

TEST REPORT

Report number : 7191189243-10

Issue date : 03/09/2018

Applicant : Panasonic AVC Networks Singapore

Equipment under test (EUT) : Bluetooth Module.

Model name : RSNE041B1

Date of test : 13/08/2018


Test place : TÜV SÜD PSB Pte. Ltd.
No.1 Science Park Drive
Singapore 118221

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 TÜV SÜD PSB Pte. Ltd.

Tested by;


Chang Wai Kit

Approved by;


Lim Cher Hwee

1. 試験の概要

Summary of Test

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 Appendix 43 | Classification of EUT | Condition | Result |
|---------------------------|---|-----------|--------|
| 1 | Voltage fluctuation | Conducted | PASS |
| 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 |
| 8 | Carrier Sensing Function (1) | Conducted | N/A |
| 9 | Carrier Sensing Function (2) | Conducted | N/A |
| 10 | Absolute Gain of Transmission Antenna | Conducted | N/A |
| 11 | Angle Width of Principal Radiation from Transmission Antenna | Conducted | N/A |
| 12 | Interference Prevention Function | Conducted | PASS |
| 13 | Hopping frequency dwell time | Conducted | PASS |

1) Test set up

Table-Top

2) Modification to the EUT by laboratory

None

2. 試驗情報

Test Information

1. Applicant
Panasonic AVC Networks Singapore
202, Bedok South Avenue 1,
Singapore 469332
Phone: +65-6222-7222 / Fax: +65-6299-1212

2. Equipment under test
Bluetooth Module

3. Model number
RSNE041B1

4. Serial number
Nil.

5. Size
(W) 29 x (D) 15 x (H) 1.2 mm

6. Terminal limitation
-20°C to 50°C

7. RF Specification Frequency range
2402-2480MHz

8. Number of RF Channels
79 Channels

9. Modulation method
GFSK, Gaussian Frequency Shift Keying

10. Data rate

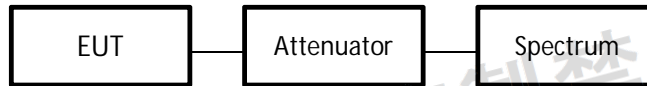
1MBps

11. Variation of the family model(s)
None

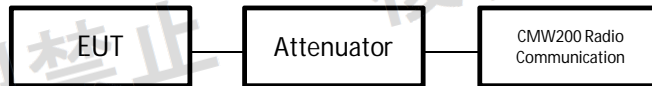
3. 機器構成

Configuration of equipment

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



2. RF output power tolerance



4. 試驗結果

Test results

S/N:

| | | |
|--------------------------|--------------|------------|
| Environment of test room | Date of test | 13/08/2018 |
| | Temperature | 23 °C |
| | Humidity | 60 % |

| | | |
|--------------------------|----------------|----------------|
| Peak Antenna Gain | 1.63 | dBi |
| Declaration Output Power | 0.16 | mW/MHz |
| Declaration Output Power | -7.9588 | dBm/MHz |
| E.I.R.P. | -6.3288 | dBm/MHz |
| Input Power Voltage | 3.3 | VDC |

| | | | |
|--|----------|--------|------|
| Tested Circuit Insertion Loss | | 0.9 | dB |
| Frequency equal to the Transmission rate | | 1 | MHz |
| Transmission Time | ON TIME | 2.860 | ms |
| | OFF TIME | 0.900 | ms |
| | Ratio | 0.7606 | |
| Packet Type (Mode) | | DH5 | mode |
| Transmit Speed | | 1 | MHz |

| | |
|--|--|
| Test category : | 2.4GHz Band Low-Power Data Communication System (BluetoothV2.1+EDR [GFSK]) |
| The reason why the tests are performed only at rated voltage : | When the input voltage to receiver RF circuit varies below $\pm 1\%$ as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply). |

| | | | | | | | |
|---------------------------------------|---------------------|-------------|-------------|-------------|--------|---------------------------------|---|
| Measurement Frequency | MHz | 2402 | 2441 | 2480 | Result | Limit | Note |
| Channel Number | Ch. | 0 | 39 | 78 | --- | --- | |
| Frequency Measurements | MHz | 2401.981370 | 2440.980770 | 2479.980450 | --- | --- | |
| Frequency Tolerance | ppm | -7.75604 | -7.87792 | -7.88306 | PASS | $\pm 50 \times 10^{-6}$ (50ppm) | |
| Occupied Bandwidth | MHz | --- | 78.1376 | --- | PASS | 83.5MHz or below | |
| Spread Bandwidth | MHz | --- | 70.9629 | --- | PASS | 500kHz or more | |
| RF Output Power | mW/MHz | 0.097228 | 0.125254 | 0.168963 | PASS | 3mW/MHz or below | |
| RF Output Power Tolerance | % | -39.232625 | -21.716457 | 5.601594 | PASS | +20 to -80% | |
| Unwanted (Spurious) Emission Strength | 30 to 2387MHz | uW/MHz | --- | 0.010990 | --- | PASS | 2.5uW/MHz or below |
| | | MHz | --- | 589.400 | --- | ---- | |
| | 2387 to 2400MHz | uW/MHz | --- | 0.116950 | --- | PASS | 25uW/MHz or below |
| | | MHz | --- | 2399.987 | --- | ---- | |
| | 2483.5 to 2496.5MHz | uW/MHz | --- | 0.013552 | --- | PASS | 25uW/MHz or below |
| | | MHz | --- | 2488.669 | --- | ---- | |
| Secondary Emitted Radio Wave Strength | 10 to 1000MHz | uW/MHz | --- | 0.030549 | --- | PASS | 2.5uW/MHz or below |
| | | MHz | --- | 2560.700 | --- | ---- | |
| | 1000 to 10000MHz | nW | --- | 0.001250 | --- | PASS | 4nW or below |
| | | MHz | --- | 337.430 | --- | ---- | |
| | 10000 to 12500MHz | nW | --- | 0.147571 | --- | PASS | 20nW or below |
| | | MHz | --- | 9770.400 | --- | ---- | |
| Time of occupancy hopping frequency | | nW | --- | 0.018880 | --- | PASS | 20nW or below |
| | | MHz | --- | 12382.200 | --- | ---- | |
| Time of occupancy hopping frequency | | sec | --- | 0.002879 | --- | PASS | 0.4sec or below |
| | | sec | --- | 0.273473 | --- | PASS | 0.4sec or below 0.4sec \times Spread rate |
| Spreading Factor | | --- | 70.962900 | | PASS | 5 or more | |

Measurement equipment list

Note1: 測定機器の較正は、1年間有効です。

The calibration of measurement equipment is valid for one year period.

Note2: "X" は使用した測定機器です。

"X" used equipment.

Note3: 較正方法 ... 1): 独立行政法人情報通信研究機構(以下「機構」という。)又は第百二条の十八第一項の指定較正機関が行う
Cal. Method ... 較正

a): Calibration conducted by the National Institute of Information and Communications Technology(NICT)(hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)

ロ: 計量法（平成四年法律第五十一号）第百三十五条又は第百四十四条の規定に基づく校正

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

ハ)：外国において行う較正であつて、機構又は第百二条の十八第一項の指定較正機関が行う較正に相当するもの

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)

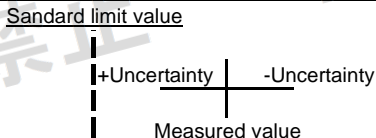
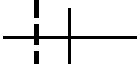

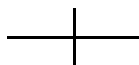
ニ) 別表第三の下欄に掲げる測定器その他の設備であつて、イからハまでのいずれかに掲げる較正等を受けたものを用いて行う較正等

d): Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c)

