



Shenzhen CTL Testing Technology Co., Ltd.
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TEST REPORT

Ordinance Article 2 paragraph 1 item (19)

Report Reference No. CTL1805283041-W

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Ivan Xie

Product Name..... Solar Power Generator

Model/Type reference PS300

Trade Mark N/A

Applicant's name 3A Technology Co., Ltd.

Address of applicant Room405, Block C, Gangzhilong Industrial Park, Longhua District, Shenzhen, China

Test Firm Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

Test specification

Standard..... Ordinance Article 2 paragraph 1 item (19)

TRF Originator Shenzhen CTL Testing Technology Co., Ltd.

Master TRF Dated 2011-01

Date of Receipt..... June 06, 2018

Date of Test Date..... June 06, 2018–June 22, 2018

Data of Issue..... June 22, 2018

Result..... Pass

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TEST REPORT

Test Report No. :	CTL1805283041-W	June 22, 2018 Date of issue
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Equipment under Test : Solar Power Generator

Model /Type : PS300

Applicant : **3A Technology Co., Ltd.**

Address : Room405, Block C, Gangzhilong Industrial
Park,Longhua District, Shenzhen, China

Manufacturer : **3A Technology Co., Ltd.**

Address : Room405, Block C, Gangzhilong Industrial
Park,Longhua District, Shenzhen, China

Test result	Pass *
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* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

**** Modified History ****

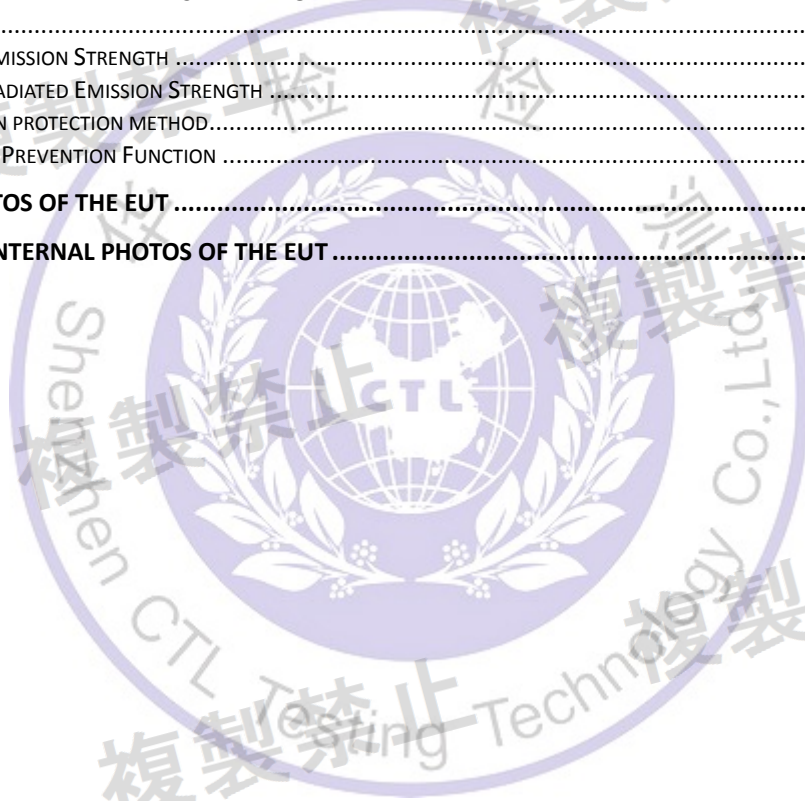
Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2018-06-22	CTL1805283041-W	Tracy Qi



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1. SUMMARY

1.1. Test Standards

The tests were performed according to following standards:

[MIC Notice No.88 Appendix No.43](#)

1.2. Test Description

Test Item	Result
Frequency Error	Pass
Antenna Output Power and Output Power Tolerance	Pass
Occupied Bandwidth and Spread spectrum bandwidth	Pass
Dwell time	Pass ^{Note 1}
Unwanted Emission Strength	Pass
Secondary Radiated Emission Strength	Pass
Construction protection method	Pass
Interference Prevention Function	Pass

Note1: Only applicable to FHSS system.

