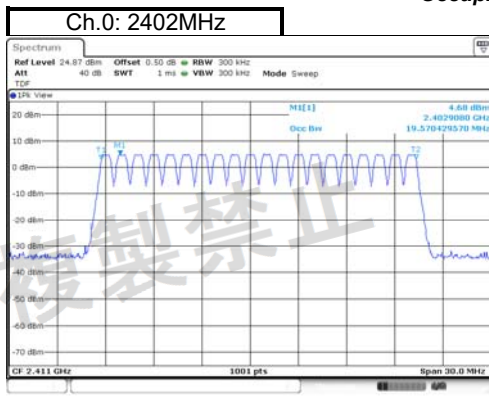
|                                                                |                                                                                                                                                                                                                                  |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test category :                                                | 2.4GHz Band Low-Power Data Communication System (BluetoothV5.0+BDR)                                                                                                                                                              |
| The reason why the tests are performed only at rated voltage : | The fluctuation of input voltage to the circuit of the radio part of the equipment to be tested is identified as being less than $\pm 1\%$ when input voltage from an external supply into the equipment fluctuates $\pm 10\%$ . |

|                                                |                     |        |            |            |            |        |                              |                    |
|------------------------------------------------|---------------------|--------|------------|------------|------------|--------|------------------------------|--------------------|
| Measurement Frequency                          |                     | MHz    | 2402       | 2441       | 2480       | Result | Limit                        | Note               |
| Channel Number                                 |                     | Ch.    | 0          | 39         | 78         | ---    | ---                          |                    |
| Frequency Measurements                         |                     | MHz    | ---        | ---        | ---        | ---    | ---                          |                    |
| Frequency Tolerance                            |                     | ppm    | ---        | ---        | ---        | ---    | ±50×10 <sup>-6</sup> (50ppm) |                    |
| Occupied Bandwidth                             |                     | MHz    | 19.57      | 19.6       | 19.57      | PASS   | 83.5MHz or below             |                    |
| Spread Bandwidth                               |                     | MHz    | 17.98      | 18.01      | 17.83      | PASS   | 500kHz or more               |                    |
| RF Output Power                                |                     | mW/MHz | 0.189056   | 0.286924   | 0.302363   | PASS   | 3mW/MHz or below             |                    |
| RF Output Power Tolerance                      |                     | %      | -52.736025 | -28.269111 | -24.409262 | PASS   | +20 to -80%                  |                    |
| Unwanted<br>(Spurious)<br>Emission<br>Strength | 30 to 2387MHz       | uW/MHz | 0.023      | 0.024      | 0.024      | PASS   | 2.5uW/MHz or below           |                    |
|                                                |                     | MHz    | 980.100    | 697.500    | 949.500    | ----   |                              |                    |
|                                                | 2387 to 2400MHz     | uW/MHz | 0.865      | 0.024      | 0.023      | PASS   | 25uW/MHz or below            |                    |
|                                                |                     | MHz    | 2399.799   | 2395.721   | 2398.591   | ----   |                              |                    |
|                                                | 2483.5 to 2496.5MHz | uW/MHz | 0.030      | 0.025      | 0.030      | PASS   | 25uW/MHz or below            |                    |
|                                                |                     | MHz    | 2492.779   | 2491.558   | 2484.584   | ----   |                              |                    |
|                                                | 2496.5 to 12500MHz  | uW/MHz | 0.148      | 0.128      | 0.138      | PASS   | 2.5uW/MHz or below           |                    |
|                                                |                     | MHz    | 12225.500  | 11355.500  | 11315.500  | ----   |                              |                    |
| Time of occupancy hopping frequency            |                     | sec    | 0.003      | 0.003      | 0.003      | PASS   | 0.4sec or below              | 0.4sec×Spread rate |
|                                                |                     | sec    | 0.251      | 0.230      | 0.230      | PASS   | 0.4sec or below              |                    |
| Spreading Factor                               |                     | ---    | 17.980     | 18.010     | 17.830     | PASS   | 5 or more                    |                    |
| Interference Prevention Function               |                     |        | Good       |            |            | PASS   |                              |                    |

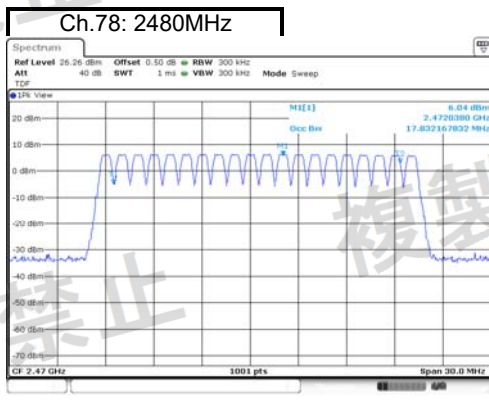
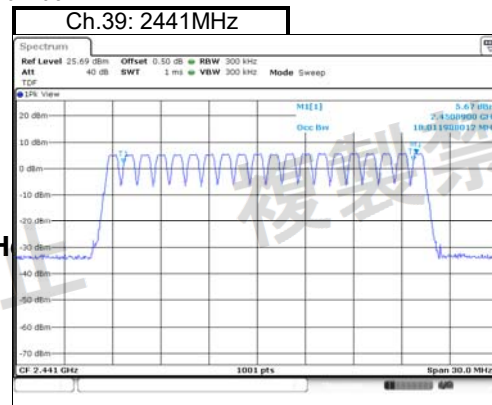
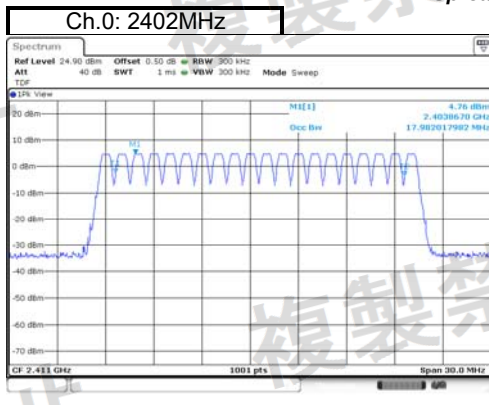
## 9. Test chart

### 9.1 Occupied bandwidth / Spread bandwidth (Rated voltage)

#### Occupied bandwidth

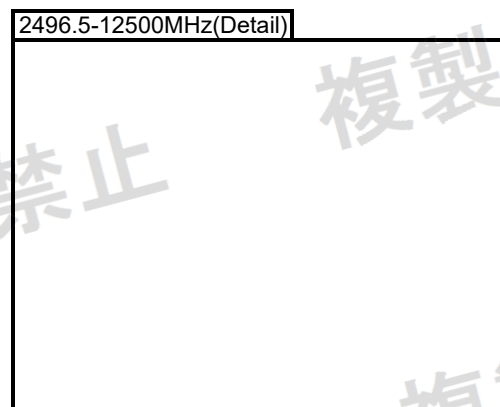
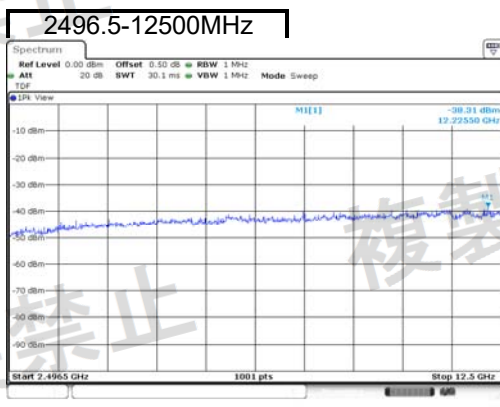
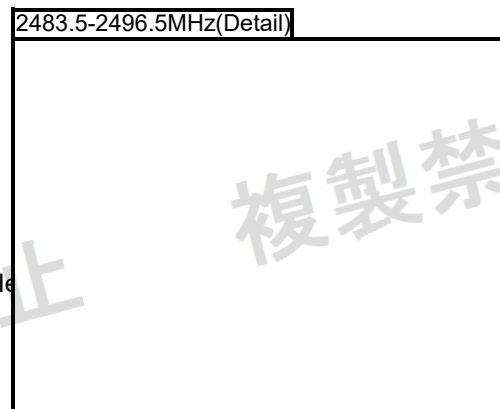
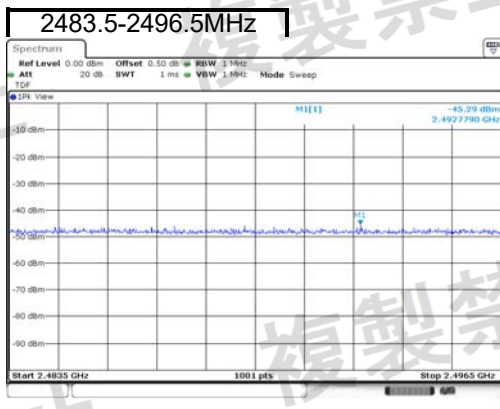
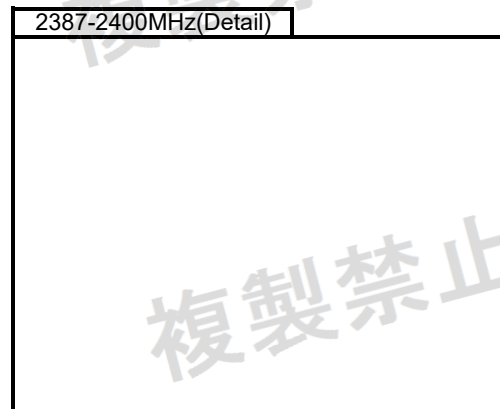
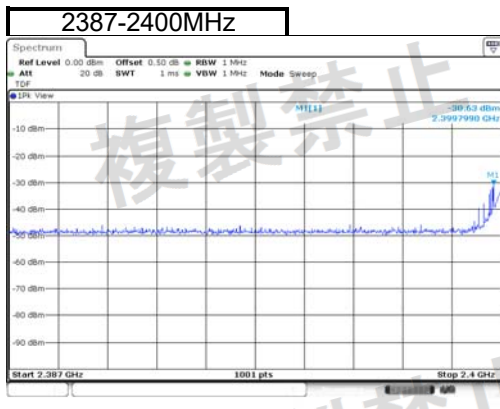
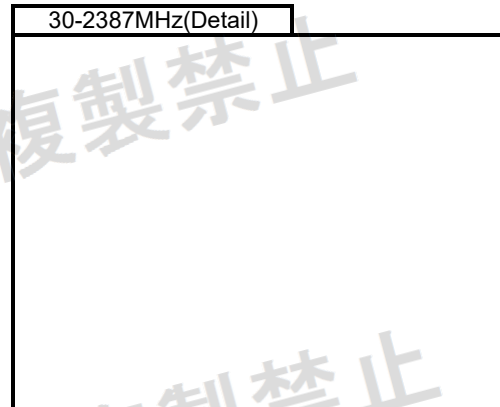
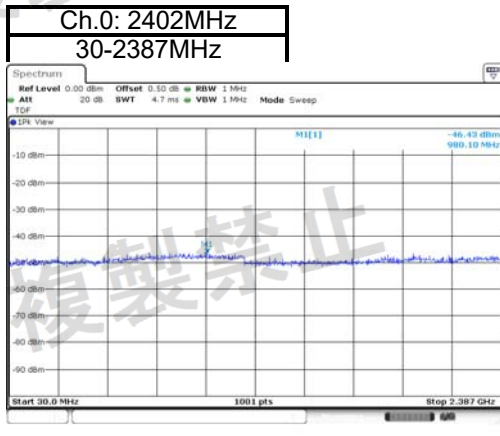


