

# TEST REPORT

*Report number* : KR23-SRT0038  
*Issue date* : 2023-07-24

*Applicant* : DREAMUS COMPANY  
311, Gangnam-daero, Seocho-gu, Seoul,  
Republic of Korea  
TEL : +82 2-6240-9118  
FAX : +82 2-3019-7576

*Equipment under test (EUT)* : AK HB1

*Model name* : PEM21

*Date of test* : 2023.07.14 ~ 2023.07.18

*Test place* : Eurofins KCTL Co., Ltd.  
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 **Eurofins KCTL Co., Ltd.**

*Tested by;*

  
Hoesung 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   |
| 5                         | Unwanted (Spurious) Emission Strength  | Conducted | PASS   |
| 6                         | RF Output Power Tolerance              | Conducted | PASS   |
| 7                         | Secondary Emittted Radio Wave Strength | Conducted | PASS   |
| 8                         | Carrier Sensing Function               | Conducted | N/A    |
| 12                        | Interference Prevention Function       | Conducted | PASS   |

#### 1) Test set up

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

None

## 1. Test Information

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1. Applicant

DREAMUS COMPANY

311, Gangnam-daero, Seocho-gu, Seoul, Republic of Korea

2. Equipment under test

AK HB1

3. Model number

PEM21

4. Serial number

TP-89

5. Size

(W) 39.87 x (D) 16.55 x (H) 68.42

6. Terminal limitation

-10°C to 50°C

7. RF Specification Frequency range

2402-2480MHz

8. Number of RF Channels

40 Channels

9. Modulation method

FHSS(GFSK)

10. Data rate

1Mbps

10. Variation of the family model(s)

None

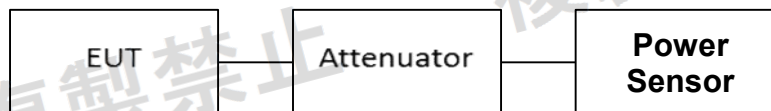
## 2. Configuration of equipment

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1. Frequency tolerance, Occupied Bandwidth, Unwanted(Spurious) emission strength, Secondary emitted radio wave strength, Interference Prevention Function



2. RF output power tolerance



### 3. Test results (Rated voltage)

S/N : N/A

|                          |              |            |            |            |
|--------------------------|--------------|------------|------------|------------|
| Environment of test room | Date of test | 2023-07-14 | 2023-07-17 | 2023-07-18 |
|                          | Temperature  | 22 °C      | 21 °C      | 23 °C      |
|                          | Humidity     | 53 %       | 55 %       | 52 %       |

|                          |               |            |
|--------------------------|---------------|------------|
| Peak Antenna Gain        | -2.41         | dBi        |
| Declaration Output Power | 4             | mW         |
| Declaration Output Power | 6.0206        | dBm        |
| <b>E.I.R.P.</b>          | <b>3.6106</b> | <b>dBm</b> |
| Input Power Voltage      | 3.8           | VDC        |

|                                          |                              |           |
|------------------------------------------|------------------------------|-----------|
| Tested Circuit Insertion Loss            | 0                            | dB        |
| Frequency equal to the Transmission rate | -                            | MHz       |
| Transmission Time                        | ON TIME<br>(1sec or less)    | 0.3984 ms |
|                                          | OFF TIME<br>(0.1sec or more) | 0.2277 ms |
|                                          | Ratio                        | 0.6363 %  |
| Packet Type (Mode)                       | Not Applicable               | mode      |
| Transmit Speed                           | Not Applicable               | 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 (GFSK/0-39ch)                                                                                                                                                                   |
| 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     | 2440     | 2480     | Result      | Limit                           | Note               |
| Channel Number                                                  | Ch.                 | 0        | 19       | 39       | ---         | ---                             |                    |
| Frequency Measurements                                          | MHz                 | 2402.030 | 2440.010 | 2480.010 | ---         | ---                             |                    |
| Frequency Tolerance                                             | ppm                 | 12.477   | 4.094    | 4.028    | <b>PASS</b> | $\pm 50 \times 10^{-6}$ (50ppm) |                    |
| Occupied Bandwidth                                              | MHz                 | 1.110    | 1.090    | 1.080    | <b>PASS</b> | 26MHz or below                  |                    |
| RF Output Power                                                 | mW                  | 4.143    | 3.567    | 2.840    | <b>PASS</b> | 10mW/MHz or below               |                    |
| RF Output Power Tolerance                                       | %                   | 3.577    | -10.821  | -28.999  |             | +20 to -80%                     |                    |
| Unwanted (Spurious) Emission Strength                           | 30 to 2387MHz       | uW/MHz   | 0.016    | 0.012    | 0.013       | <b>PASS</b>                     | 2.5uW/MHz or below |
|                                                                 |                     | MHz      | 2385.800 | 2289.300 | 1003.600    | ----                            |                    |
|                                                                 | 2387 to 2400MHz     | uW/MHz   | 2.323    | 0.012    | 0.014       | <b>PASS</b>                     | 25uW/MHz or below  |
|                                                                 |                     | MHz      | 2399.994 | 2389.123 | 2399.214    | ----                            |                    |
|                                                                 | 2483.5 to 2496.5MHz | uW/MHz   | 0.016    | 0.014    | 0.052       | <b>PASS</b>                     | 25uW/MHz or below  |
|                                                                 |                     | MHz      | 2490.130 | 2488.026 | 2483.506    | ----                            |                    |
|                                                                 | 2496.5 to 12500MHz  | uW/MHz   | 0.052    | 0.124    | 0.147       | <b>PASS</b>                     | 2.5uW/MHz or below |
|                                                                 |                     | MHz      | 6928.500 | 4879.500 | 4959.500    | ----                            |                    |
| Secondary Emitted Radio Wave Strength                           | 30 to 1000MHz       | nW       | 1.871    | 1.811    | 2.234       | <b>PASS</b>                     | 4nW or below       |
|                                                                 |                     | MHz      | 275.650  | 267.900  | 267.900     | ----                            |                    |
|                                                                 | 1000 to 12500MHz    | nW       | 0.536    | 0.541    | 0.583       | <b>PASS</b>                     | 20nW or below      |
|                                                                 |                     | MHz      | 6658.000 | 6980.000 | 9599.000    | ----                            |                    |
| Interference Prevention Function                                | Good                |          |          |          | <b>PASS</b> |                                 |                    |
| Transmitting antenna absolute gain                              | -                   |          |          |          | ----        | *1                              |                    |
| Angular width of the main radiation of the transmitting antenna | -                   |          |          |          | ----        | *1                              |                    |