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shaheixi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

1.3.1 Laboratory accreditation

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

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 399832

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4. Measurement Uncertainty

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with TR100028-1 [2] and shall correspond to an expansion factor (coverage factor) $K=1.96$ or $K=2$ (which provide confidence levels of respectively 95% and 95.5% in the case where the distributions characterizing the actual measurement uncertainties are normal.

Parameter	Uncertainty
Frequency error / 99%&90% bandwidth	$\pm 1.62 \times 10^{-6}$
Total RF power, conducted	$\pm 0.8\text{dB}$
Spurious emissions, conducted	$\pm 0.8\text{dB}$
DC and low frequency voltages	$\pm 0.05\%$
Humidity	$\pm 5\%$
Temperature	$\pm 1^\circ\text{C}$

2. GENERAL INFORMATION

2.1. Environmental conditions

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

Voltage	Normal Voltage	AC 100V
	High Voltage	AC 110V
	Low Voltage	AC 90V
Other	Normal Temperature	25°C
	Relative Humidity	55 %
	Air Pressure	989 hPa

Note : As the EUT was powered by AC 100V , We have tested and found output voltage float not exceed $\pm 1\%$ when working on extreme voltage, so all test performed at nominal input voltage only.

2.2. General Description of EUT

Product Name:	Solar Power Generator
Model/Type reference:	PS300
Power supply:	AC 100V
Hardware version:	V1.0
Software version:	V1.0
Bluetooth BR/EDR	
Version:	Supported Bluetooth BR/EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation frequency:	2402MHz~2480MHz
Channel number:	79
Channel separation:	1MHz
Antenna type:	PCB Antenna
Antenna gain:	1.08dBi
Bluetooth BLE	
Supported type:	Version 4.0 for low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2 MHz
Antenna type:	PCB Antenna
Antenna gain:	1.08dBi

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.3. Description of Test Modes

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

Operation Frequency List Bluetooth BR/EDR :

Channel	Frequency (MHz)
00	2402
01	2403
⋮	⋮
38	2440
39	2441
40	2442
⋮	⋮
77	2479
78	2480

Operation Frequency List BLE :

Channel	Frequency (MHz)
00	2402
01	2404
02	2406
⋮	⋮
19	2440
⋮	⋮
37	2476
38	2478
39	2480

Note: Test performed at the lowest/middle/highest frequencies selected in the list above for EUT supported while working on specified mode.

2.4. Measurement Instruments List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Institution	Calibration Date	Calibration Due Date
1	Spectrum Analyzer	Agilent	N9020	US46220290	Shenzhen Academy of metrology & Quality Inspection	2018/01/16	2019/01/15
2	Signal generator	agilent	N5182A	MY47420864	Shenzhen Academy of metrology & Quality Inspection	2018/05/19	2019/05/18

Note: Calibration by the calibration agencies listed in the table correspond to paragraph 4 (ii) (c) of Article 24-2 in the Radio Law".

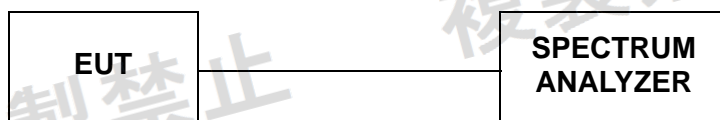
3. Test conditions and Results

3.1. Frequency Error

LIMIT

50ppm

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: non-modulation

Spectrum Condition:

- Frequency: test frequency
- Span: 300 KHz
- RBW: 10 KHz
- VBW: 30 KHz
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