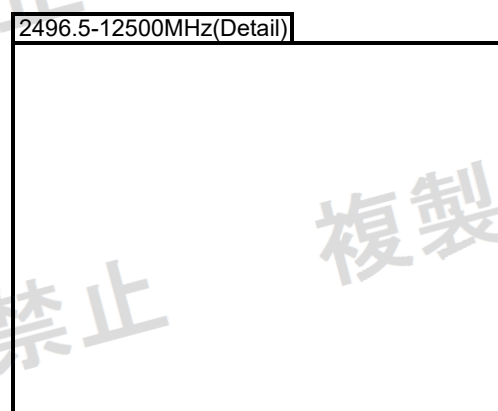
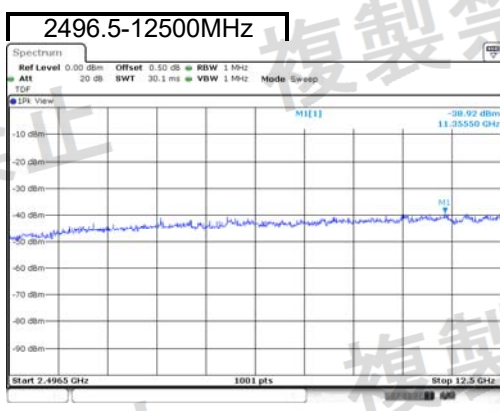
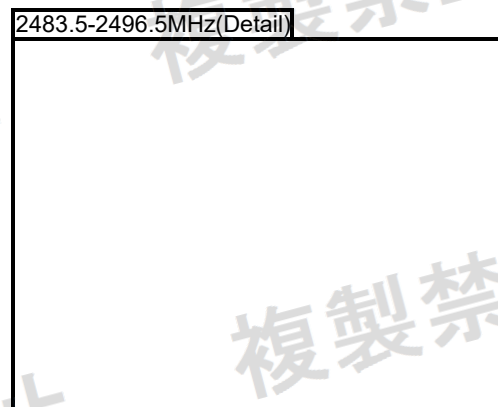
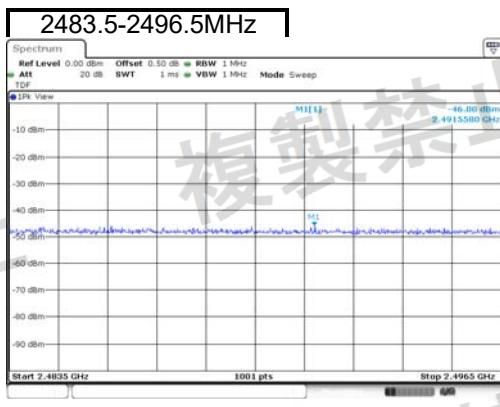
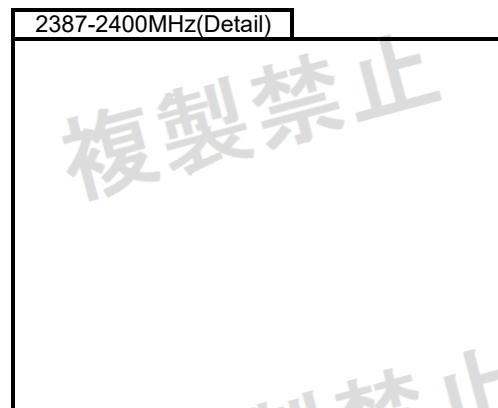
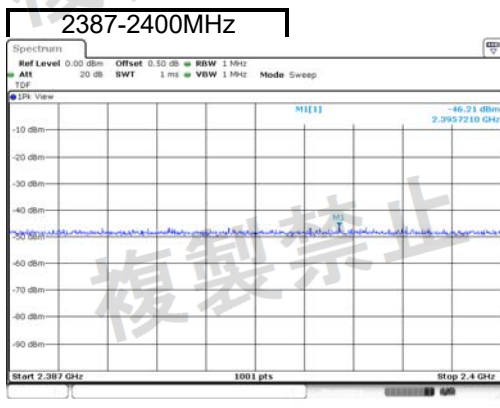
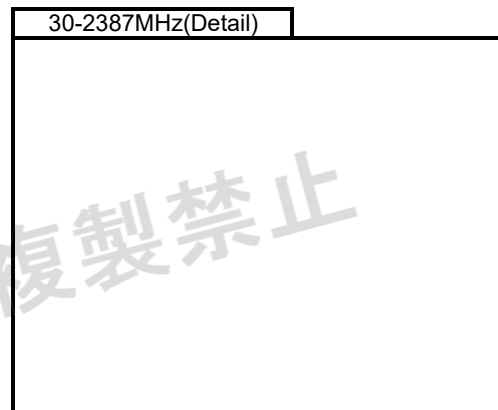
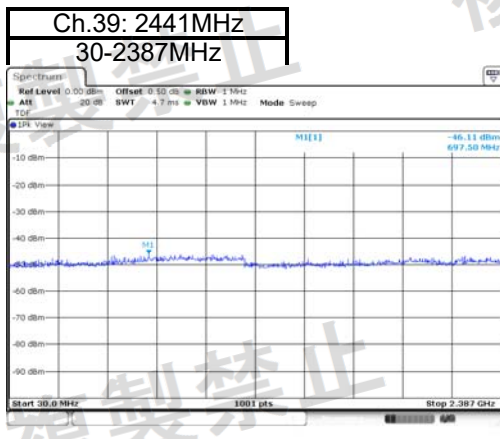
#### Spread bandwidth

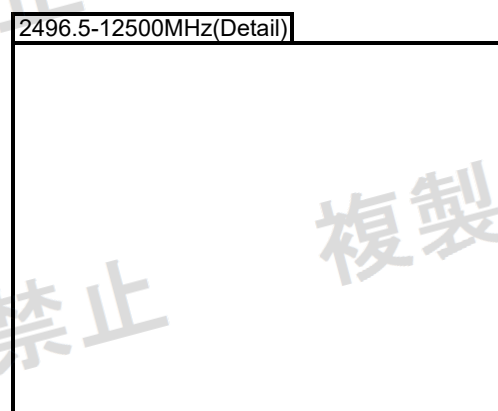
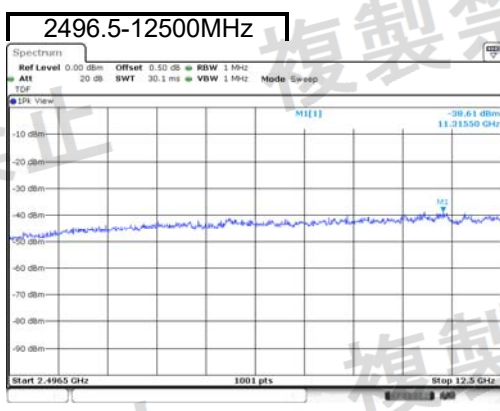
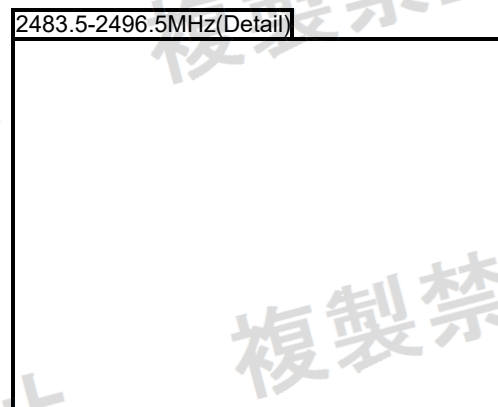
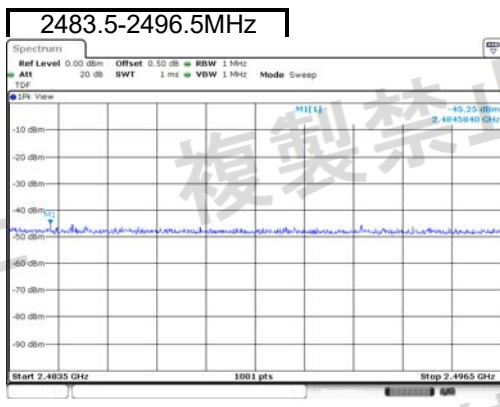
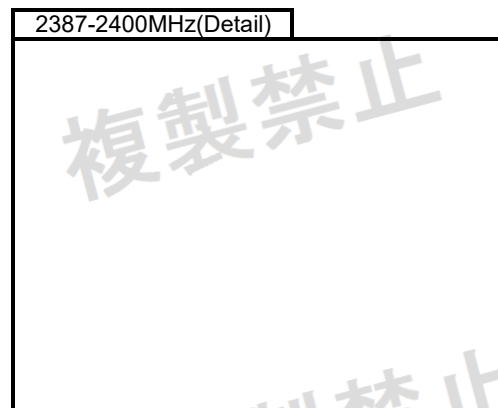
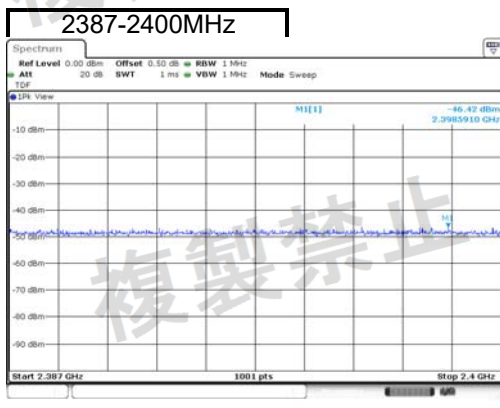
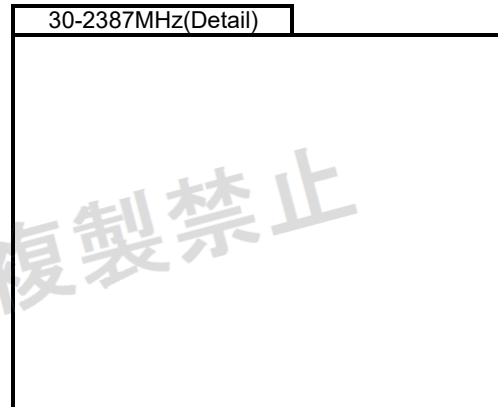
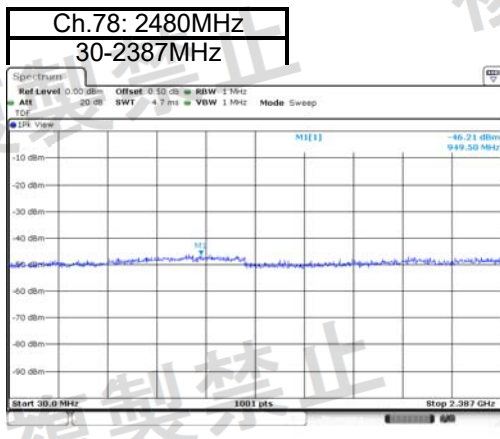