\*1 Measurement only if the E.I.R.P. exceeds 12.14dBm/MHz

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## 5. Uncertainty

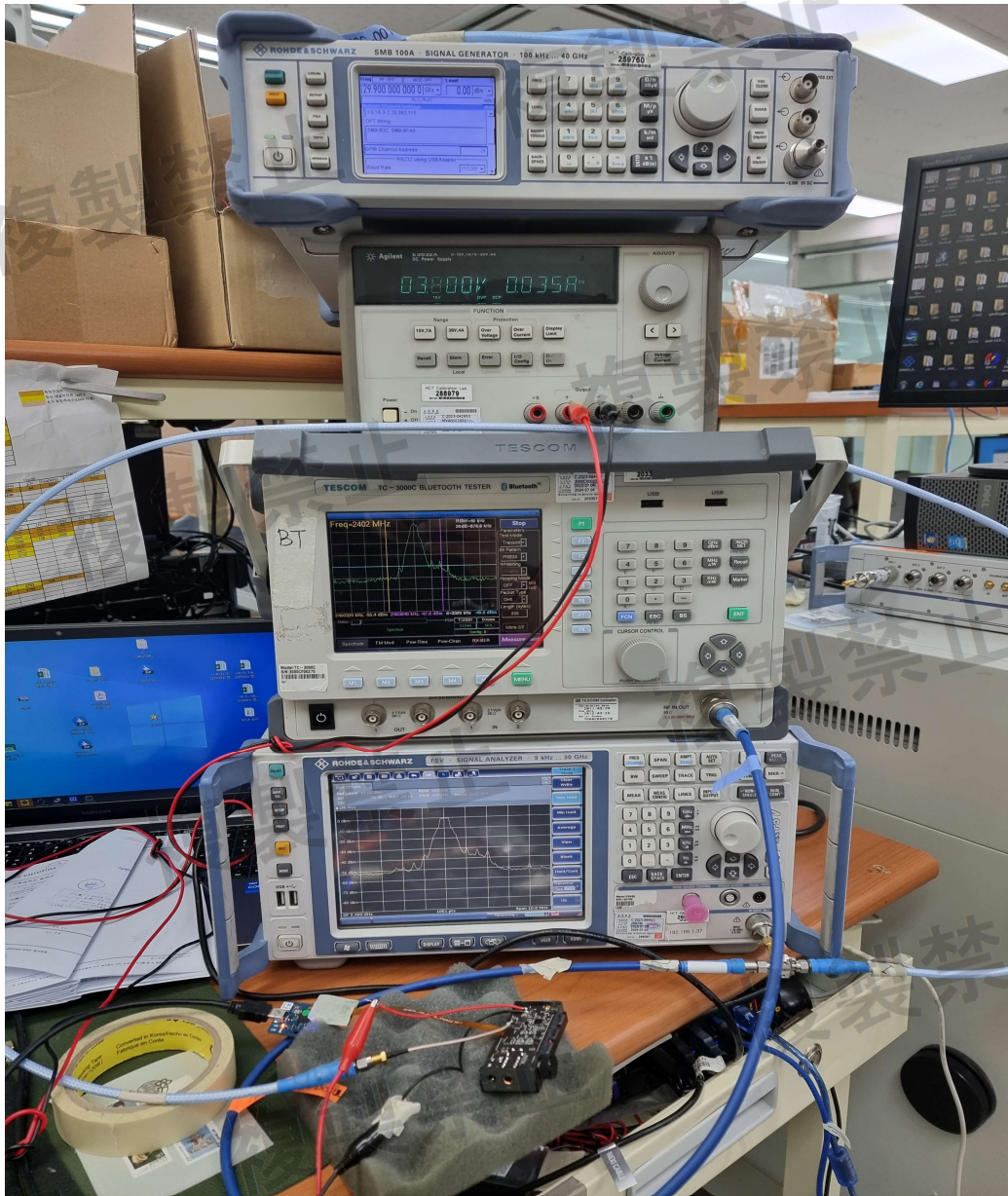
About uncertainty of measured value

| Parameter                    | Uncertainty               |
|------------------------------|---------------------------|
| Total RF power conducted     | $\pm 0.9\text{dB}$        |
| Spurious emissions conducted | $\pm 1.1\text{dB}$        |
| Temperature                  | $\pm 0.9^{\circ}\text{C}$ |
| Humidity                     | $\pm 4.6\%$               |