6. 測定の不確かさ

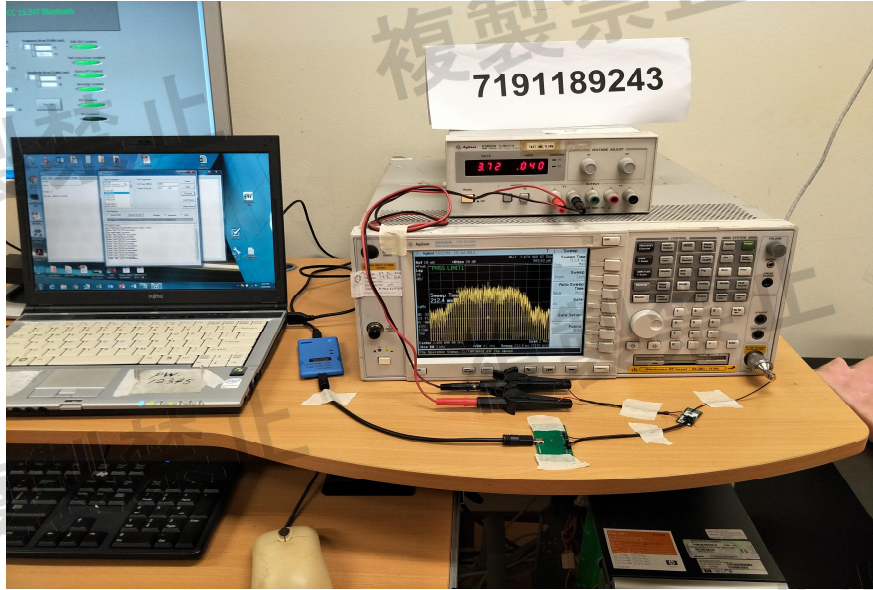
About uncertainty of measured value

| Parameter | Uncertainty |
|------------------------------|-----------------------|
| RF Frequency | $\pm 74\text{Hz}$ |
| Total RF power conducted | $\pm 1.0\text{dB}$ |
| Spurious emissions conducted | $\pm 1.0\text{dB}$ |
| Temperature | $\pm 1^\circ\text{C}$ |
| Humidity | $\pm 1\%$ |