## 9. Test chart

### 9.2 Unwanted(Spurious) emission strength (Rated voltage)

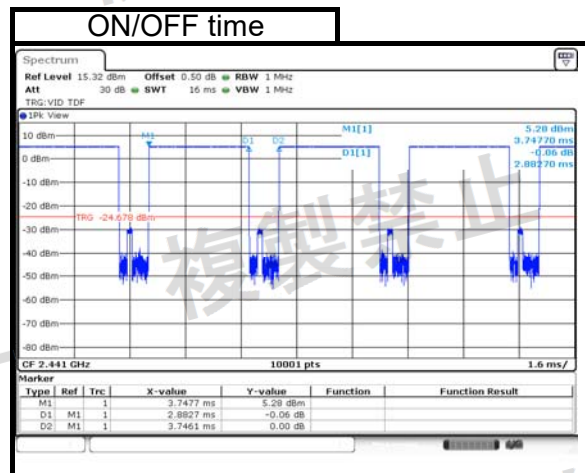
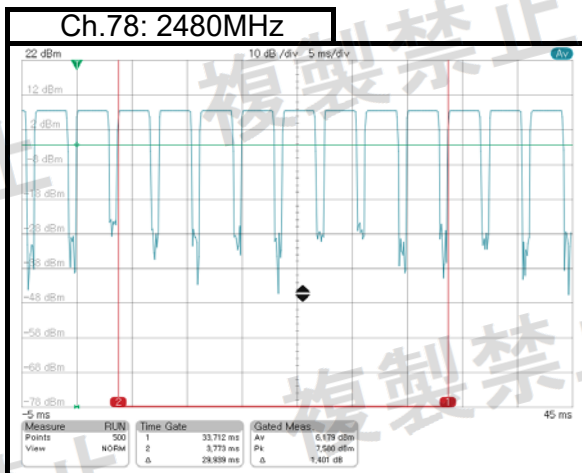
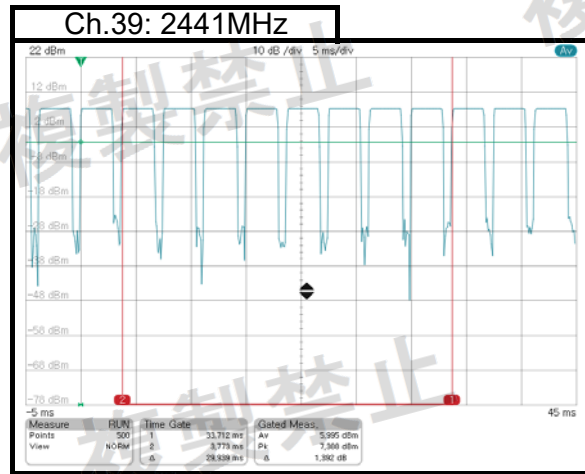
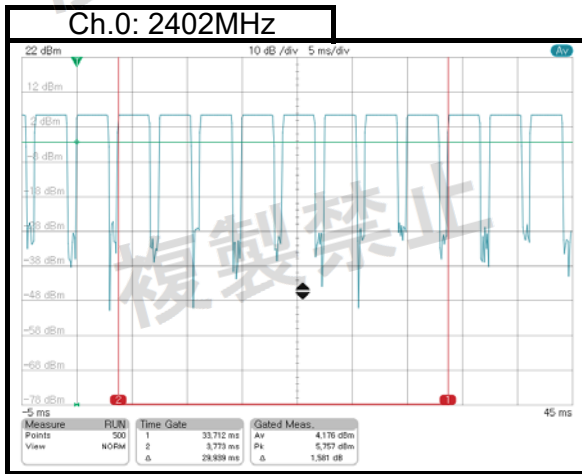






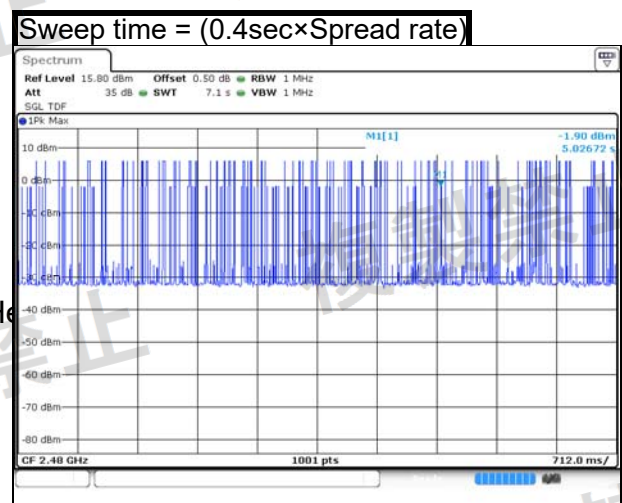
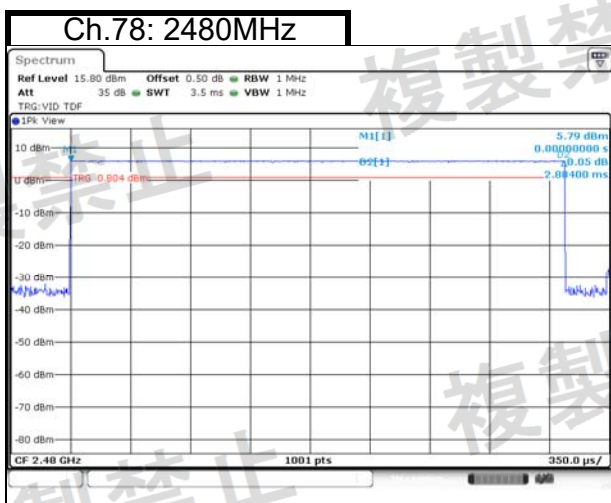
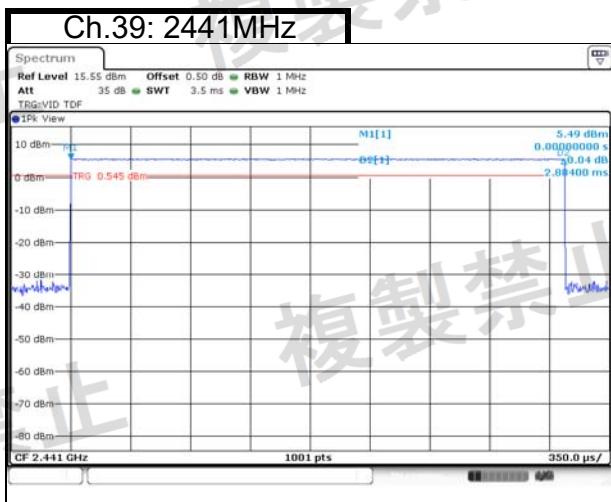
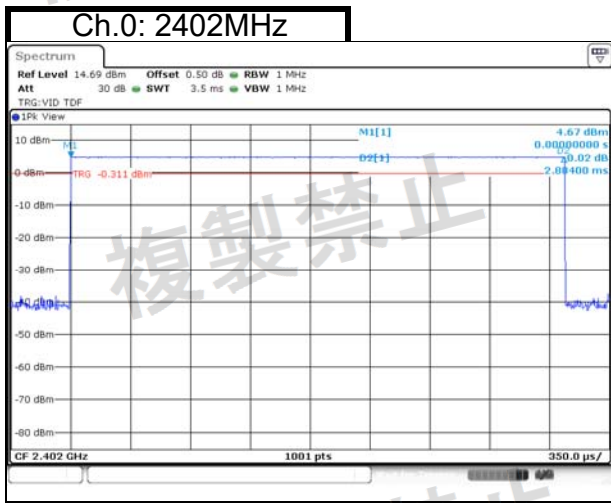
## 9. Test chart

### 9.3 RF output power tolerance (Rated voltage)



## 9. Test chart

### 9.4 Time of occupancy hopping frequency (Rated voltage)



### 3. Test results (Rated voltage)

S/N : N/A

|                          |              |            |            |
|--------------------------|--------------|------------|------------|
| Environment of test room | Date of test | 2022-01-03 | 2022-01-04 |
|                          | Temperature  | 21 °C      | 20 °C      |
|                          | Humidity     | 49 %       | 50 %       |

|                          |               |                |
|--------------------------|---------------|----------------|
| Peak Antenna Gain        | -1.25         | dBi            |
| Declaration Output Power | 0.050         | mW/MHz         |
| Declaration Output Power | -13.01        | dBm/MHz        |
| <b>E.I.R.P.</b>          | <b>-14.26</b> | <b>dBm/MHz</b> |
| Input Power Voltage      | 3.80          | VDC            |

|                                          |          |       |      |
|------------------------------------------|----------|-------|------|
| Tested Circit Insertion Loss             |          | 0     | dB   |
| Frequency equal to the Transmission rate |          | 1     | MHz  |
| Transmission<br>Time                     | ON TIME  | 2.880 | ms   |
|                                          | OFF TIME | 0.877 | ms   |
|                                          | Ratio    | 0.767 |      |
| Packet Type (Mode)                       |          | 3DH5  | mode |
| Transmit Speed                           |          | 1     | MHz  |