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

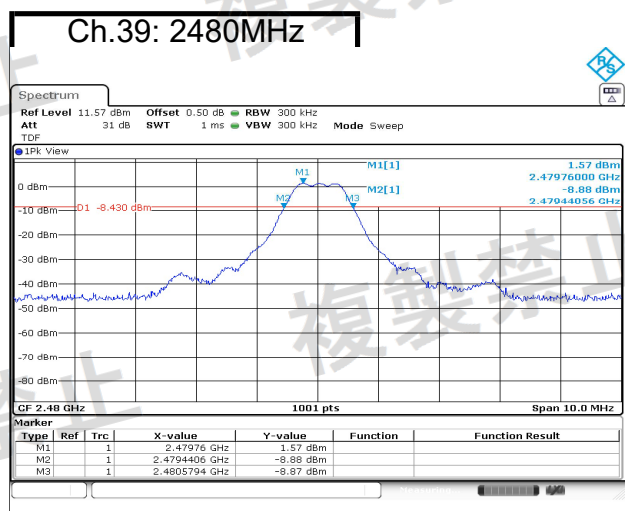
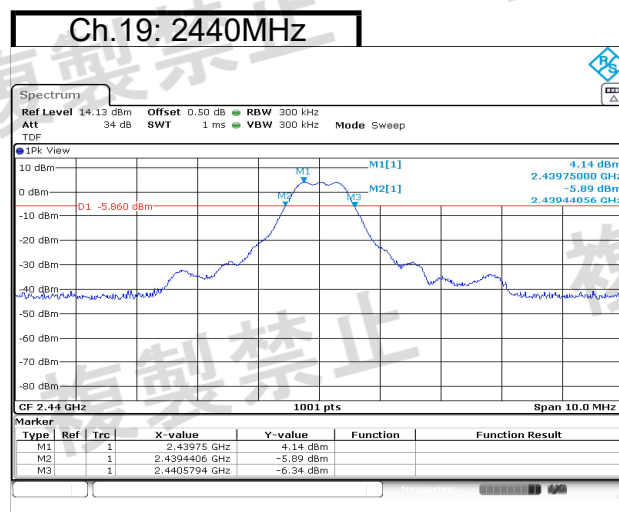
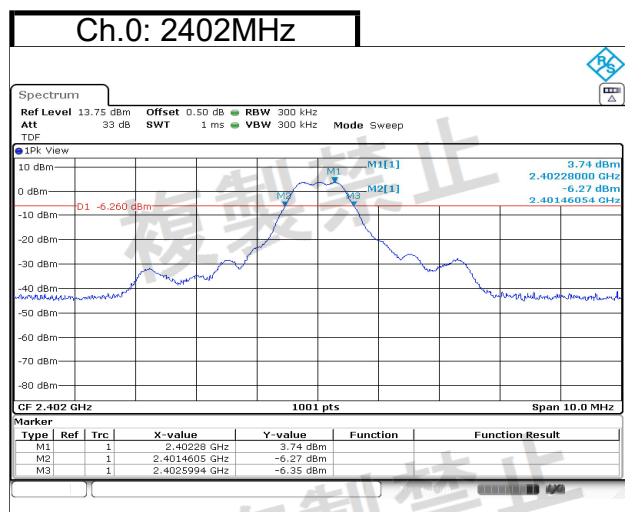
## 6. Photographs

Conducted Measurement Photo



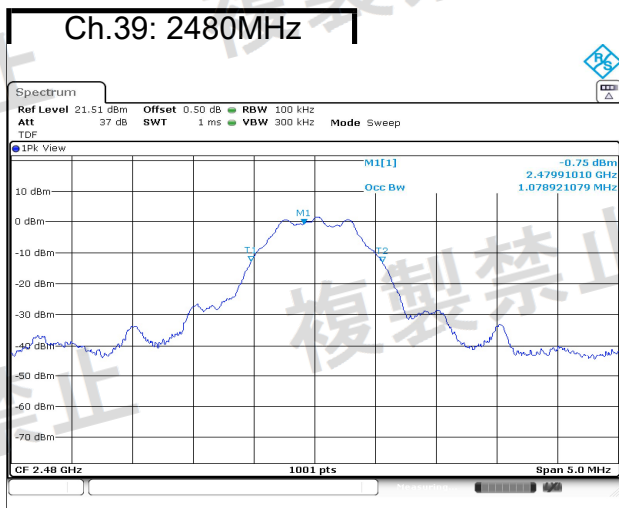
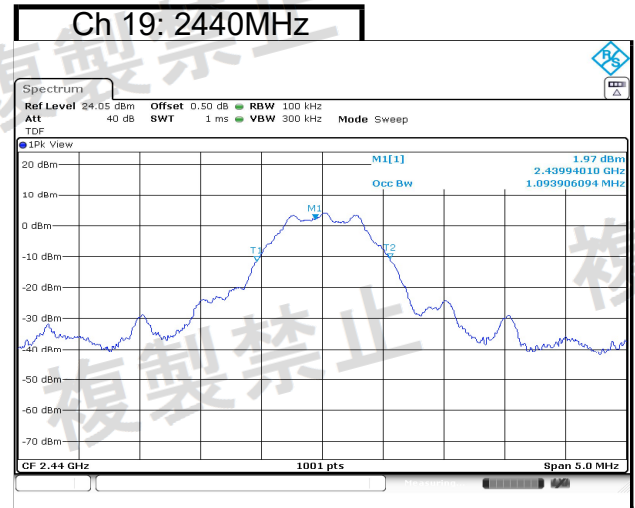
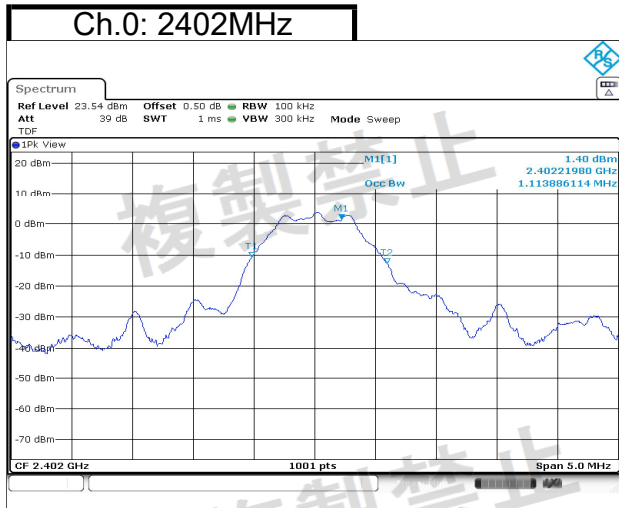
## 7. Test chart