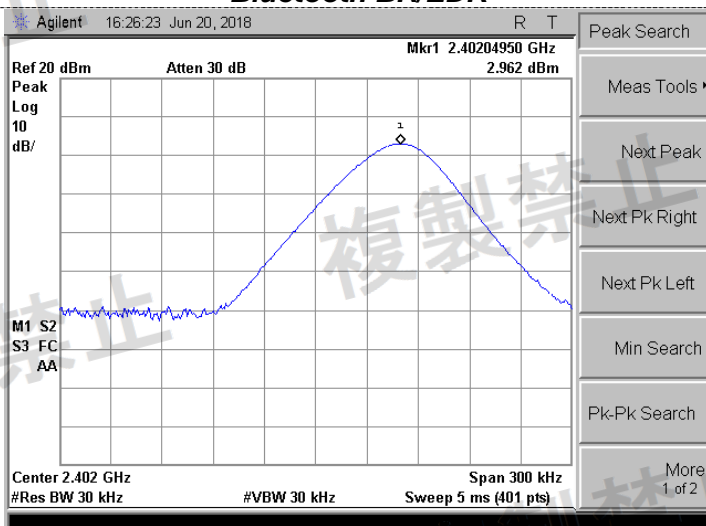
TEST RESULTS

Bluetooth BR/EDR

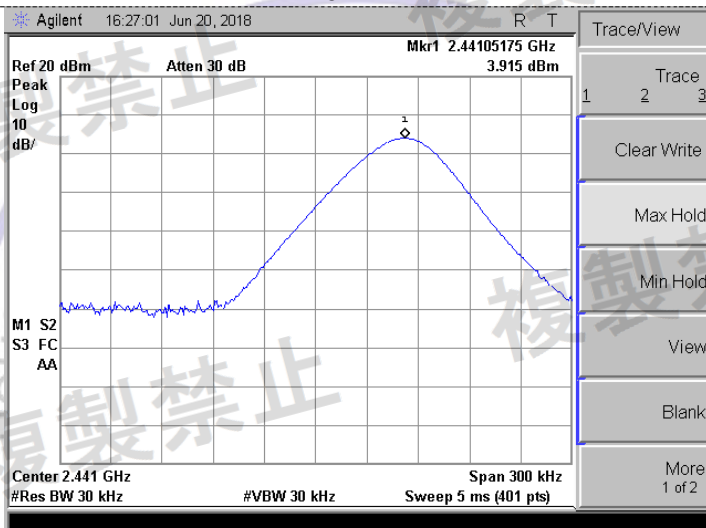
Test Condition	Frequency (MHz)	Read (MHz)	Deviation (MHz)	Tolerance (ppm)	Limit (ppm)	Result
Non-modulation	2402.00	2402.04950	0.04950	20.61	50.00	Pass
	2441.00	2441.05175	0.05175	21.20		
	2480.00	2480.05475	0.05475	22.08		

BLE

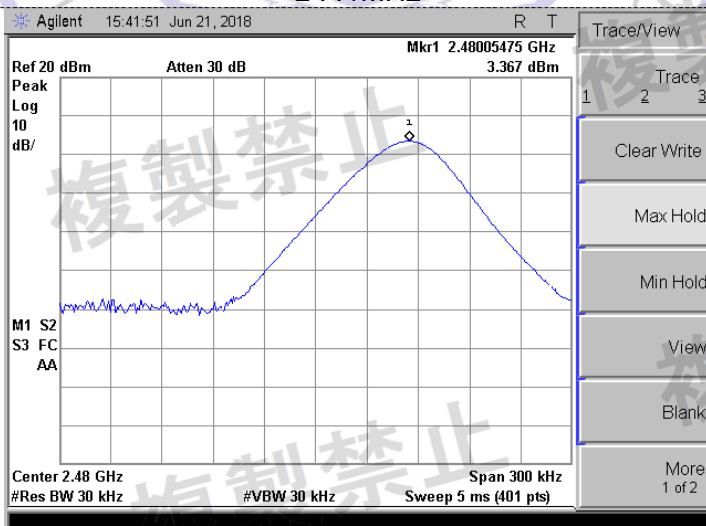
Test Condition	Frequency (MHz)	Read (MHz)	Deviation (MHz)	Tolerance (ppm)	Limit (ppm)	Result
Non-modulation	2402.00	2402.04875	0.04875	20.30	50.00	Pass
	2440.00	2440.05175	0.05175	21.21		
	2480.00	2480.05400	0.05400	21.77		