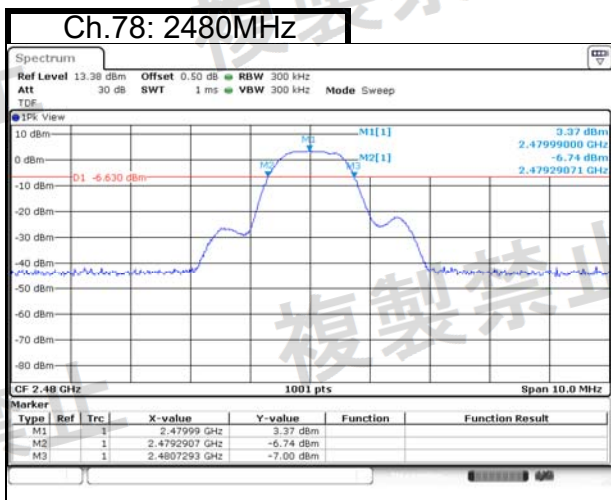
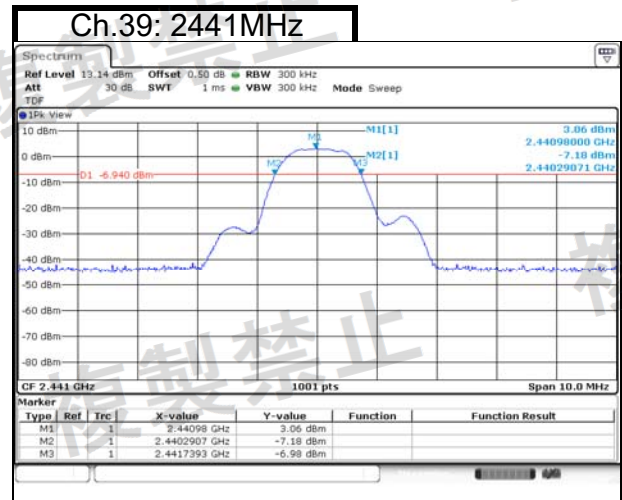
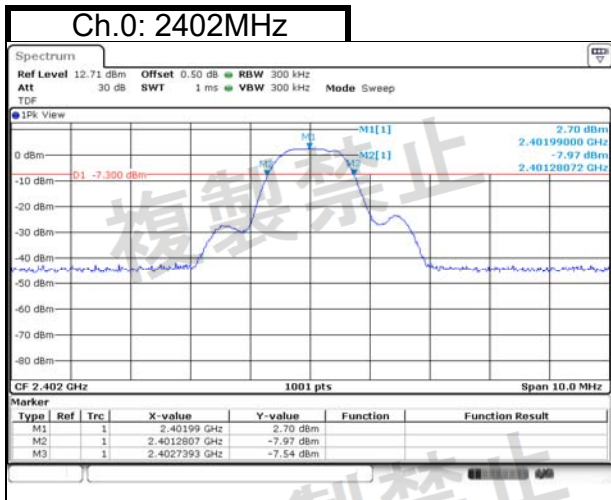
Using TDF and offset function in Spectrum Analyzer.  
Measurement of plots are included Loss value.  
(Att : 10dB + Cable loss + EUT cable: 0.5dB offset )

|                                                                |                                                                                                                                                                                                                                 |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test category :                                                | 2.4GHz Band Low-Power Data Communication System (BluetoothV5.0+EDR                                                                                                                                                              |
| The reason why the tests are performed only at rated voltage : | The fluctuation of input voltage to the circuit of the radio part of the equipment to be tested is identified as being less than $\pm 1$ % when input voltage from an external supply into the equipment fluctuates $\pm 10$ %. |

|                                       |                     |          |          |           |             |                                 |                    |
|---------------------------------------|---------------------|----------|----------|-----------|-------------|---------------------------------|--------------------|
| Measurement Frequency                 | MHz                 | 2402     | 2441     | 2480      | Result      | Limit                           | Note               |
| Channel Number                        | Ch.                 | 0        | 39       | 78        | ---         | ---                             |                    |
| Frequency Measurements                | MHz                 | 2402.010 | 2441.015 | 2480.010  | ---         | ---                             |                    |
| Frequency Tolerance                   | ppm                 | 4.163    | 6.145    | 4.032     | <b>PASS</b> | $\pm 50 \times 10^{-6}$ (50ppm) |                    |
| Occupied Bandwidth                    | MHz                 | ---      | 78.32    | ---       | <b>PASS</b> | 83.5MHz or below                |                    |
| Spread Bandwidth                      | MHz                 | ---      | 71.33    | ---       | <b>PASS</b> | 500kHz or more                  |                    |
| RF Output Power                       | mW/MHz              | 0.029    | 0.039    | 0.042     | <b>PASS</b> | 3mW/MHz or below                |                    |
| RF Output Power Tolerance             | %                   | -42.61   | -21.42   | -16.49    | <b>PASS</b> | +20 to -80%                     |                    |
| Unwanted (Spurious) Emission Strength | 30 to 2387MHz       | uW/MHz   | ---      | 0.027     | <b>PASS</b> | 2.5uW/MHz or below              |                    |
|                                       |                     | MHz      | ---      | 878.800   | ----        |                                 |                    |
|                                       | 2387 to 2400MHz     | uW/MHz   | ---      | 3.7068    | <b>PASS</b> | 25uW/MHz or below               |                    |
|                                       |                     | MHz      | ---      | 2399.994  | ----        |                                 |                    |
|                                       | 2483.5 to 2496.5MHz | uW/MHz   | ---      | 0.0237    | <b>PASS</b> | 25uW/MHz or below               |                    |
|                                       |                     | MHz      | ---      | 2493.922  | ----        |                                 |                    |
|                                       | 2496.5 to 12500MHz  | uW/MHz   | ---      | 0.1122    | <b>PASS</b> | 2.5uW/MHz or below              |                    |
|                                       |                     | MHz      | ---      | 10816.500 | ----        |                                 |                    |
| Secondary Emitted Radio Wave Strength | 30 to 1000MHz       | nW       | ---      | 0.0294    | <b>PASS</b> | 4nW or below                    |                    |
|                                       |                     | MHz      | ---      | 616.750   | ----        |                                 |                    |
|                                       | 1000 to 12500MHz    | nW       | ---      | 1.1350    | <b>PASS</b> | 20nW or below                   |                    |
|                                       |                     | MHz      | ---      | 11242.000 | ----        |                                 |                    |
| Time of occupancy hopping frequency   | sec                 | ---      | 0.0029   | ---       | <b>PASS</b> | 0.4sec or below                 |                    |
|                                       | sec                 | ---      | 0.2485   | ---       | <b>PASS</b> | 0.4sec or below                 | 0.4sec×Spread rate |
| Spreading Factor                      | ---                 |          | 71.3300  |           | <b>PASS</b> | 5 or more                       |                    |
| Interference Prevention Function      |                     |          | Good     |           | <b>PASS</b> |                                 |                    |

## 7. Test chart

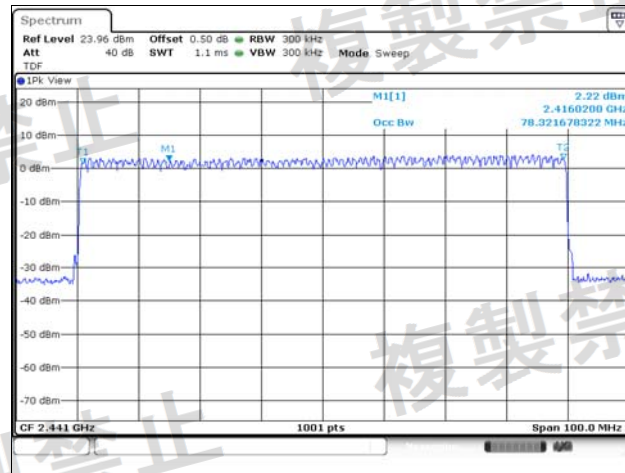
### 7.1 Frequency tolerance (Rated voltage)



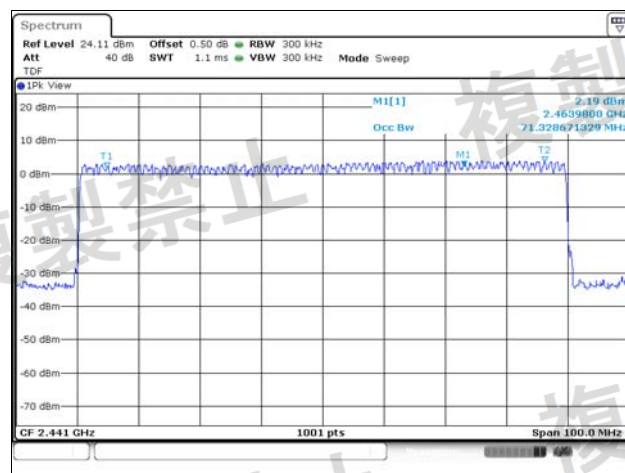
## 7. Test chart

### 7.2 Occupied bandwidth / Spread bandwidth (Rated voltage)

Occupied bandwidth

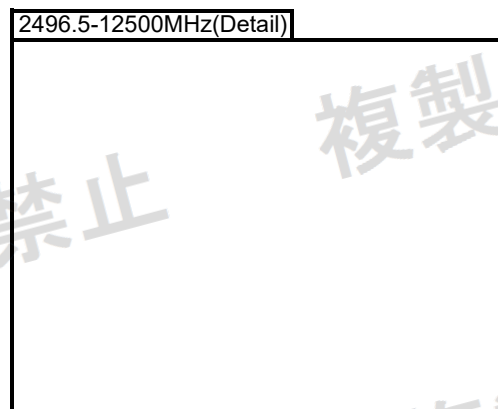
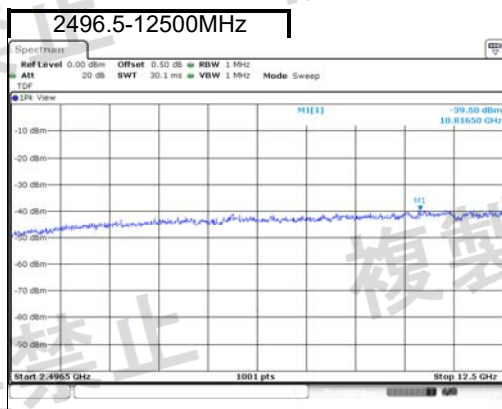
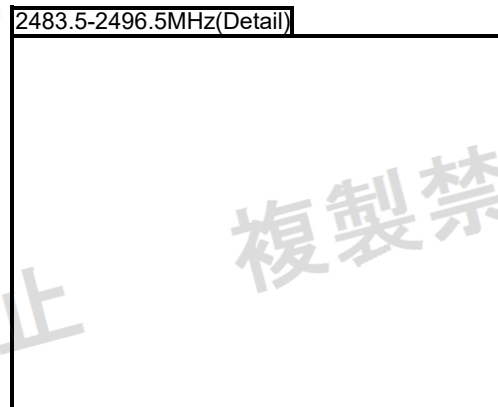
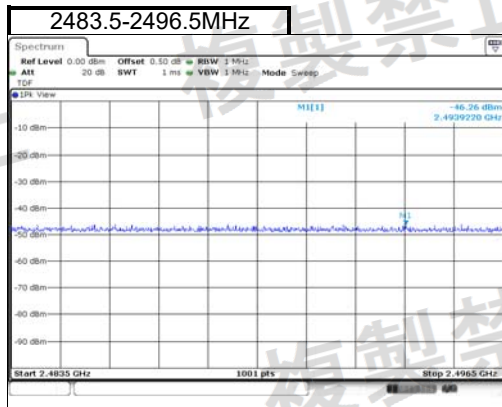
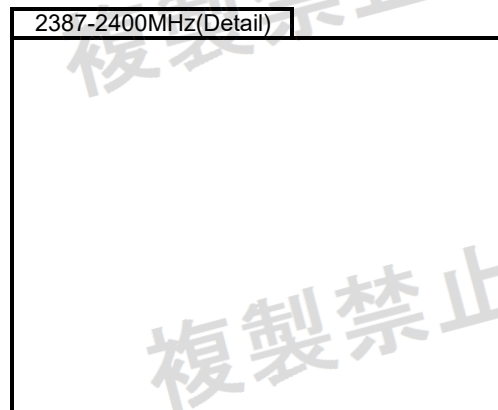
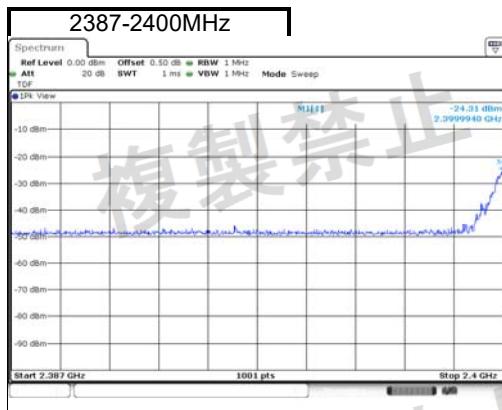
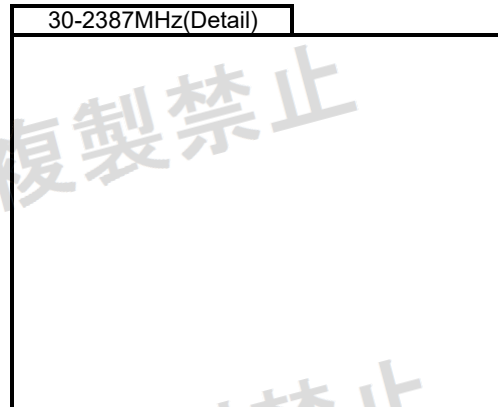
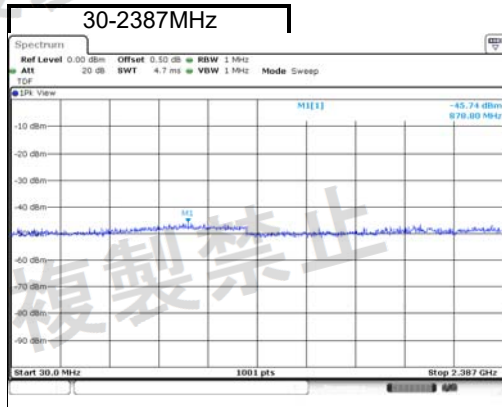