### 7.1 Frequency tolerance (Rated voltage)



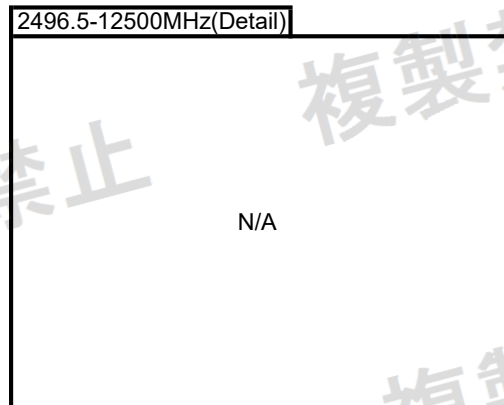
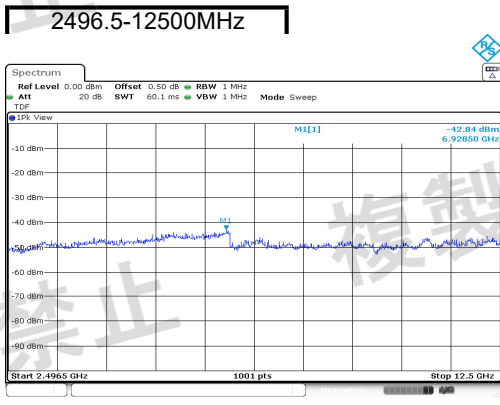
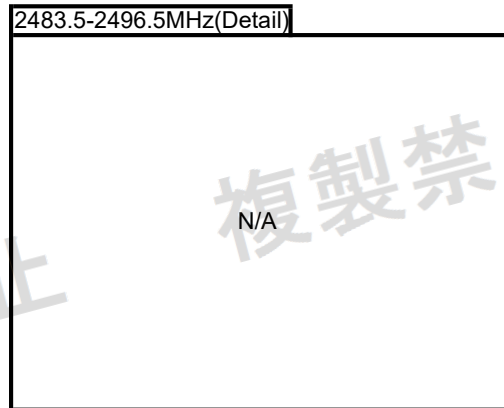
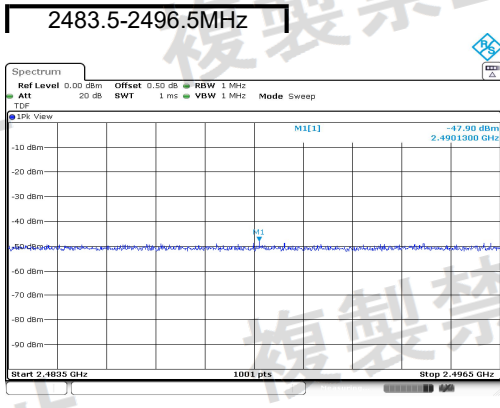
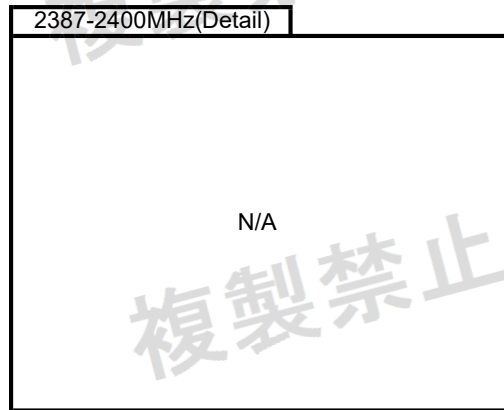
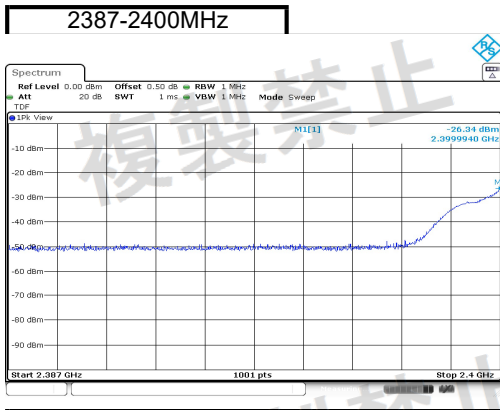
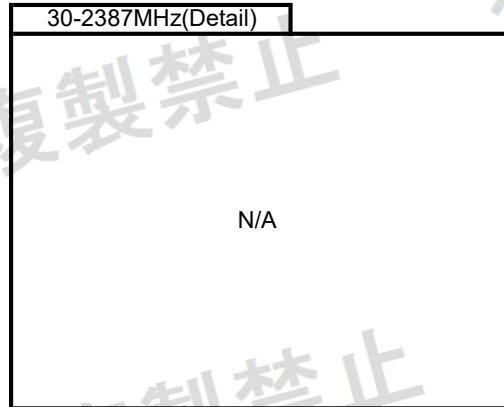
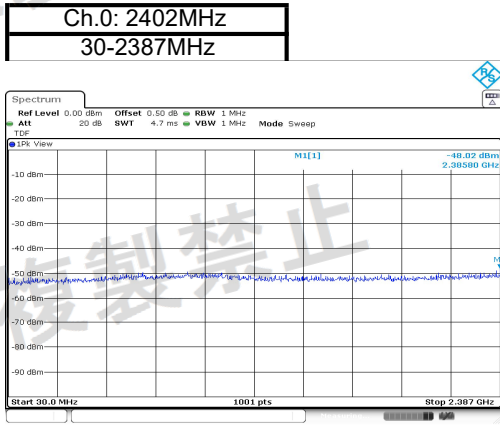
## 7. Test chart