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

7. 測定写真
Photographs

Conducted Measurement Photo



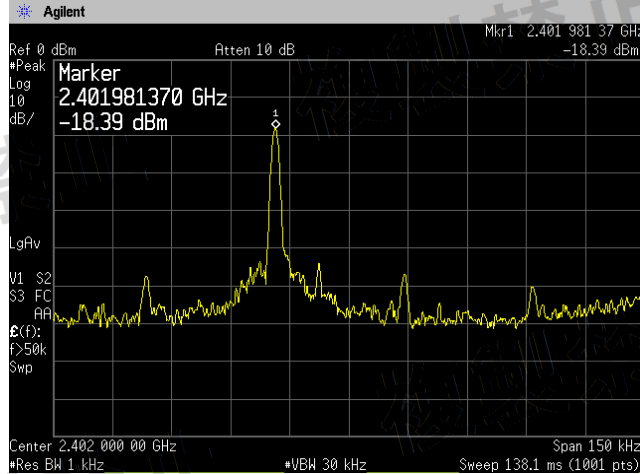
8. 測定チャート

Test chart

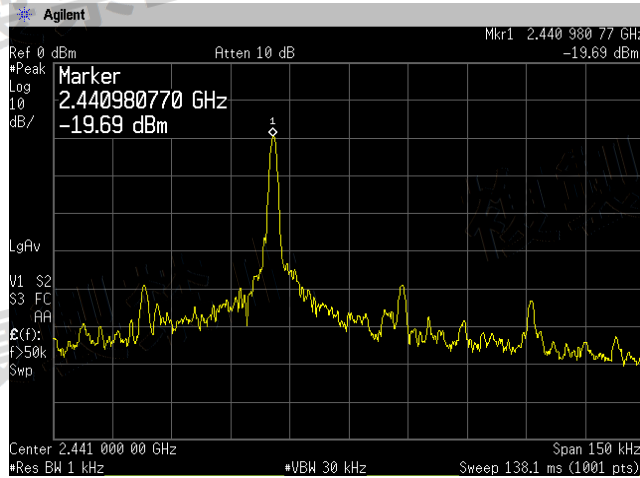
8.1 周波数の偏差

Frequency tolerance

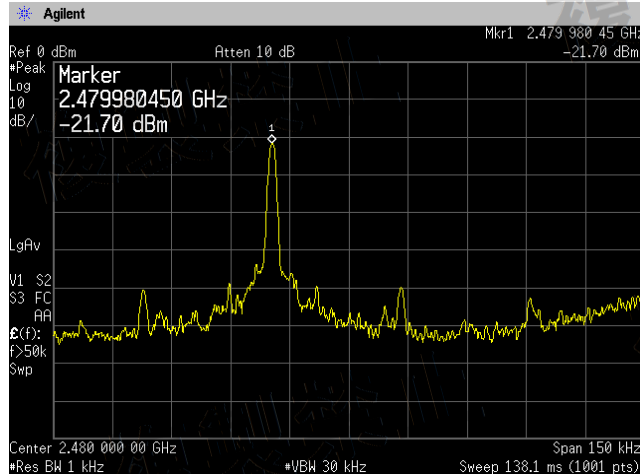
Ch.1: 2402MHz



Ch.40: 2441MHz



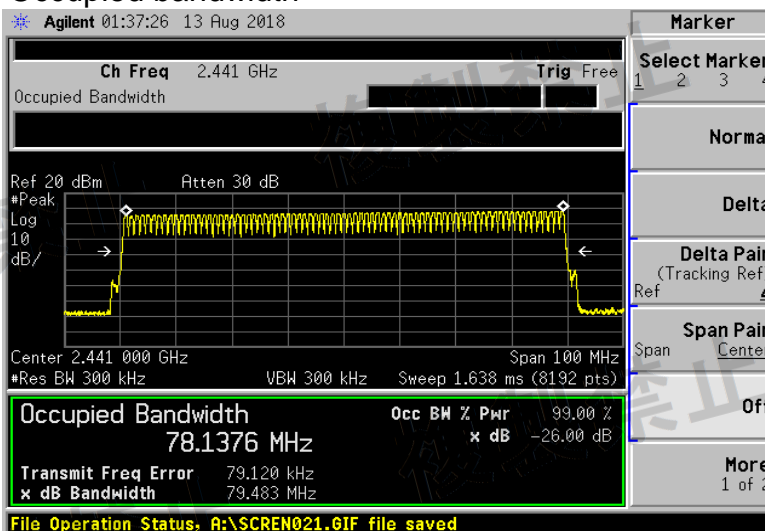
Ch.79: 2480MHz



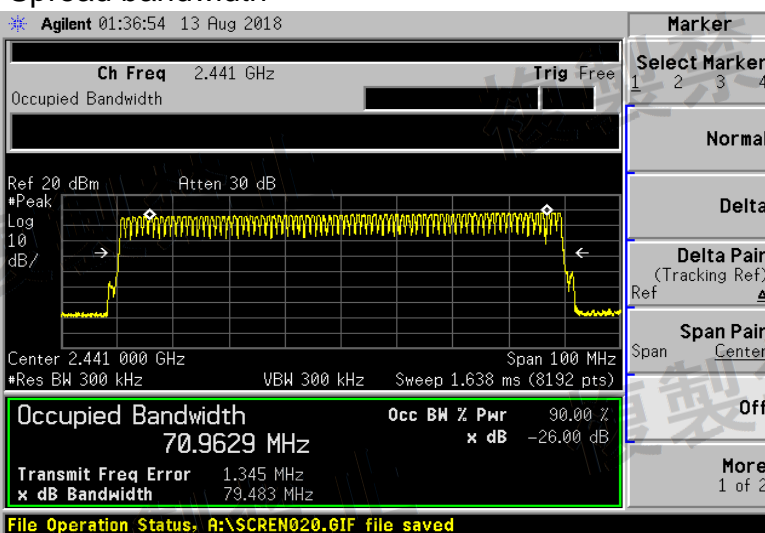
8.2 占有周波数帯幅及び拡散帯域幅

Occupied bandwidth / Spread bandwidth

Occupied bandwidth

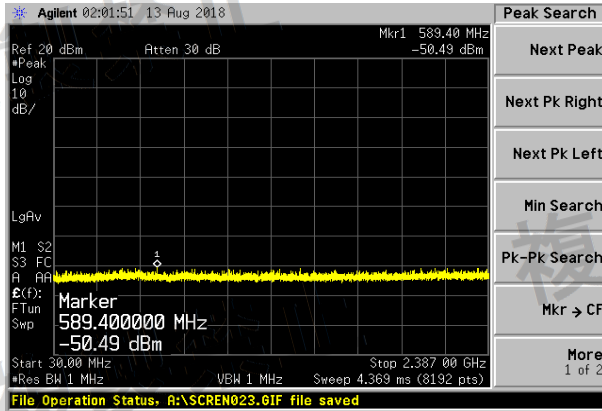


Spread bandwidth

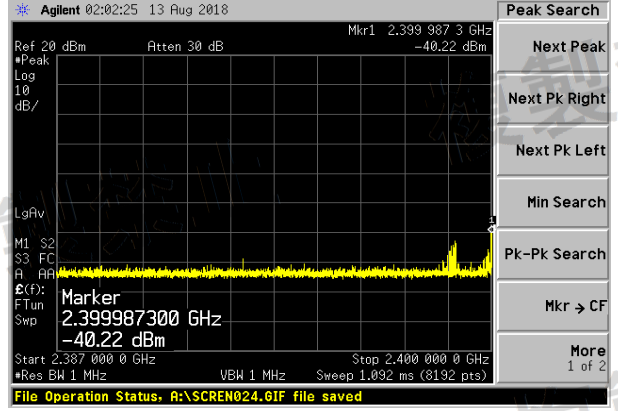


8.3スプリアスの発射又は不要発射の強度
Unwanted(Spurious) emission strength

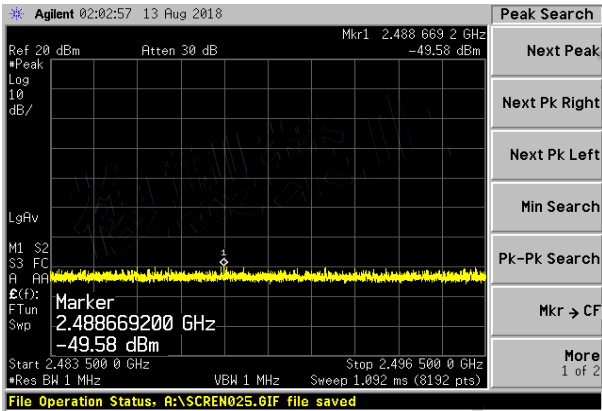
30-2387MHz



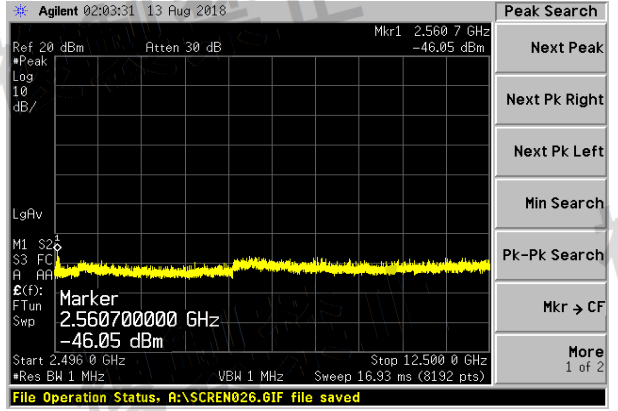
2387-2400MHz



2483.5-2496.5MHz

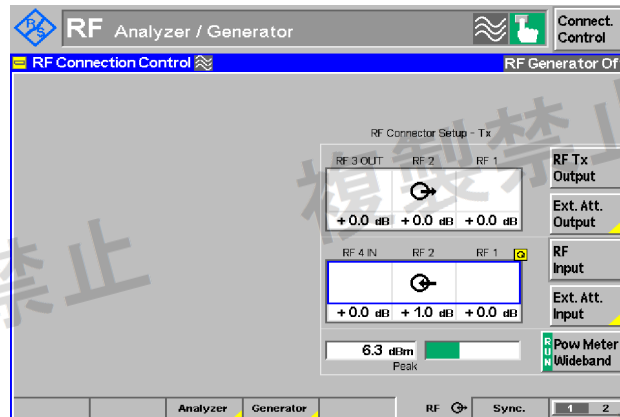


2496.5-12500MHz

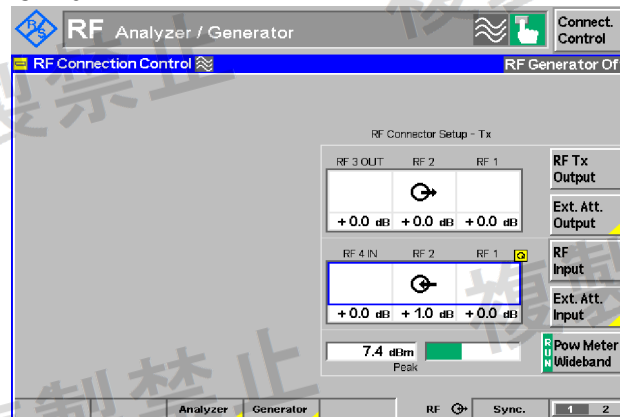


8.4 空中線電力の偏差 RF output power tolerance

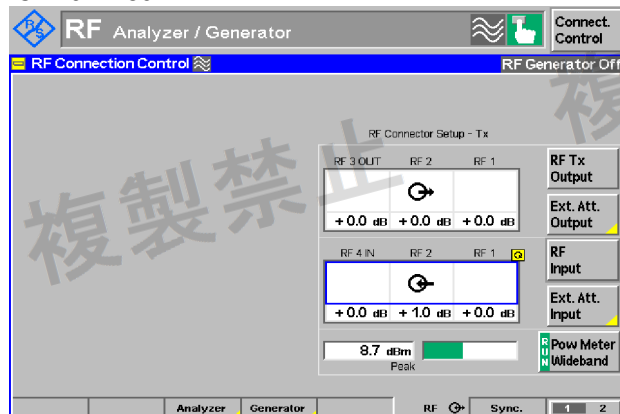
Ch.1: 2402MHz



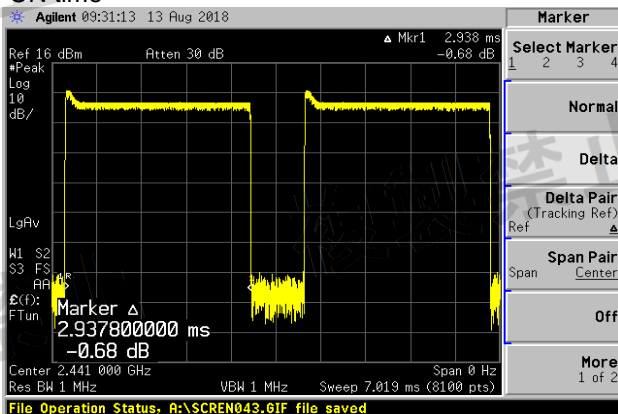
Ch.40: 2441MHz



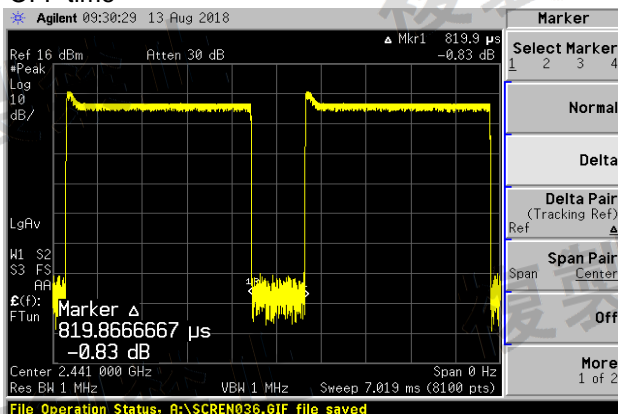
Ch.79: 2480MHz



ON time

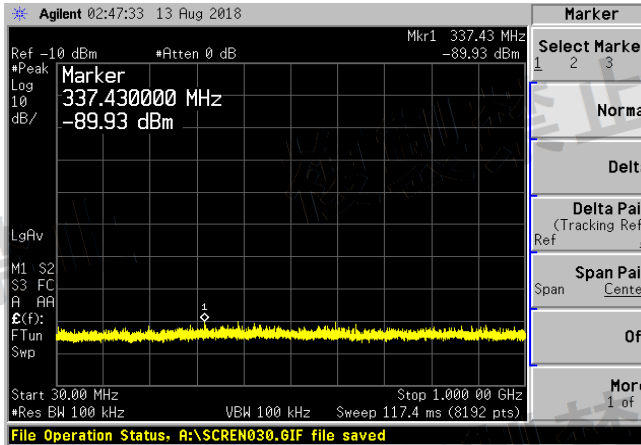


OFF time

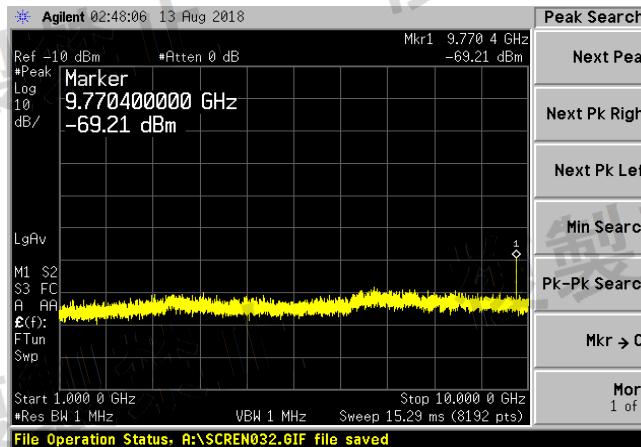


8.5 副次的に発する電波等の限度
Secondary emitted radio wave strength

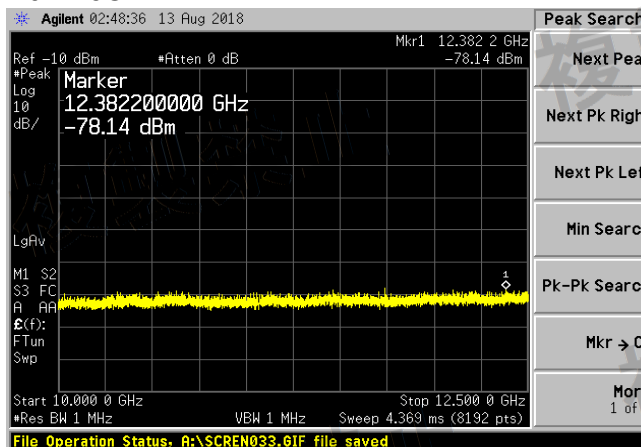
30MHz-1GHz



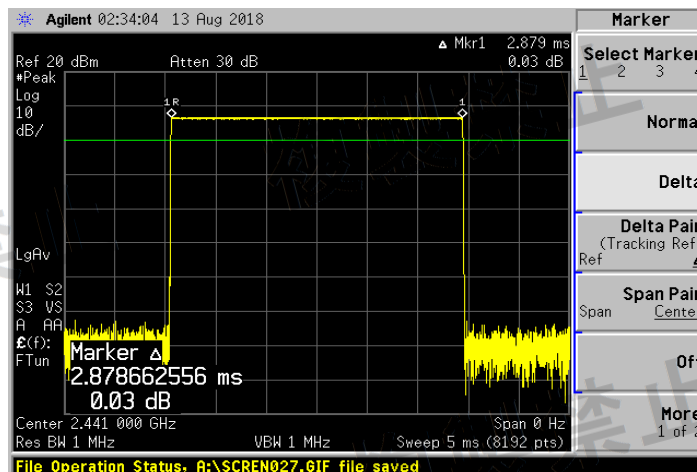
1-10GHz



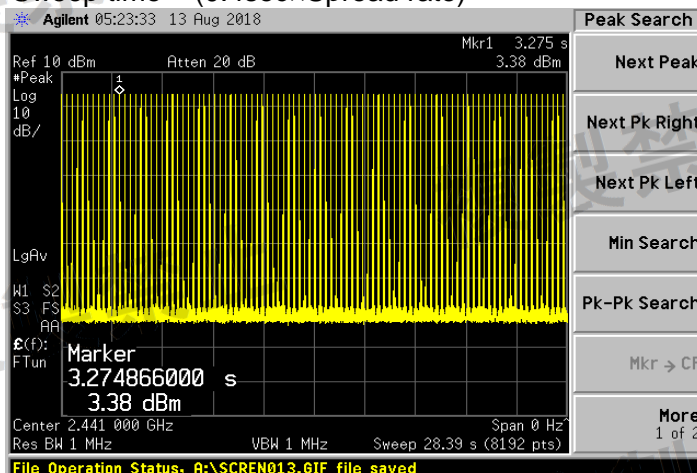
10-12.5GHz



8.6 ホッピング周波数帯流時間 Time of occupancy hopping frequency



Sweep time = (0.4sec×Spread rate)



9. 試驗結果

Test results

S/N:

| | | |
|--------------------------|--------------|------------|
| Environment of test room | Date of test | 13/08/2018 |
| | Temperature | 23 °C |
| | Humidity | 60 % |

| | | |
|--------------------------|----------------|-----------------|
| Peak Antenna Gain | 1.63 | dB _i |
| Declaration Output Power | 0.5 | mW/MHz |
| Declaration Output Power | -3.0103 | dBm/MHz |
| E.I.R.P. | -1.3803 | dBm/MHz |
| Input Power Voltage | 3.3 | VDC |

| | | | |
|--|----------|--------|------|
| Tested Circuit Insertion Loss | | 0.9 | dB |
| Frequency equal to the Transmission rate | | 1 | MHz |
| Transmission Time | ON TIME | 2.860 | ms |