Spread bandwidth



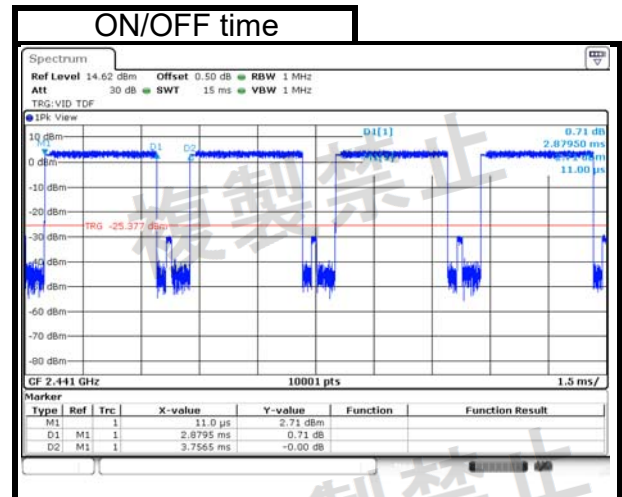
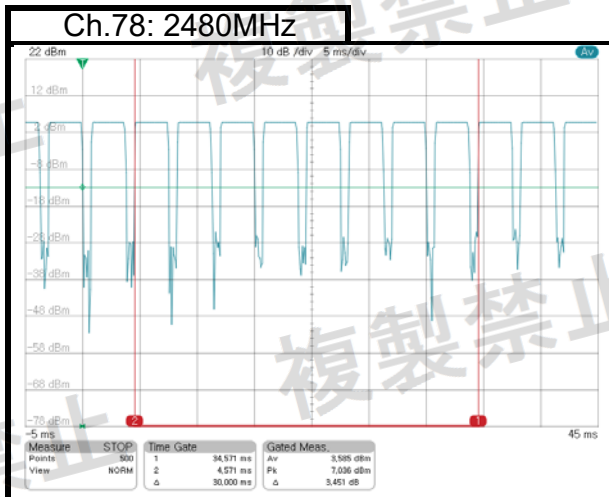
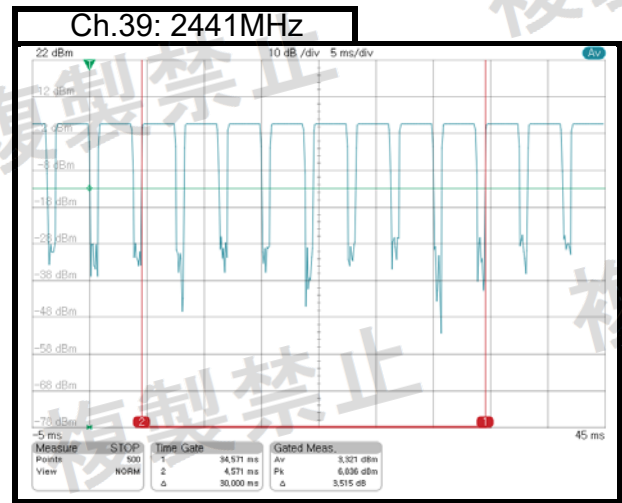
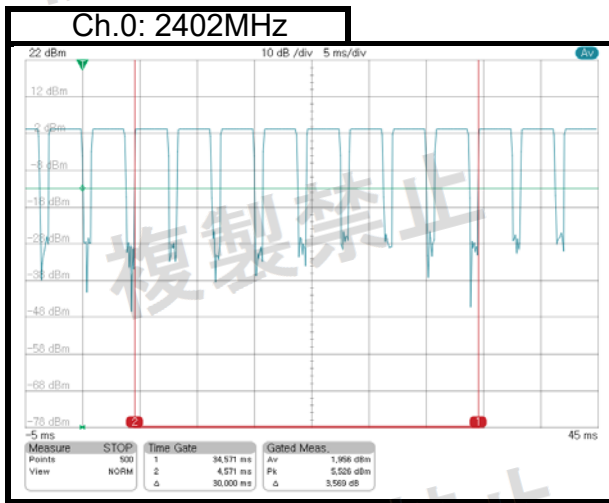
## 7. Test chart

### 7.3 Unwanted(Spurious) emission strength (Rated voltage)



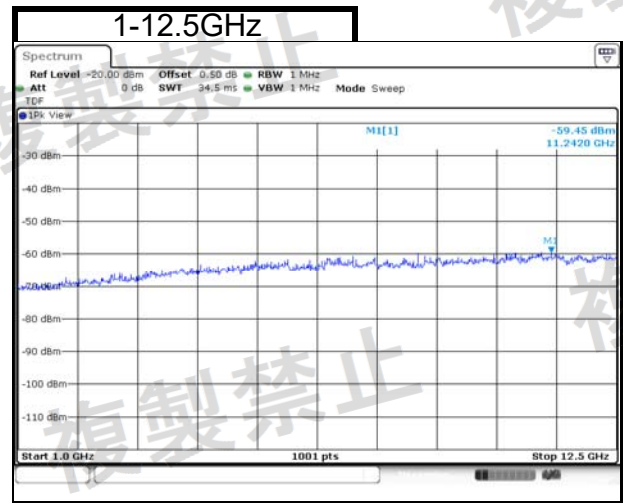
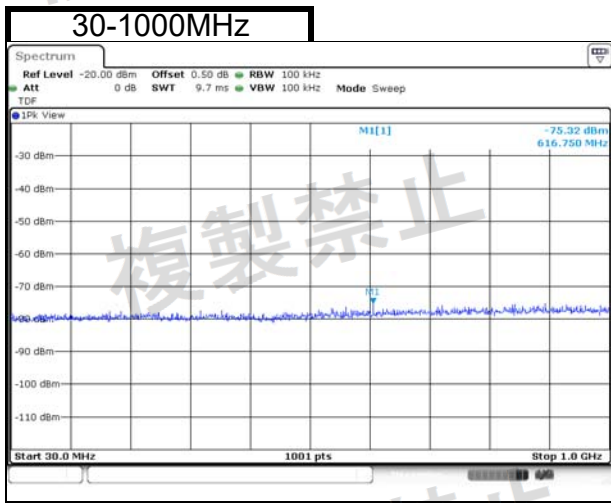
## 7. Test chart

### 7.4 RF output power tolerance (Rated voltage)



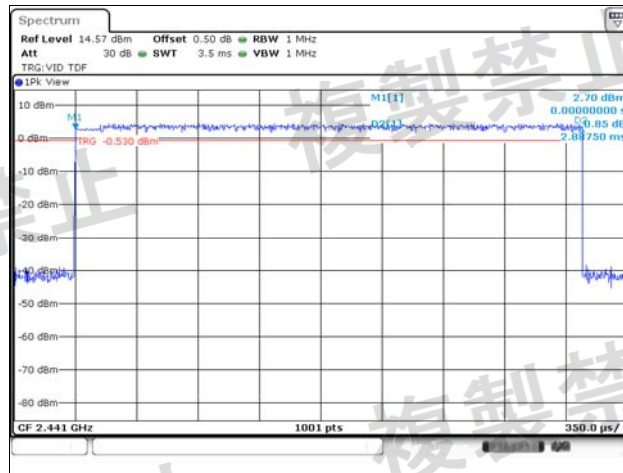
## 7. Test chart

### 7.5 Secondary emitted radio wave strength (Rated voltage)



## 7. Test chart

### 7.6 Time of occupancy hopping frequency (Rated voltage)



### 3. Test results (Rated voltage)

S/N : N/A

|                          |              |            |            |
|--------------------------|--------------|------------|------------|
| Environment of test room | Date of test | 2022-01-03 | 2022-01-04 |
|                          | Temperature  | 21 °C      | 20 °C      |
|                          | Humidity     | 49 %       | 50 %       |

|                          |              |                |
|--------------------------|--------------|----------------|
| Peak Antenna Gain        | -1.25        | dBi            |
| Declaration Output Power | 0.20         | mW/MHz         |
| Declaration Output Power | -6.99        | dBm/MHz        |
| <b>E.I.R.P.</b>          | <b>-8.24</b> | <b>dBm/MHz</b> |
| Input Power Voltage      | 3.80         | VDC            |

|                                          |          |       |      |
|------------------------------------------|----------|-------|------|
| Tested Circuit Insertion Loss            |          | 0     | dB   |
| Frequency equal to the Transmission rate |          | 1     | MHz  |
| Transmission Time                        | ON TIME  | 2.890 | ms   |
|                                          | OFF TIME | 0.861 | ms   |
|                                          | Ratio    | 0.771 |      |
| Packet Type (Mode)                       |          | 3DH5  | mode |
| Transmit Speed                           |          | 1     | MHz  |

Using TDF and offset function in Spectrum Analyzer.  
Measurement of plots are included Loss value.