Bluetooth BR/EDR

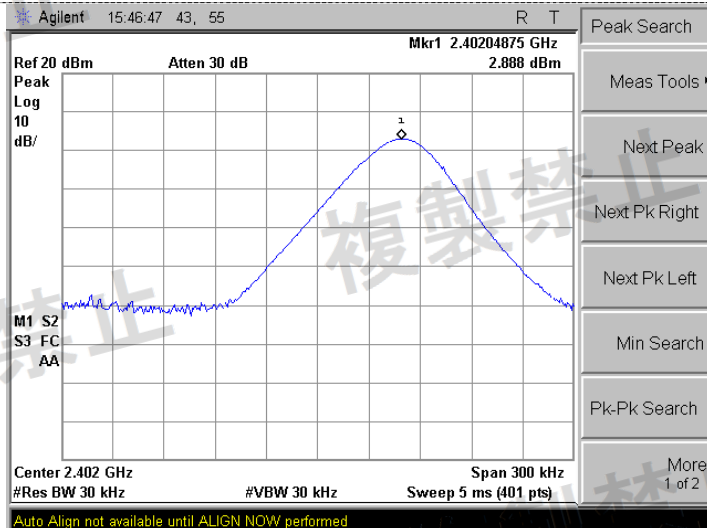
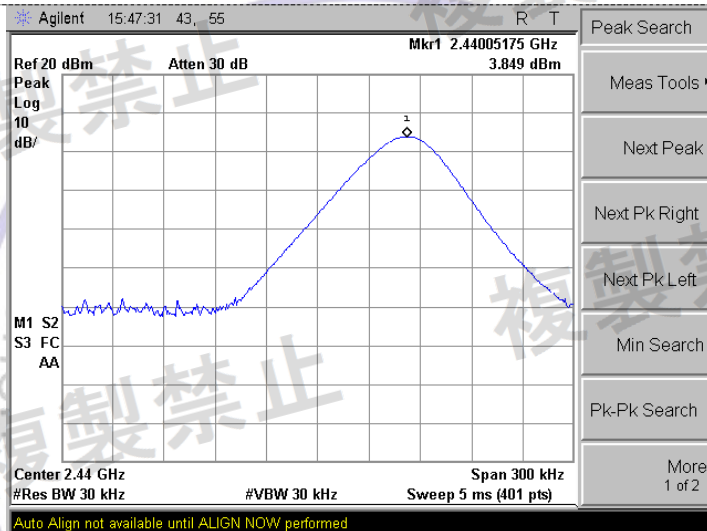
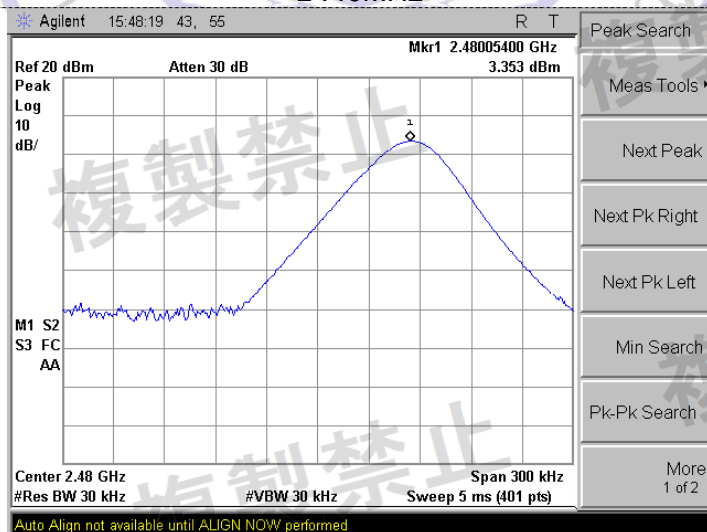
2402 MHz