| | OFF TIME | 0.900 | ms |
| | Ratio | 0.7606 | |
| Packet Type (Mode) | | DH5 | mode |
| Transmit Speed | | 1 | MHz |

| | |
|--|--|
| Test category ; | 2.4GHz Band Low-Power Data Communication System (BluetoothV2.1+EDR [GFSK] *AFH) |
| The reason why the tests are performed only at rated voltage : | When the input voltage to receiver RF circuit varies below $\pm 1\%$ as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply). |

| | | | | | | | |
|---------------------------------------|---------------------|------------|------------|------------|-----------|---------------------------------|--------------------|
| Measurement Frequency | MHz | 2402 | 2441 | 2480 | Result | Limit | Note |
| Channel Number | Ch. | 1 | 40 | 79 | --- | --- | |
| Frequency Measurements | MHz | --- | --- | --- | --- | --- | |
| Frequency Tolerance | ppm | --- | --- | --- | --- | $\pm 50 \times 10^{-6}$ (50ppm) | |
| Occupied Bandwidth | MHz | 18.5647 | 19.569 | 19.5662 | PASS | 83.5MHz or below | |
| Spread Bandwidth | MHz | 17.1592 | 18.0136 | 17.9998 | PASS | 500kHz or more | |
| RF Output Power | mW/MHz | 0.167620 | 0.215388 | 0.318826 | PASS | 3mW/MHz or below | |
| RF Output Power Tolerance | % | -66.476082 | -56.922420 | -36.234741 | PASS | +20 to -80% | |
| Unwanted (Spurious) Emission Strength | 30 to 2387MHz | uW/MHz | 0.003381 | 0.002483 | 0.004102 | PASS | 2.5uW/MHz or below |
| | | MHz | 2357.700 | 2281.110 | 2305.850 | ---- | |
| | 2387 to 2400MHz | uW/MHz | 0.916220 | 0.001972 | 0.003828 | PASS | 25uW/MHz or below |
| | | MHz | 2399.986 | 2396.096 | 2396.429 | ---- | |
| | 2483.5 to 2496.5MHz | uW/MHz | 0.006950 | 0.001995 | 0.016788 | PASS | 25uW/MHz or below |
| | | MHz | 2493.107 | 2488.460 | 2483.511 | ---- | |
| | 2496.5 to 12500MHz | uW/MHz | 0.025527 | 0.015066 | 0.010399 | PASS | 2.5uW/MHz or below |
| | | MHz | 2571.100 | 2592.500 | 2624.200 | ---- | |
| Time of occupancy hopping frequency | sec | 0.002880 | 0.002879 | 0.002879 | PASS | 0.4sec or below | |
| | sec | 0.282229 | 0.279241 | 0.276410 | PASS | 0.4sec or below | 0.4secxSpread rate |
| Spreading Factor | | --- | 17.159200 | 18.013600 | 17.999800 | PASS | 5 or more |