(Att : 10dB + Divider : 6dB + Cable loss + EUT cable: 0.5dB offset )

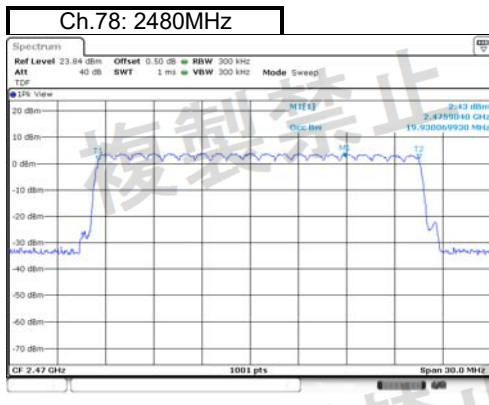
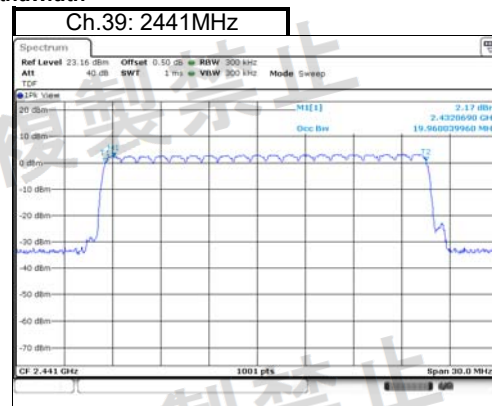
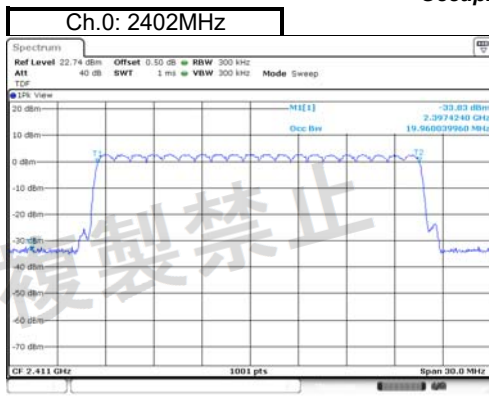
|                                                                |                                                                                                                                                                                                                                  |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test category :                                                | 2.4GHz Band Low-Power Data Communication System (BluetoothV5.0+EDR)                                                                                                                                                              |
| The reason why the tests are performed only at rated voltage : | The fluctuation of input voltage to the circuit of the radio part of the equipment to be tested is identified as being less than $\pm 1\%$ when input voltage from an external supply into the equipment fluctuates $\pm 10\%$ . |

|                                                |                     |        |            |            |            |        |                              |                    |
|------------------------------------------------|---------------------|--------|------------|------------|------------|--------|------------------------------|--------------------|
| Measurement Frequency                          |                     | MHz    | 2402       | 2441       | 2480       | Result | Limit                        | Note               |
| Channel Number                                 |                     | Ch.    | 0          | 39         | 78         | ---    | ---                          |                    |
| Frequency Measurements                         |                     | MHz    | ---        | ---        | ---        | ---    | ---                          |                    |
| Frequency Tolerance                            |                     | ppm    | ---        | ---        | ---        | ---    | ±50×10 <sup>-6</sup> (50ppm) |                    |
| Occupied Bandwidth                             |                     | MHz    | 19.96      | 19.96      | 19.93      | PASS   | 83.5MHz or below             |                    |
| Spread Bandwidth                               |                     | MHz    | 18.16      | 18.19      | 18.1       | PASS   | 500kHz or more               |                    |
| RF Output Power                                |                     | mW/MHz | 0.112506   | 0.155331   | 0.164707   | PASS   | 3mW/MHz or below             |                    |
| RF Output Power Tolerance                      |                     | %      | -43.747026 | -22.334412 | -17.646368 | PASS   | +20 to -80%                  |                    |
| Unwanted<br>(Spurious)<br>Emission<br>Strength | 30 to 2387MHz       | uW/MHz | 0.024      | 0.029      | 0.025      | PASS   | 2.5uW/MHz or below           |                    |
|                                                |                     | MHz    | 1031.900   | 796.400    | 820.000    | ----   |                              |                    |
|                                                | 2387 to 2400MHz     | uW/MHz | 4.093      | 0.026      | 0.021      | PASS   | 25uW/MHz or below            |                    |
|                                                |                     | MHz    | 2399.994   | 2399.851   | 2390.175   | ----   |                              |                    |
|                                                | 2483.5 to 2496.5MHz | uW/MHz | 0.022      | 0.025      | 0.025      | PASS   | 25uW/MHz or below            |                    |
|                                                |                     | MHz    | 2492.688   | 2489.182   | 2496.104   | ----   |                              |                    |
|                                                | 2496.5 to 12500MHz  | uW/MHz | 0.132      | 0.114      | 0.129      | PASS   | 2.5uW/MHz or below           |                    |
|                                                |                     | MHz    | 10876.500  | 10846.500  | 11325.500  | ----   |                              |                    |
| Time of occupancy hopping frequency            |                     | sec    | 0.003      | 0.003      | 0.003      | PASS   | 0.4sec or below              | 0.4sec×Spread rate |
|                                                |                     | sec    | 0.272      | 0.263      | 0.266      | PASS   | 0.4sec or below              |                    |
| Spreading Factor                               |                     | ---    | 18.160     | 18.190     | 18.100     | PASS   | 5 or more                    |                    |
| Interference Prevention Function               |                     |        | Good       |            |            | PASS   |                              |                    |

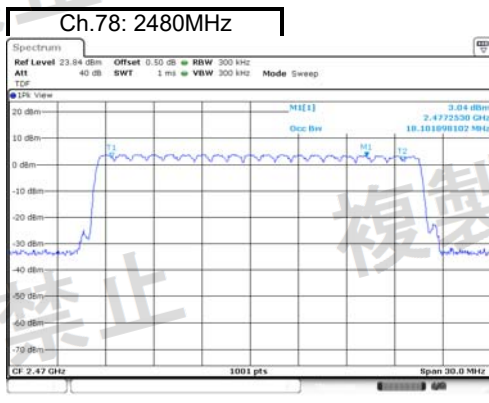
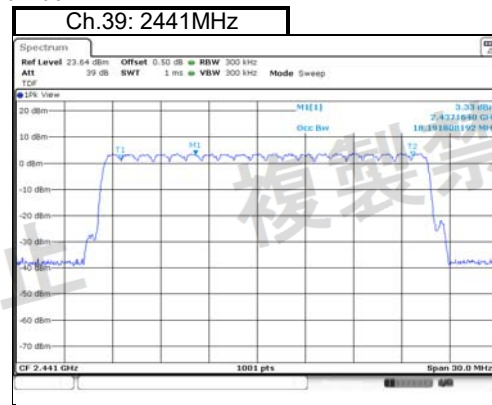
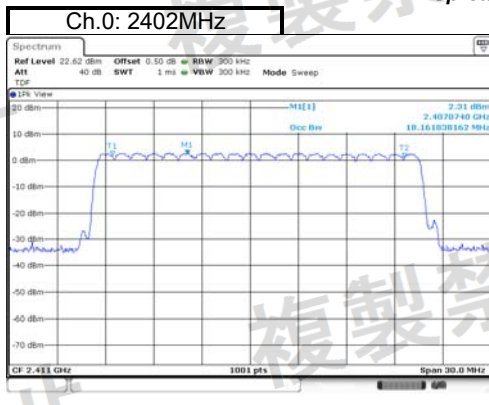
## 9. Test chart

### 9.1 Occupied bandwidth / Spread bandwidth (Rated voltage)

#### Occupied bandwidth

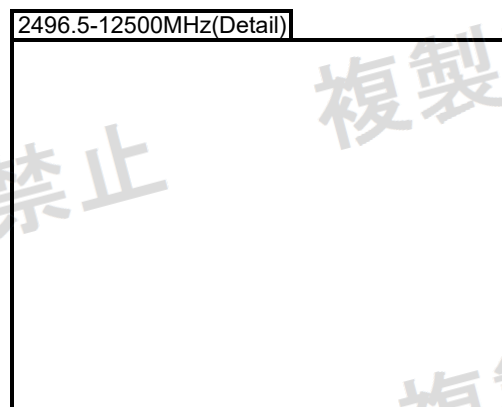
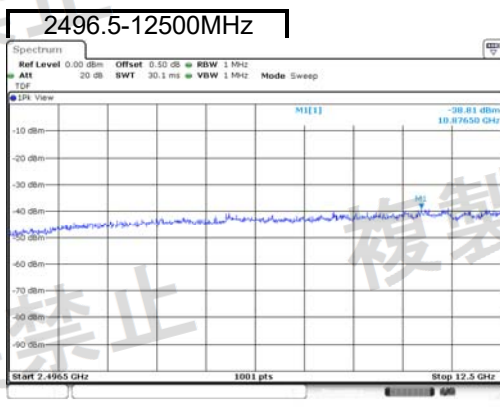
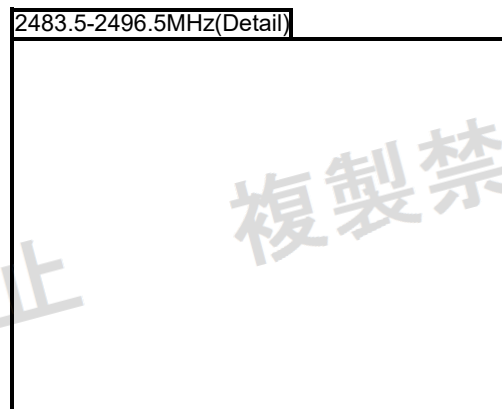
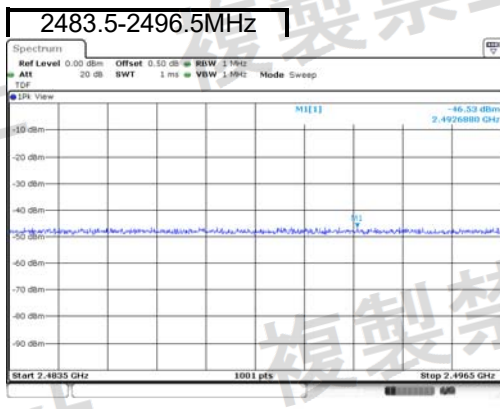
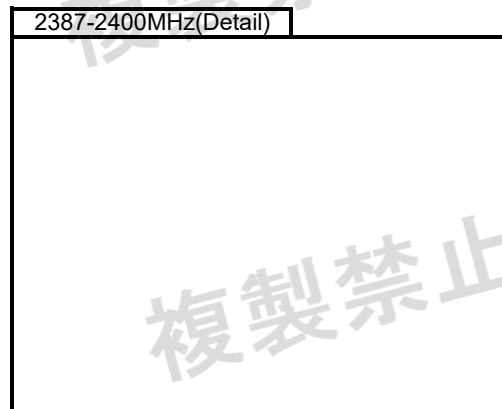
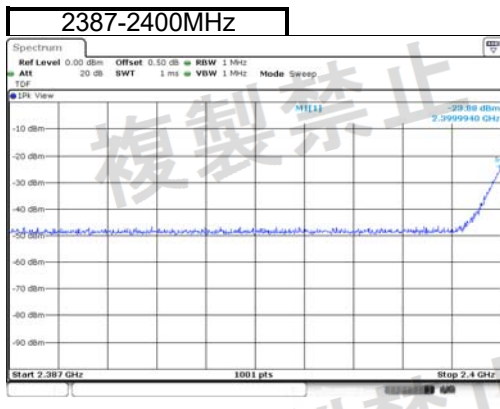
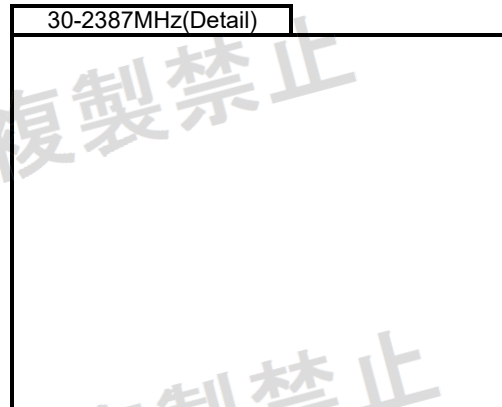
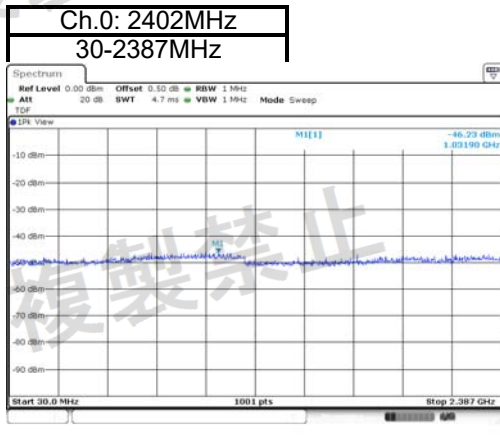