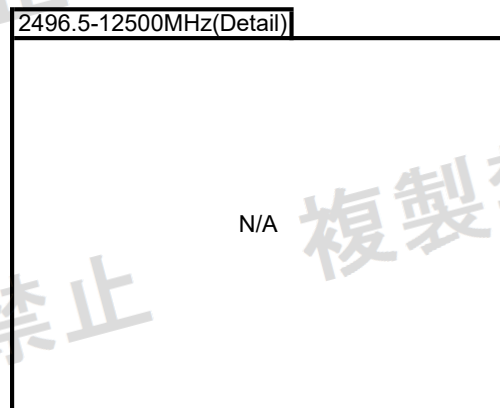
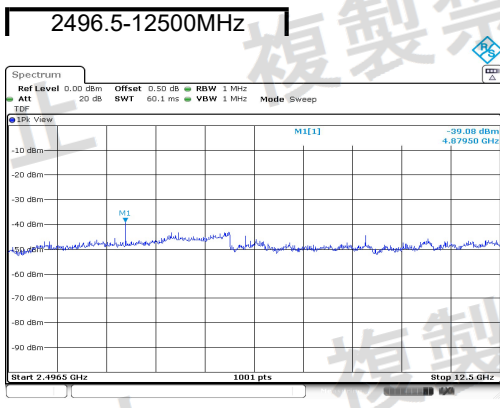
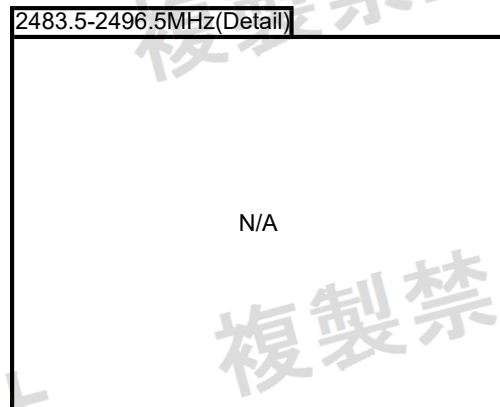
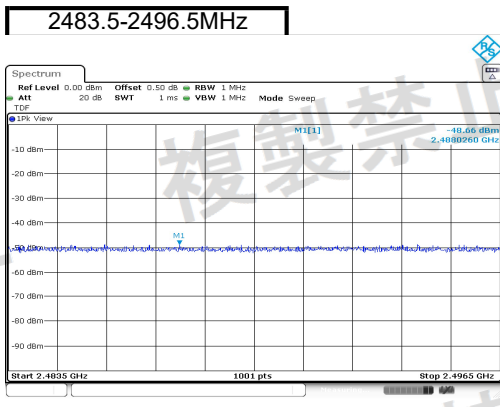
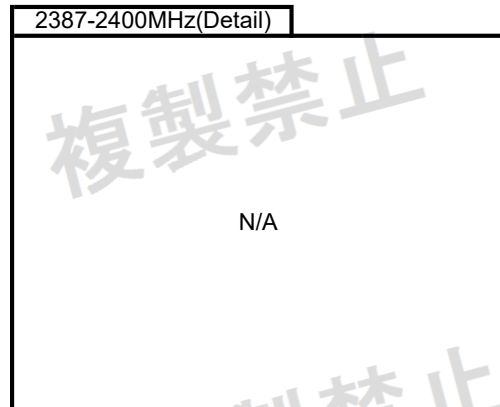
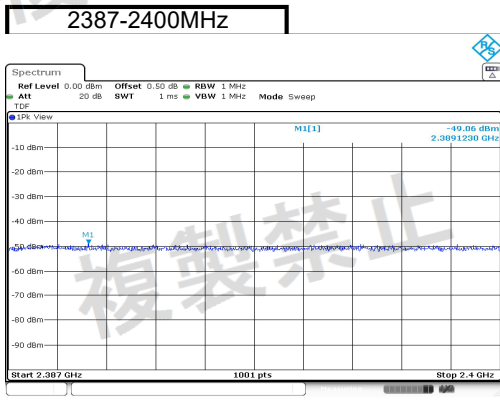
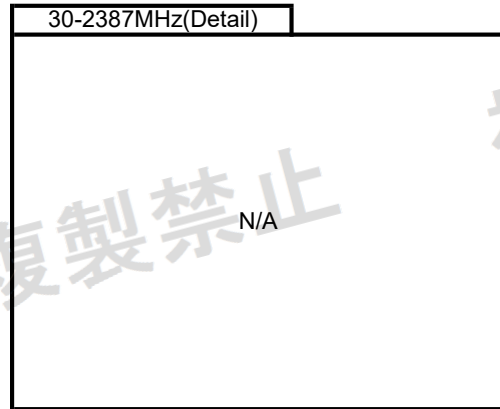
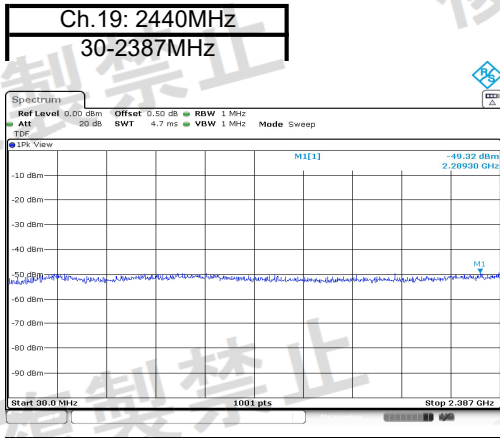
### 7.2 Occupied bandwidth (Rated voltage)