10. 試験チャート

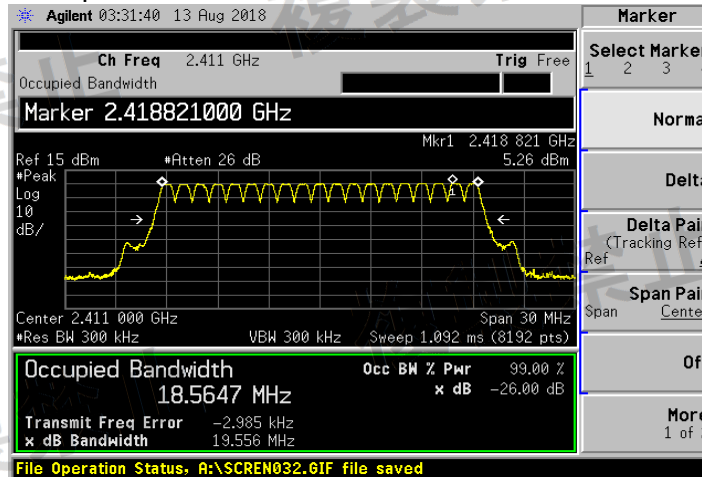
Test chart

10.1 占有周波数帯幅及び拡散帯域幅

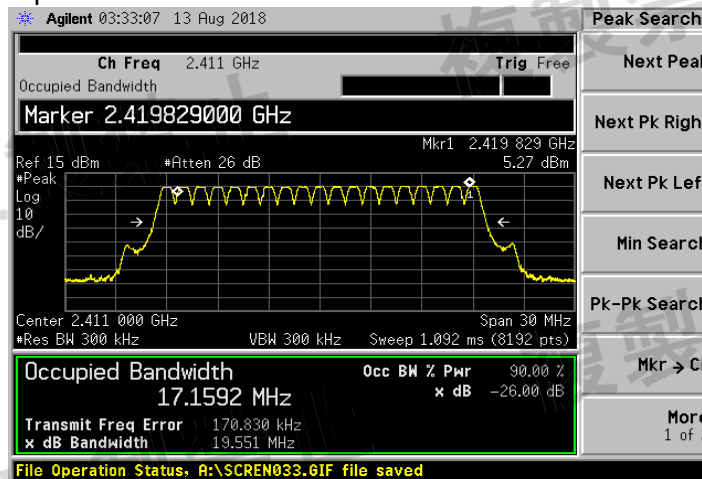
Occupied bandwidth / Spread bandwidth

Ch:Low

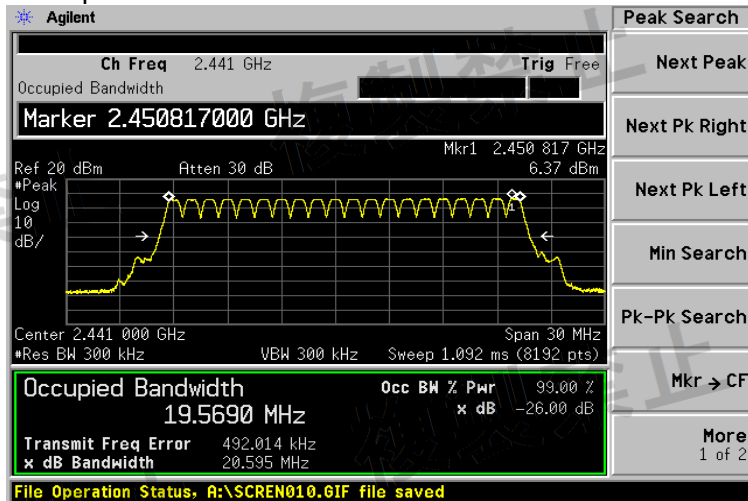
Occupied bandwidth



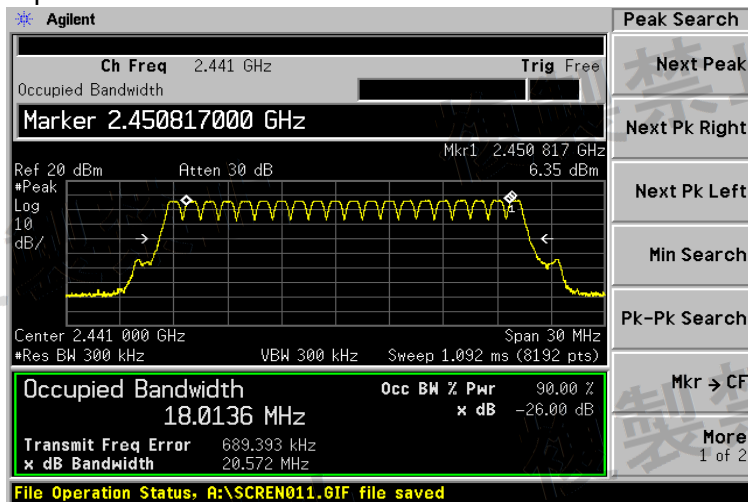
Spread bandwidth



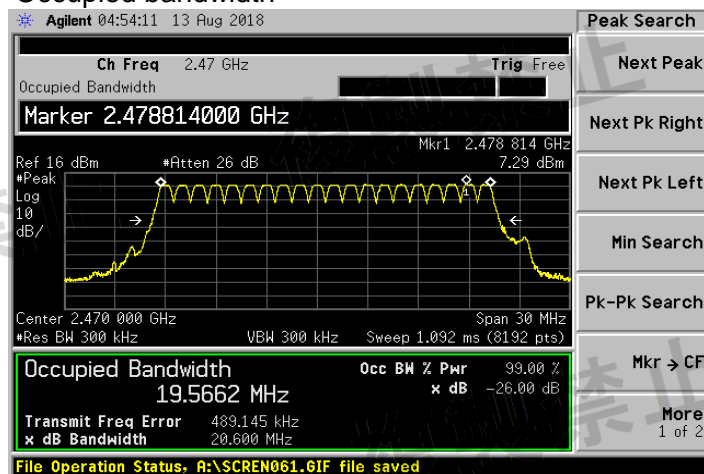
Ch:Middle
Occupied bandwidth



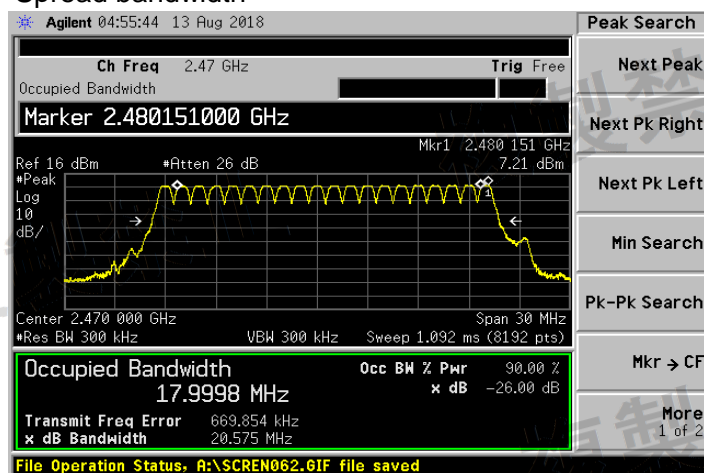
Spread bandwidth



Ch:High
Occupied bandwidth



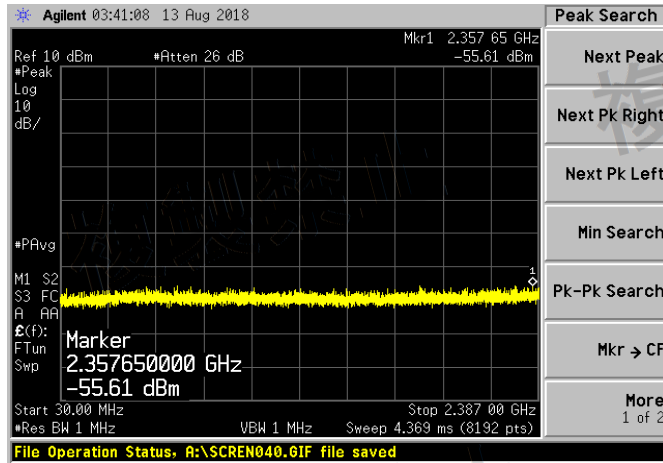
Spread bandwidth



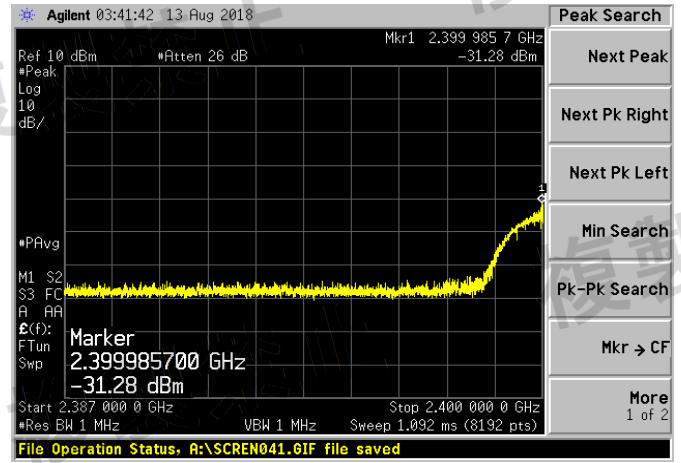
10.2 スプリアス発射又は不要発射の強度 Unwanted(Spurious) emission strength