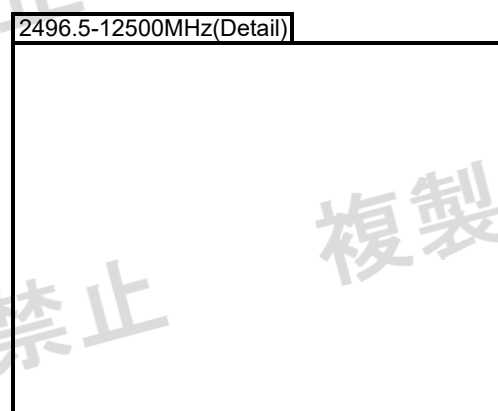
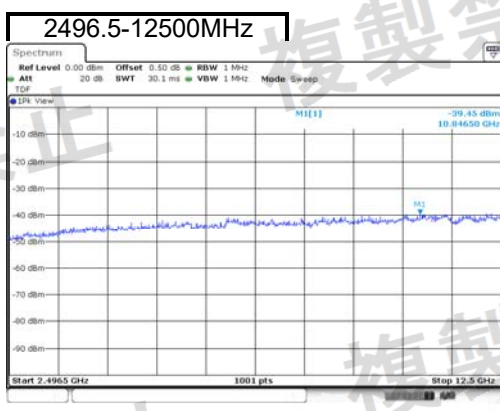
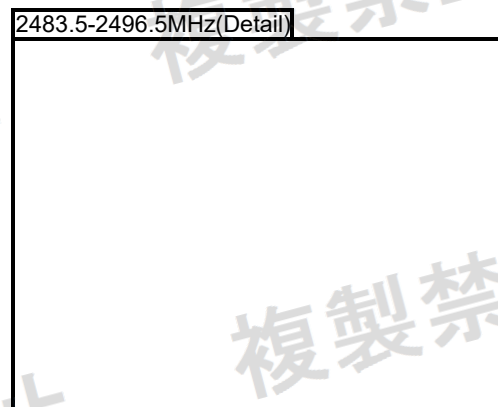
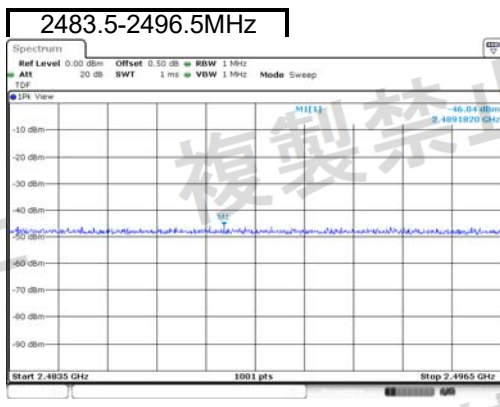
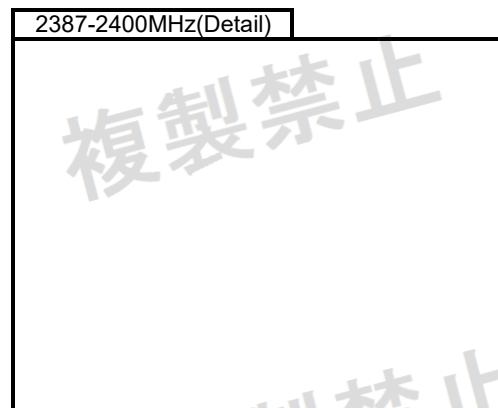
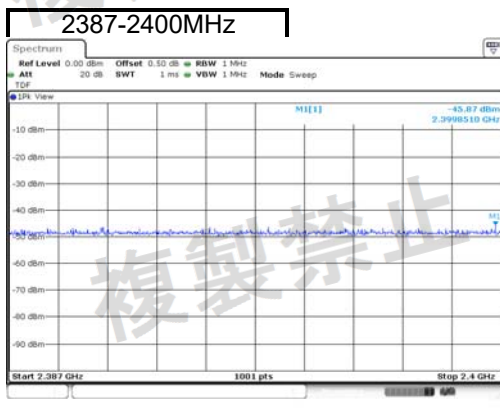
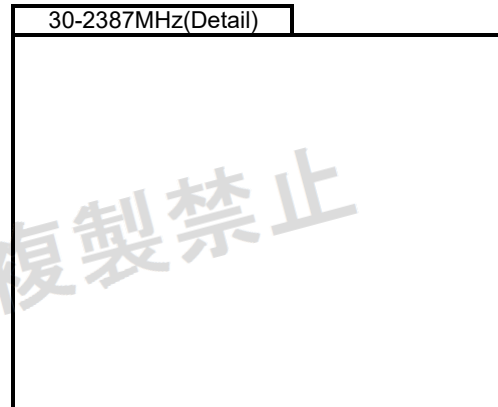
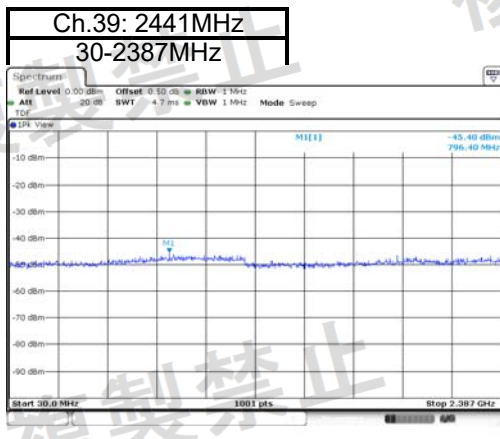
#### Spread bandwidth