2441MHz



2480MHz

BLE**2402 MHz****2440MHz****2480MHz**

3.2. Antenna Output Power and Output Power Tolerance

LIMIT

- $\leq 3 \text{ mW /MHz}$ (FHSS from 2402-2480 MHz)
- $\leq 10 \text{ mW/MHz}$ (OFDM, DSSS from 2400-2483.5 MHz)
- $\leq 10 \text{ mW}$ (other from 2400-2483.5 MHz)

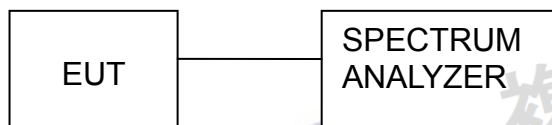
The Output Power Tolerance must be within +20%, -80%.

E.i.r.p:

- $\leq 12.14 \text{ dBm/MHz}$ (OFDM, DS form 2400-2483.5 MHz)

Note: E.I.R.P will not be applied to the transmission antenna which has a gain of 2.14dBi or less.

TEST CONFIGURATION



TEST PROCEDURE

Step 1:

Connect the UUT to the spectrum analyzer as TEST CONFIGURATION and use the following settings:

- Centre Frequency: The centre frequency of the channel under test.
- RBW: 1 MHz
- VBW: 1 MHz
- Span: Wide enough to cover the complete power envelope of the signal of the UUT.
- Detector: Peak
- Trace Mode: Max Hold

Step 2:

When the trace is complete, find the peak value of the power envelope and record the frequency.

Step 3:

Make the following changes to the settings of the spectrum analyzer:

- Centre Frequency: Equal to the frequency recorded in step 2.
- Span: 0 MHz
- RBW: 1 MHz
- VBW: 1 MHz
- Detector: RMS
- Trace Mode: Clear Write

TEST RESULTS**Bluetooth BR/EDR**

Modulation type	Channel (MHz)	Average burst power(dBm)	Output power (mW/MHz)	Limit (mW/MHz)	Rated output power (mW/MHz)	Tolerance (%)	Limit	Result
GFSK	2402	2.482	1.771	3.00	3.00	-40.97%	-80%~20%	Pass
	2441	3.370	2.173	3.00	3.00	-27.58%		
	2480	4.611	2.891	3.00	3.00	-3.62%		
Pi/4QPSK	2402	4.507	2.823	3.00	3.00	-5.90%		
	2441	4.732	2.973	3.00	3.00	-0.90%		
	2480	4.380	2.742	3.00	3.00	-8.61%		
8DPSK	2402	4.637	2.909	3.00	3.00	-3.04%		
	2441	4.371	2.736	3.00	3.00	-8.80%		
	2480	4.516	2.829	3.00	3.00	-5.71%		

Remark:

- For GFSK modulation, Pre-scan all kind of packet type DH1, DH3, DH5, found the DH5 which it worse case mode,
- For Pi/4QPSK modulation, pre-scan all kind of packet type 2DH1, 2DH3, 2DH5, found the 2DH5 which it worse case mode
- For 8DPSK modulation, pre-scan all kind of packet type 3DH1, 3DH3, 3DH5, found the 3DH5 which it worse case mode

BLE

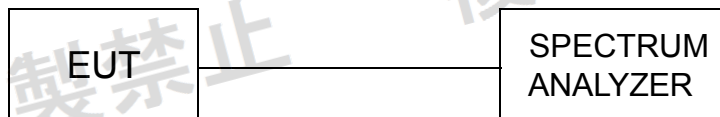
Mode	Channel (MHz)	Average burst power(dBm)	Output power (mW)	Limit (mW)	Rated output power (mW)	Tolerance (%)	Limit	Result
BLE	2402	2.725	1.873	10.00	2.00	-6.36%	-80%~20%	Pass
	2440	3.014	2.002	10.00	2.00	0.09%		
	2480	3.128	2.055	10.00	2.00	2.75%		

3.3. OCCUPIED BANDWIDTH AND SPREADING BANDWIDTH

LIMIT

- Occupied bandwidth: FH \leq 83.5 MHz; OFDM \leq 38 MHz, DS \leq 26 MHz; Others \leq 26 MHz
- Spread Bandwidth: \geq 500 kHz(FH,DS)
- Spread factor $>$ 5.