Ch:Low

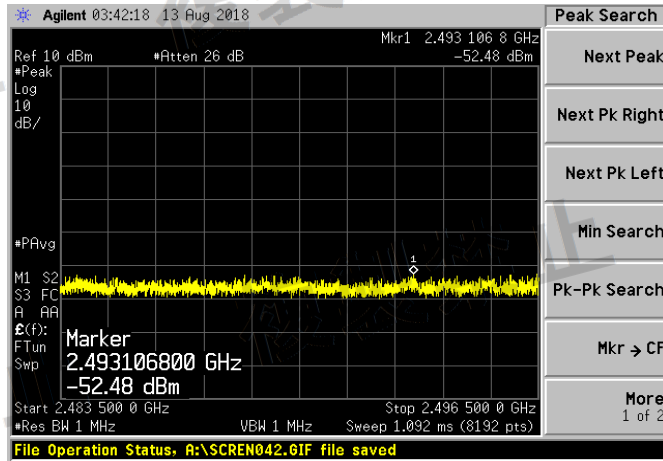
30-2387MHz



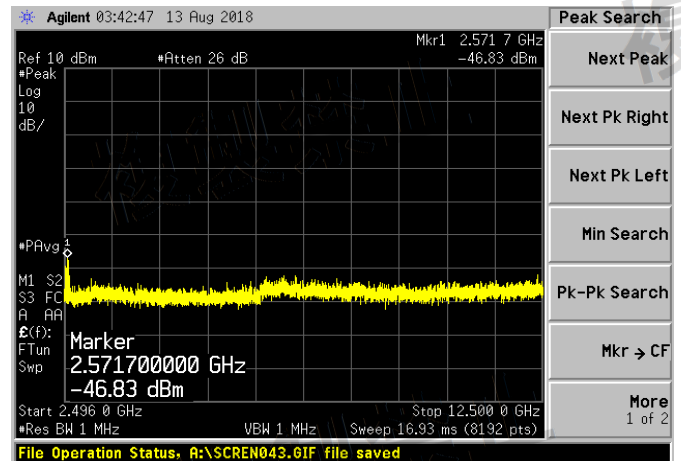
2387-2400MHz



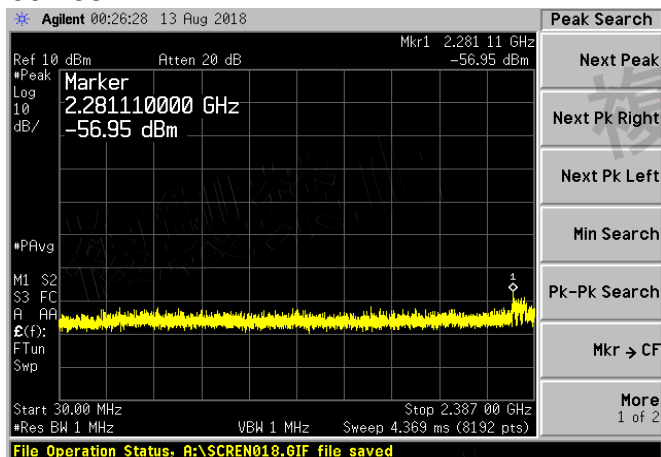
2483.5-2496.5MHz



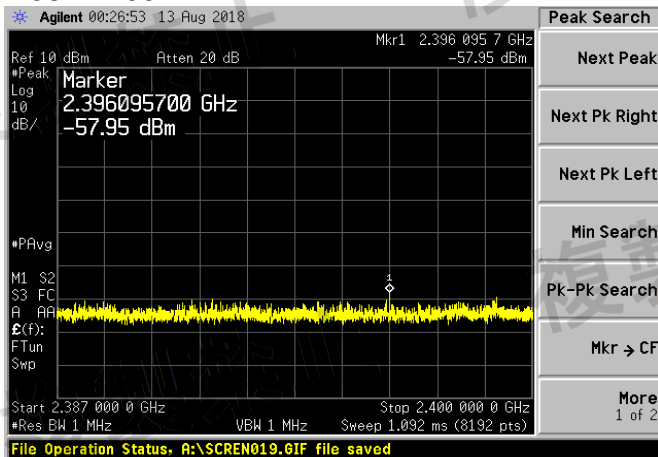
2496.5-12500MHz



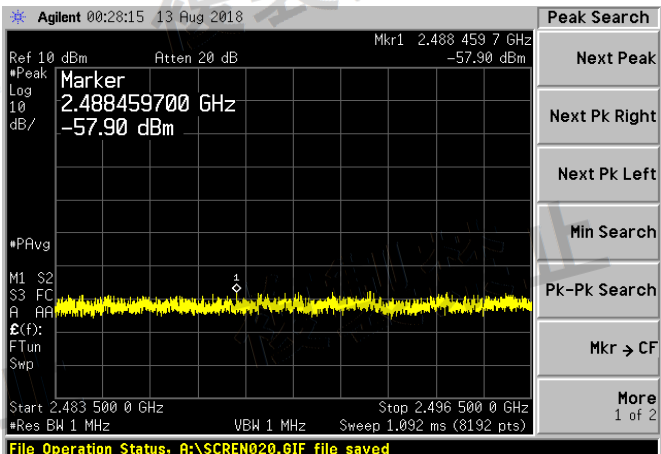
Ch:Middle
30-2387MHz



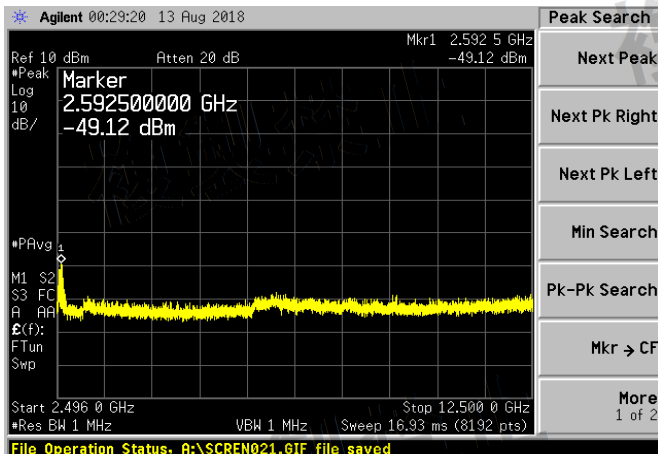
2387-2400MHz



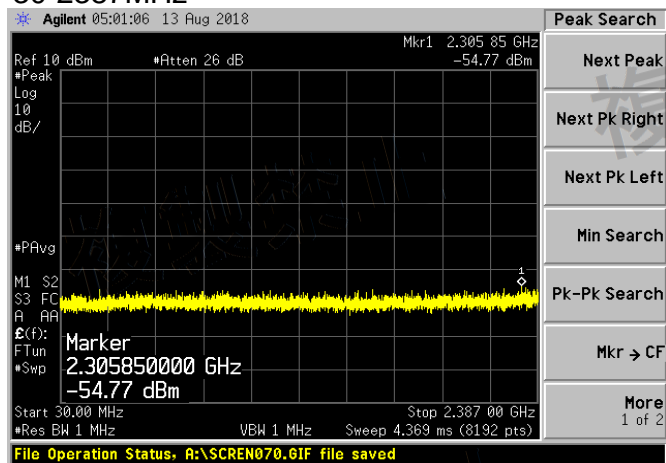
2483.5-2496.5MHz



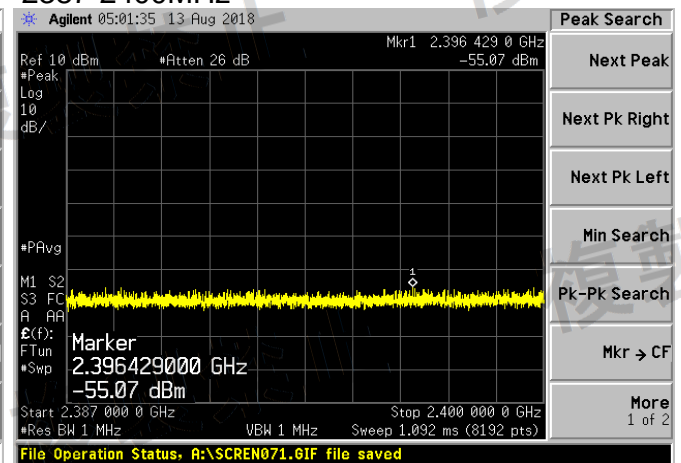
2496.5-12500MHz



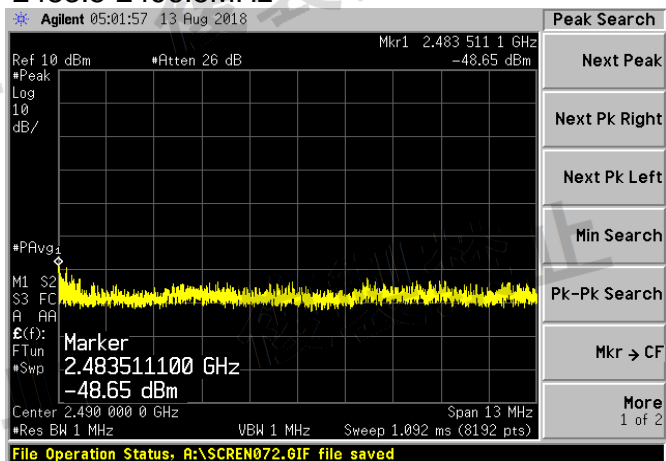
Ch:High
30-2387MHz



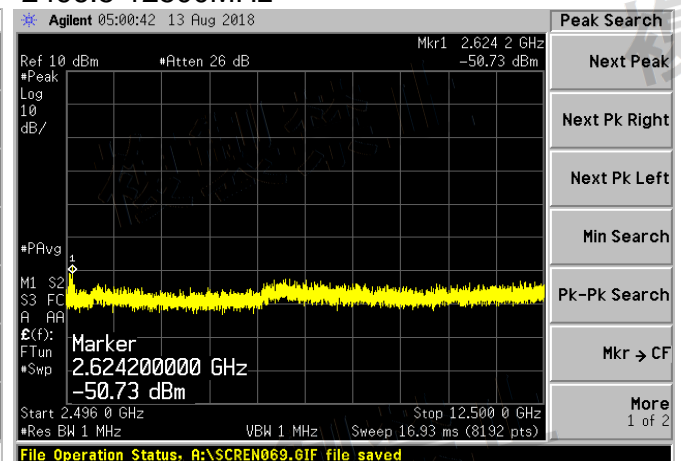
2387-2400MHz



2483.5-2496.5MHz

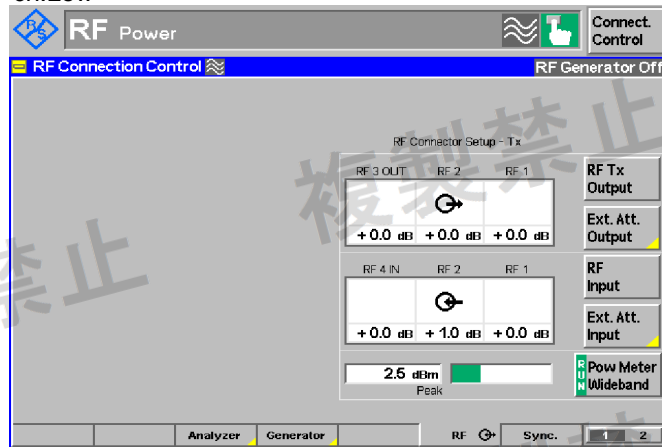


2496.5-12500MHz

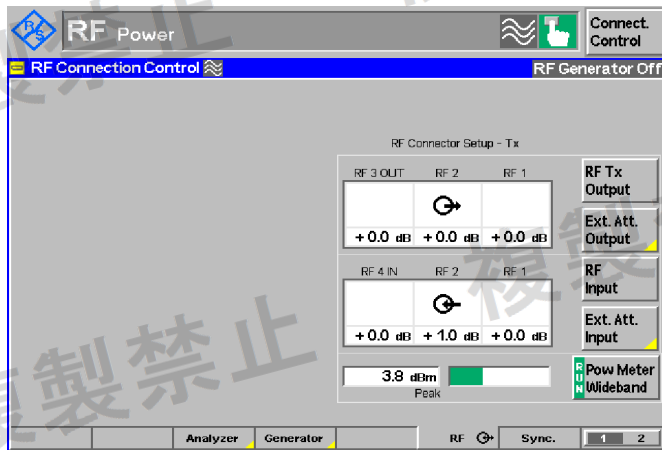


10.3 空中線電力の偏差 RF output power tolerance

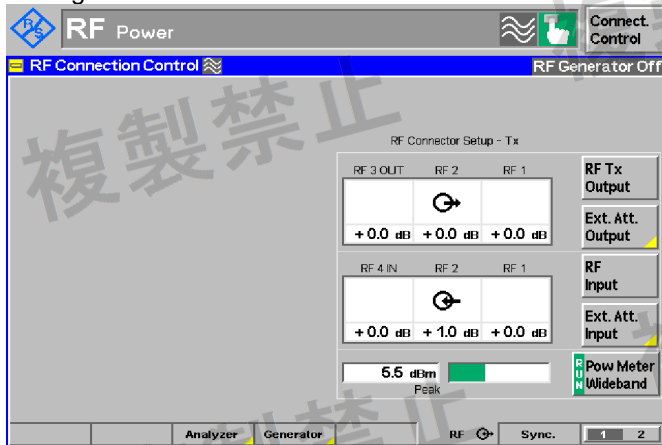