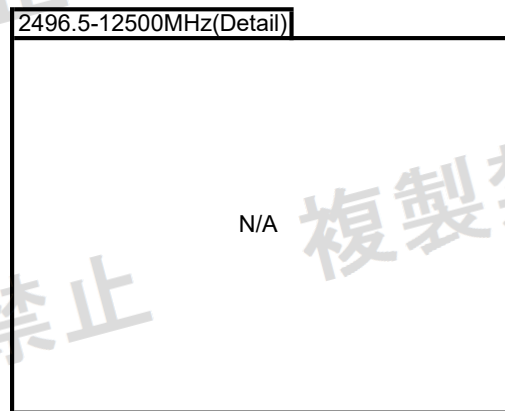
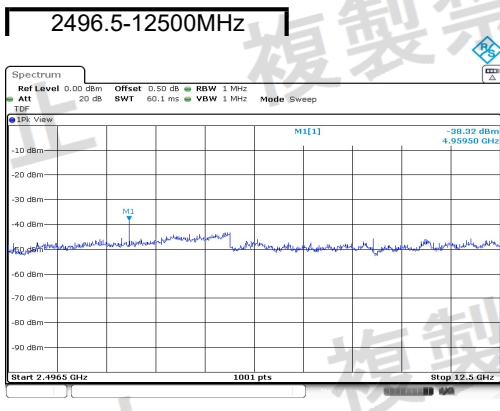
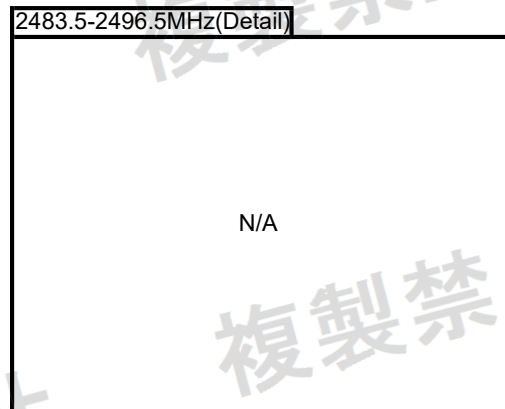
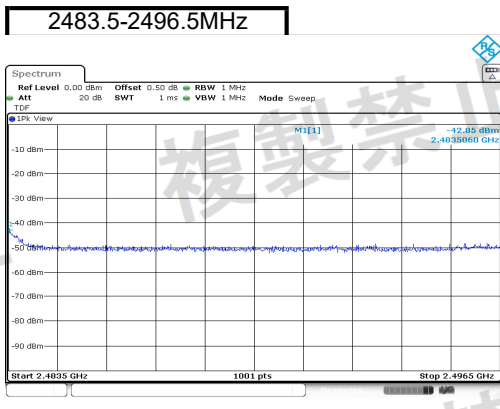
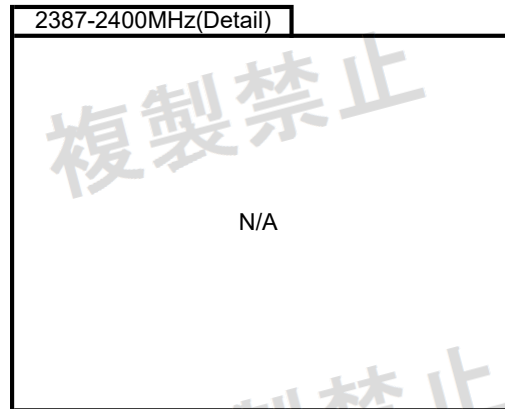
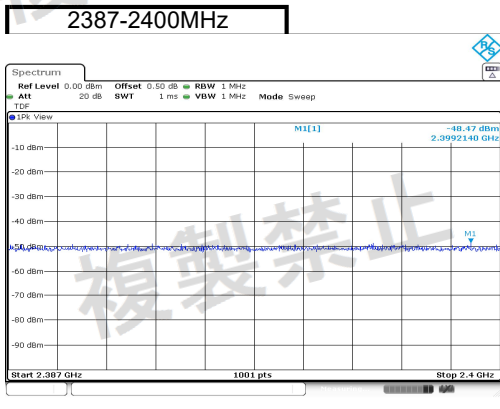
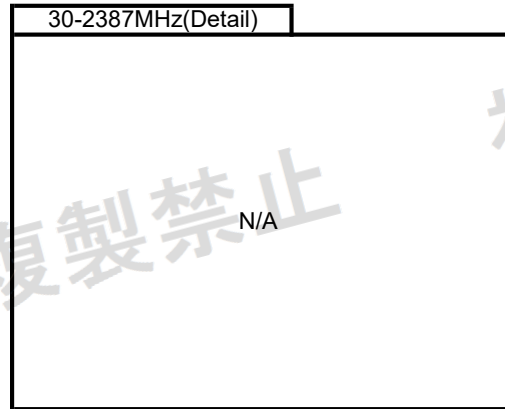
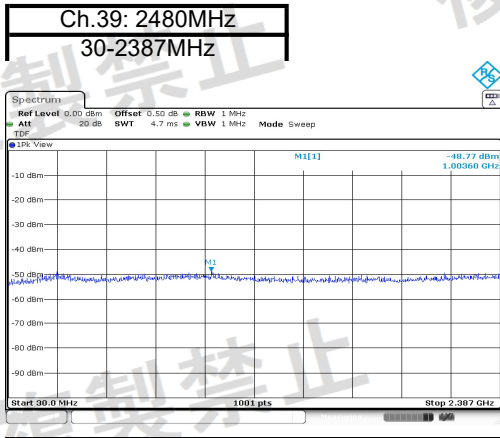