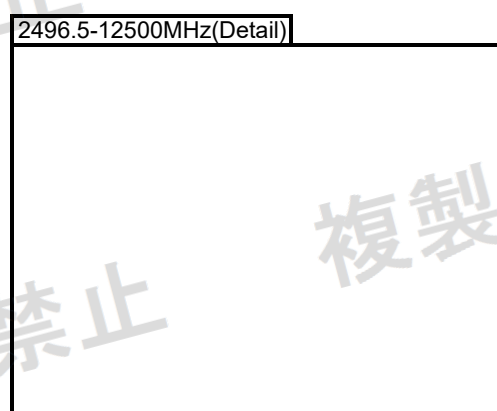
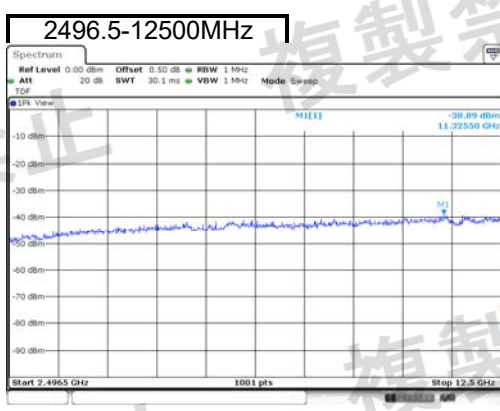
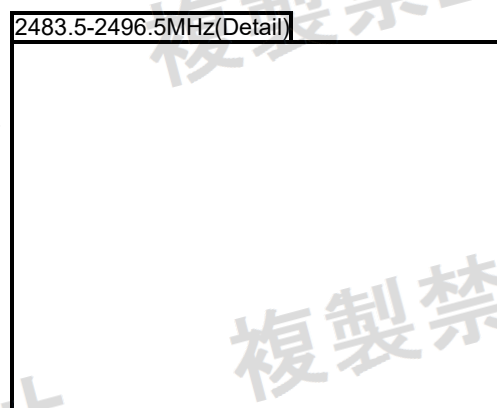
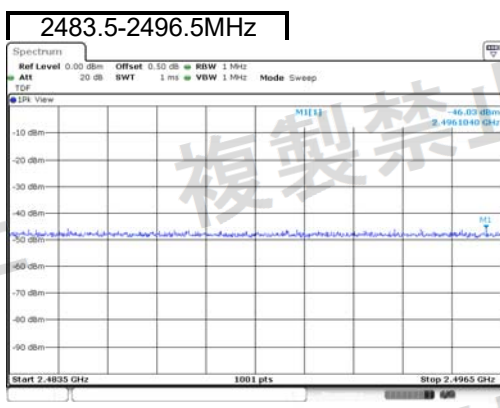
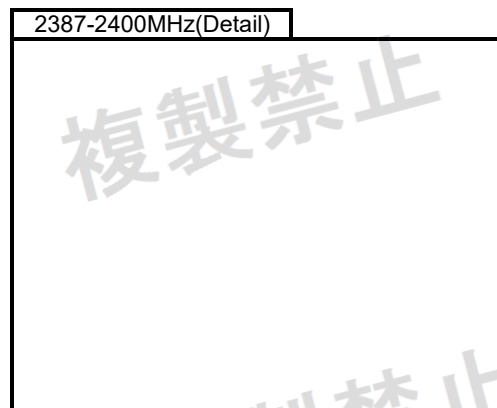
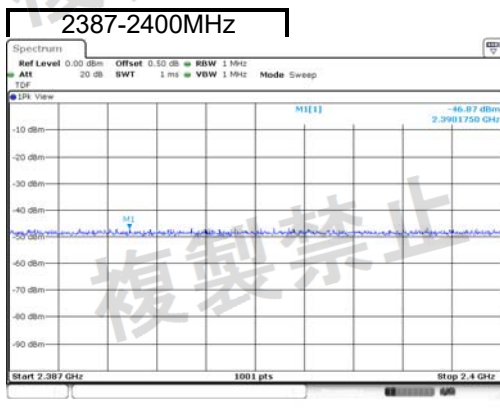
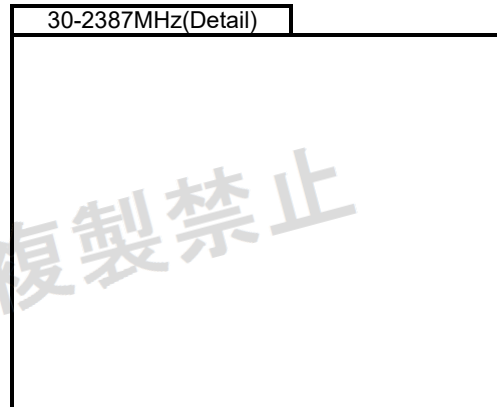
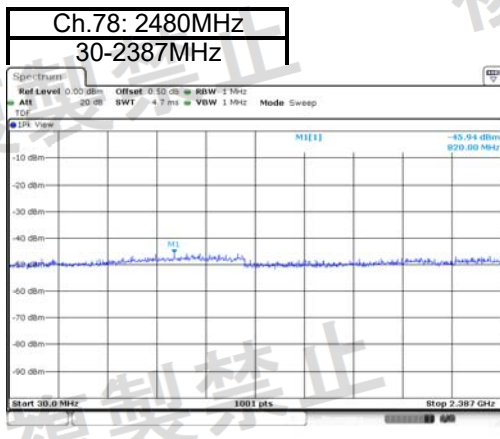


## 9. Test chart

### 9.2 Unwanted(Spurious) emission strength (Rated voltage)

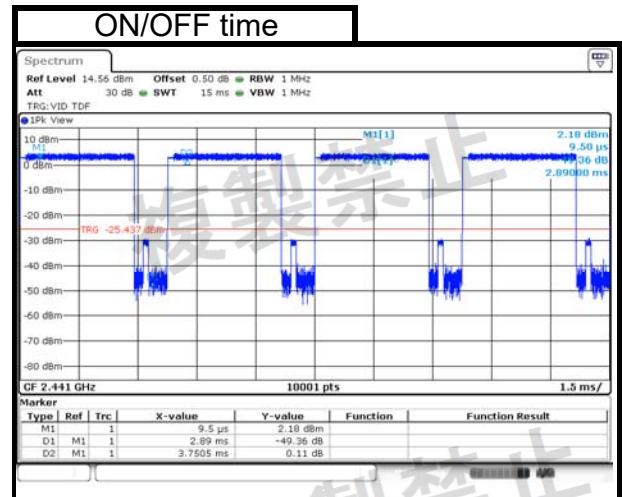
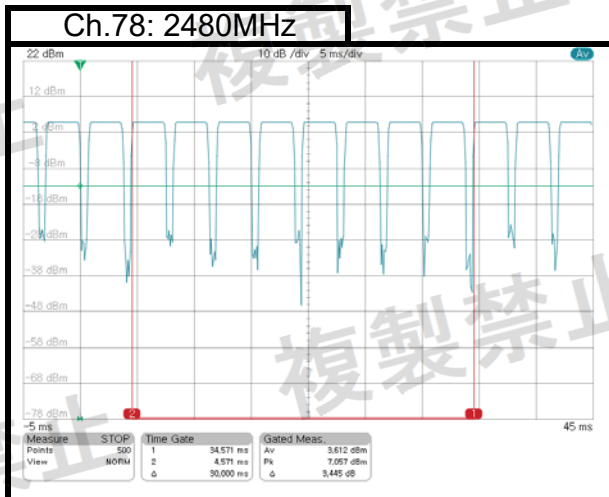
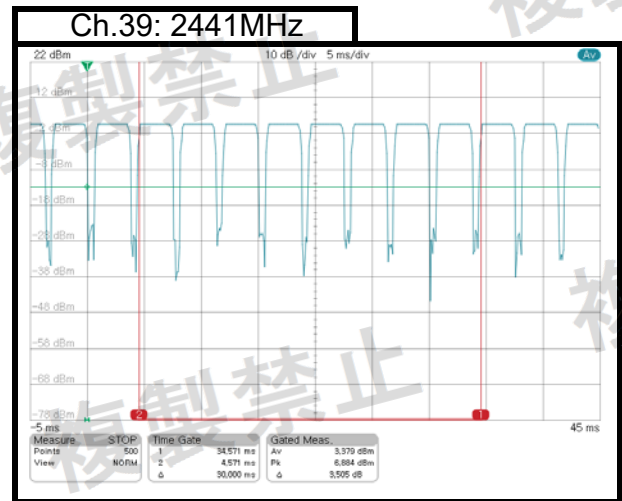






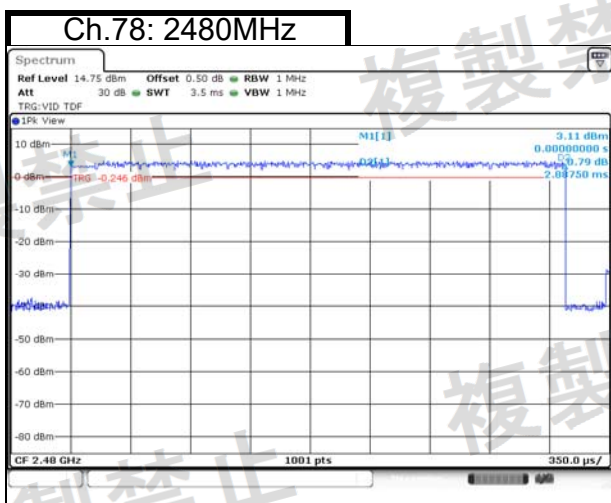
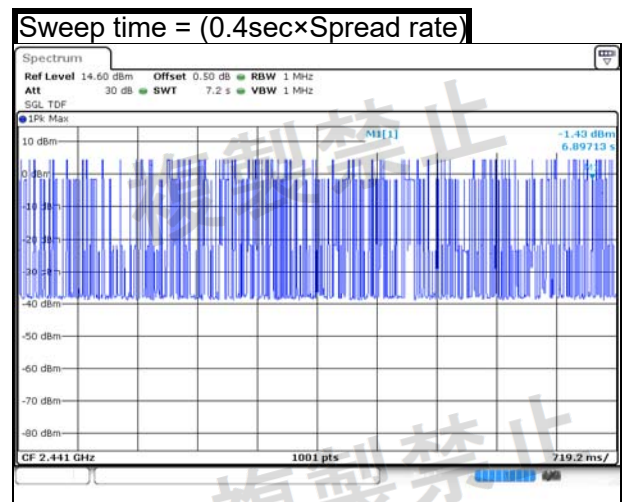
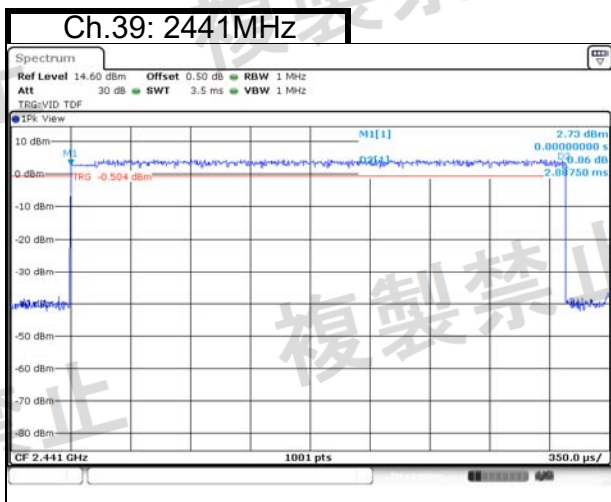
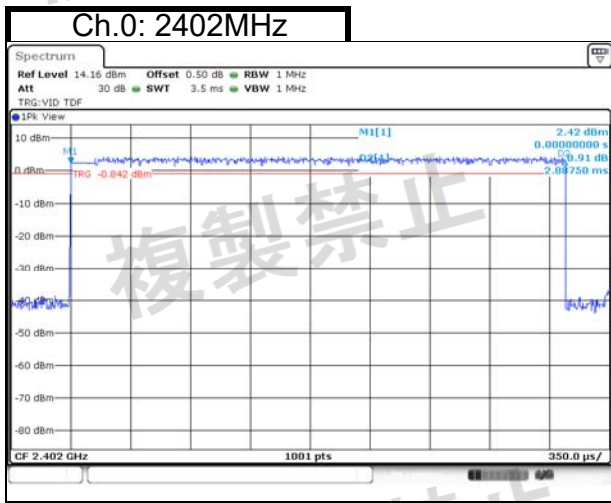
## 9. Test chart

### 9.3 RF output power tolerance (Rated voltage)



## 9. Test chart

### 9.4 Time of occupancy hopping frequency (Rated voltage)



## 10. Laboratory description

### 1. Location

Name: KCTL Inc.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: +82 31 285 0894

Facsimile Number: +82 505 299 8311

### 2. Accreditation and Registration

#### 1) FCC

Site Designation No.: KR0040

Site Registration No.: 687132

#### 2) VCCI

Registration No.: R-20080, G-20078, C-20059, T-20056

#### 3) Industry Canada

Registration No.: 8035A

| Test Site | OATS 3m | OATS 10m | OATS 30m | Chamber 3m | Chamber 10m | Expiry Date |
|-----------|---------|----------|----------|------------|-------------|-------------|
| 8035A-2   | No      | No       | No       | Yes        | Yes         | 2022-02-25  |

#### 4) KOLAS

| Registration number | Expiration date |
|---------------------|-----------------|
| KT231               | 2024-09-13      |