ch:Low



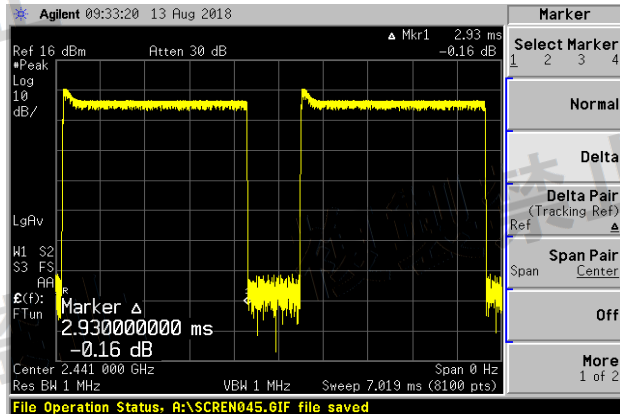
ch:Middle



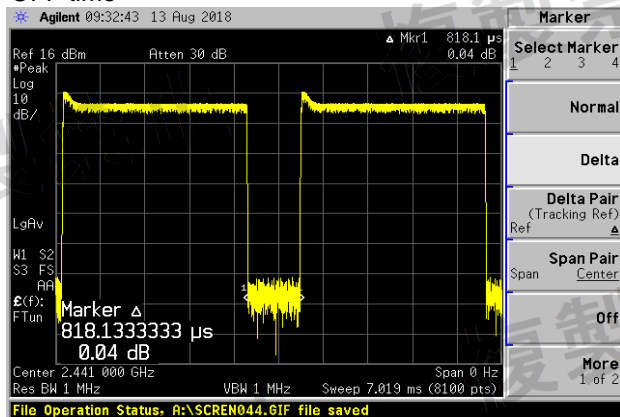
ch:High



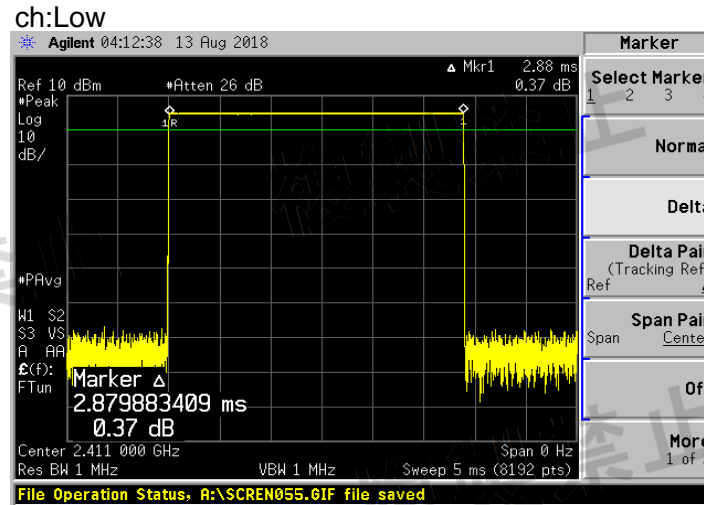
ON time



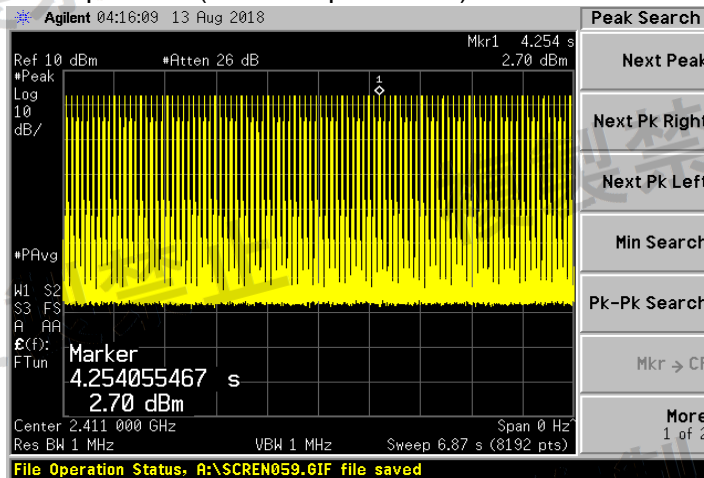
OFF time



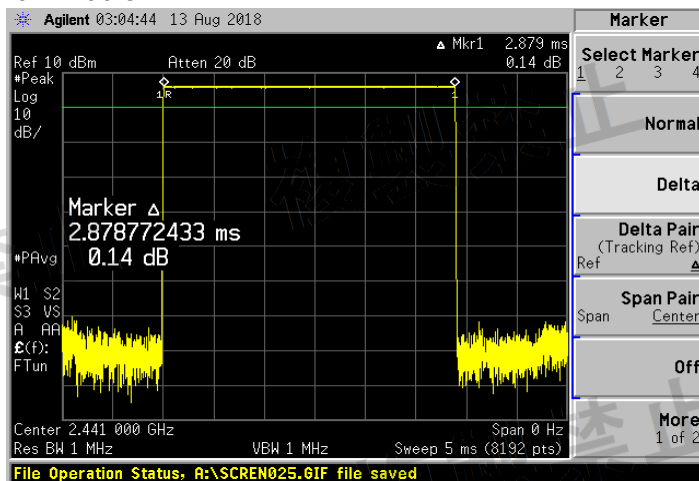
10.4 ホッピング周波数滞留時間 Time of occupancy hopping frequency



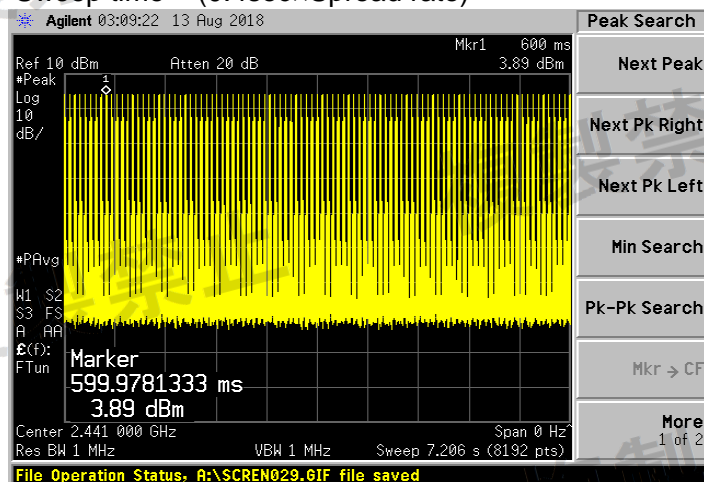
Sweep time = (0.4sec×Spread rate)



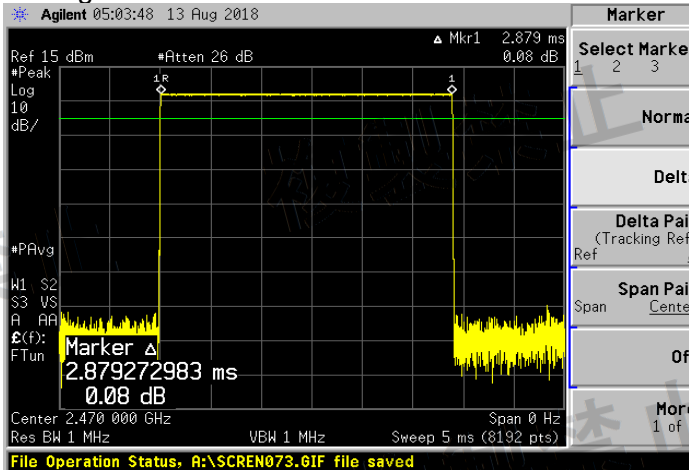
ch:Middle



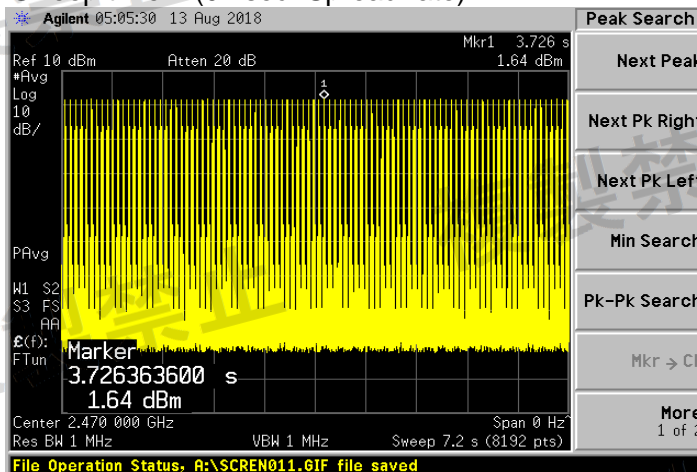
Sweep time = (0.4secxSpread rate)



ch:High



Sweep time = (0.4sec×Spread rate)



9. 試験所の説明

Laboratory description

1. Location

Name: TÜV SÜD PSB Pte. Ltd.

Address: No.1 Science Park Drive, Singapore 118221

Phone: +65-6778-7777

Fax: +65-6779-7088

2. Accreditation and Registration

1) FCC

Test Firm Registration Number: 994109

Designation Number: SG0002

2) SABS

LAB CODE: SABS/A-LAB/0029/2018

3) BSMI

Laboratory Code: SL2-IS-E-6001R [CNS-13803 (ISM Equipment)]

Laboratory Code: SL2-IN-E-6001R [CNS-13438 (IT Equipment)]

Laboratory Code: SL2-R1/R2-E-6001R [CNS-13439 (Broadcast Receivers)]

Laboratory Code: SL2-A1-E-6001R [CNS-13783-1 (Household Appliances)]

Laboratory Code: SL2-L1-E-6001R [CNS-14115 (Lighting Equipment)]

4) Industry Canada

| Site number | Facility | Expiration date |
|-------------|--------------------------------|-----------------|
| 2923I-1 | 3m & 10m Semi-anechoic chamber | 16/01/2020 |

5) VCCI Council

| Registration number | Expiration date |
|---------------------|-----------------|
| R-1335 | 19/02/2020 |
| C-2306 | 14/12/2020 |
| T-1471 | 08/10/2020 |