## 7. Test chart

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

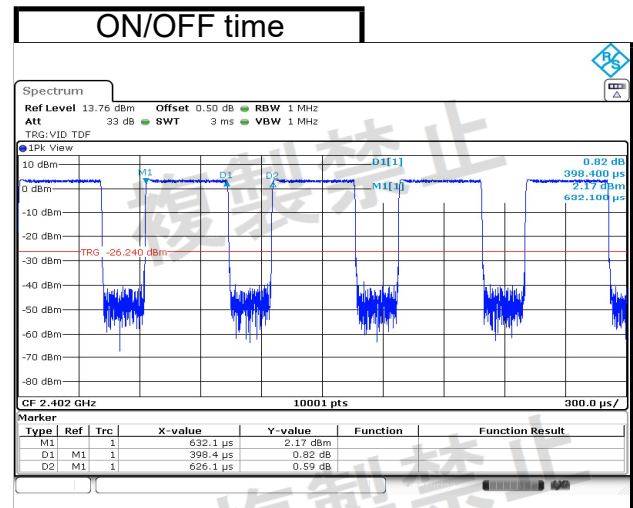
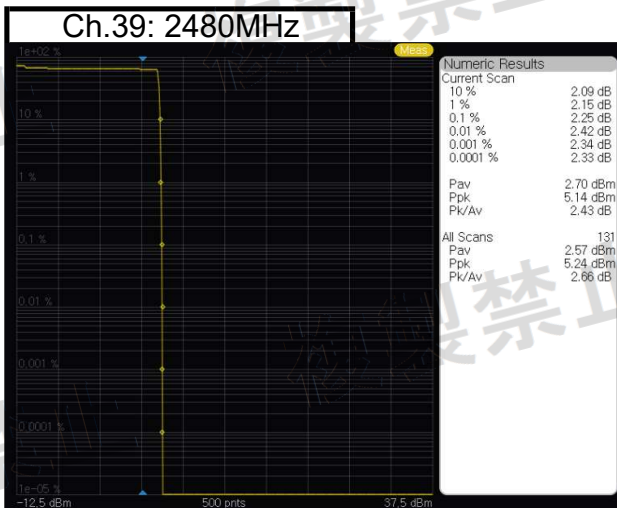
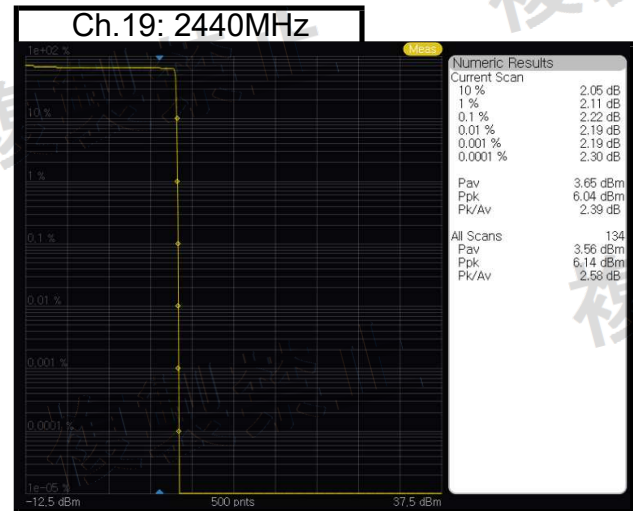
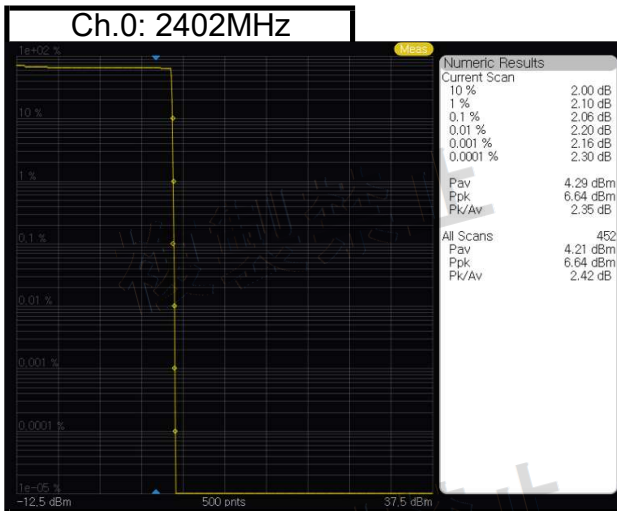






## 7. Test chart

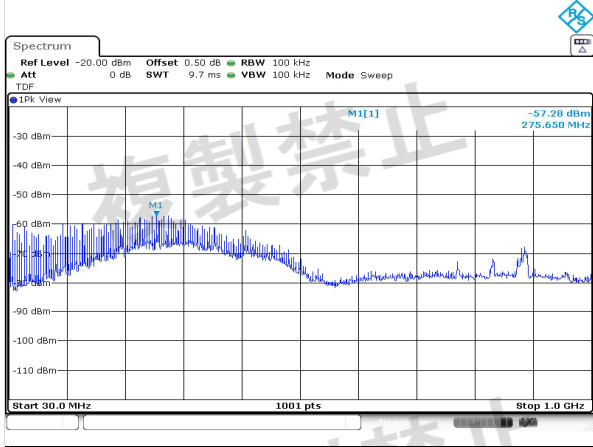
### 7.4 RF output power tolerance (Rated voltage)



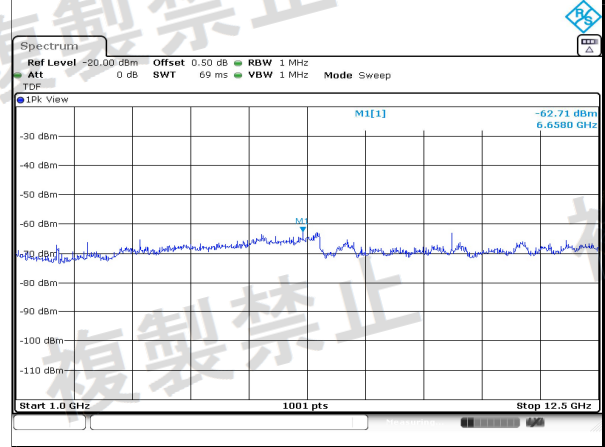
## 7. Test chart

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

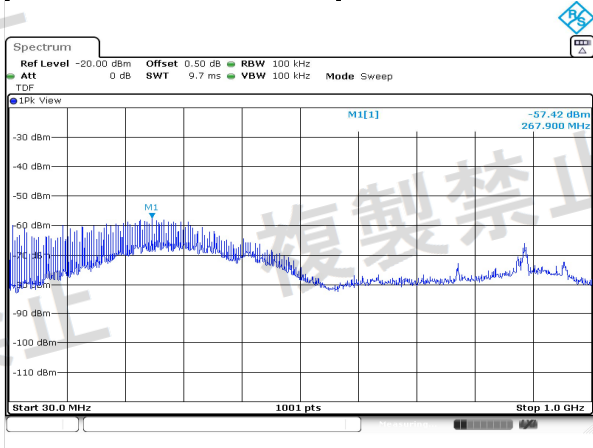
Ch.0: 2402MHz  
30-1000MHz



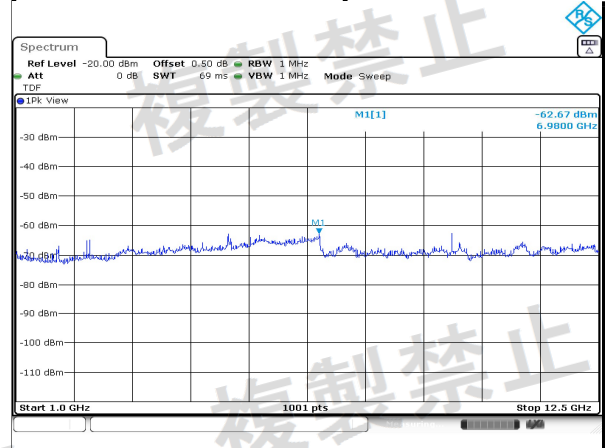
1-12.5GHz



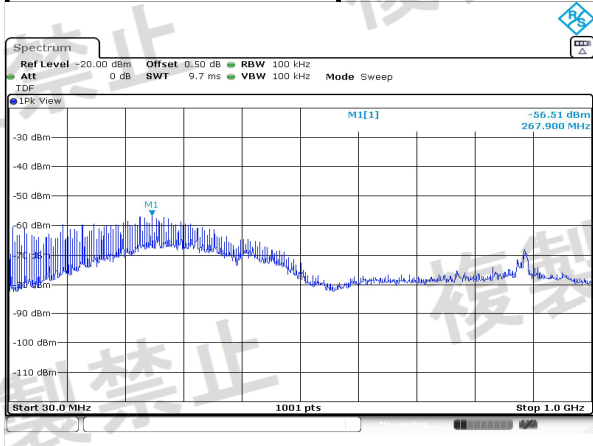
Ch.19: 2440MHz  
30-1000MHz



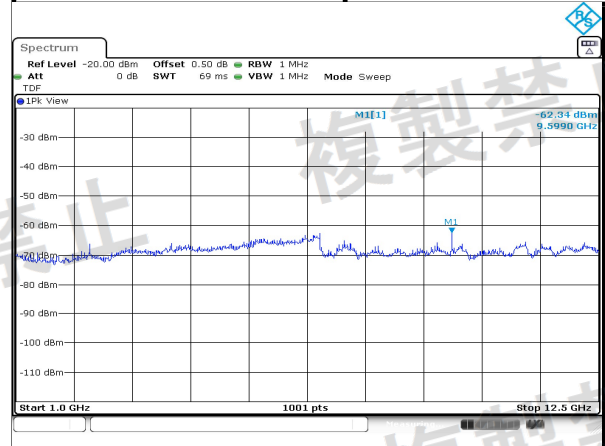
1-12.5GHz



Ch.39: 2480MHz  
30-1000MHz



1-12.5GHz



## 8. Laboratory description

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### 1. Location

Name: Eurofins KCTL Co., Ltd.

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 :8035A-2

#### 4) KOLAS

Registration number : KT231