TEST CONFIGURATION



TEST PROCEDURE

- Setting of SA is following as follow:
 - RBW: under 3% of OBW
 - VBW: = RBW
 - Sweep time: Auto
 - Sweep Mode: Continuous sweep
 - Detect mode: Positive peak
 - Trace mode: Max hold
- EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 99% of occupied bandwidth to measure occupied bandwidth.
- EUT have transmitted the maximum modulation signal and fixed channelize. SA set to 90% of occupied bandwidth to measure spread bandwidth.
- Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1Mbps (declare by client)

TEST RESULTS

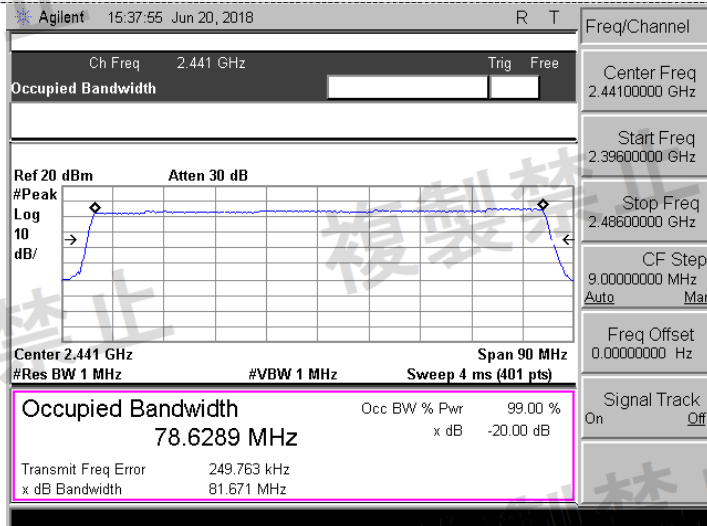
Bluetooth BR/EDR

Type	Channel (MHz)	Occupy Bandwidth (MHz)	Limit (MHz)	Result
GFSK	2402-2480	78.6289	<83.5	Pass
Pi/4QPSK	2402-2480	78.7814		
8DPSK	2402-2480	78.7607		

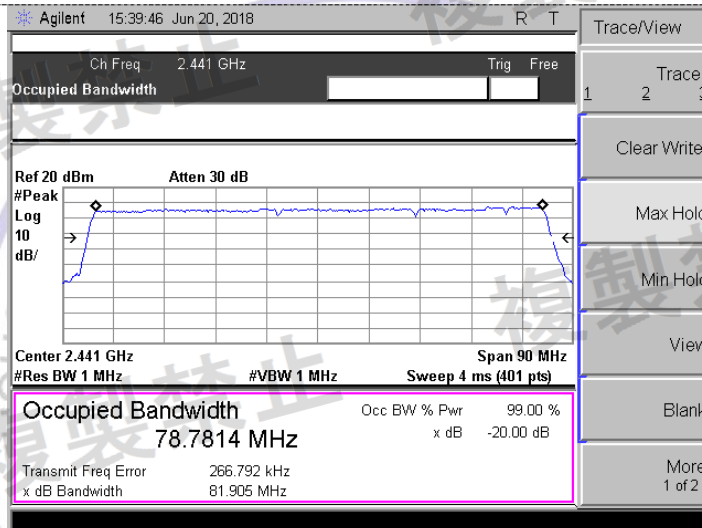
BLE

Type	Channel (MHz)	Occupy Bandwidth (MHz)	Limit (MHz)	Result
GFSK	2402	1.0742	<26	Pass
	2440	1.0757		
	2480	1.0795		

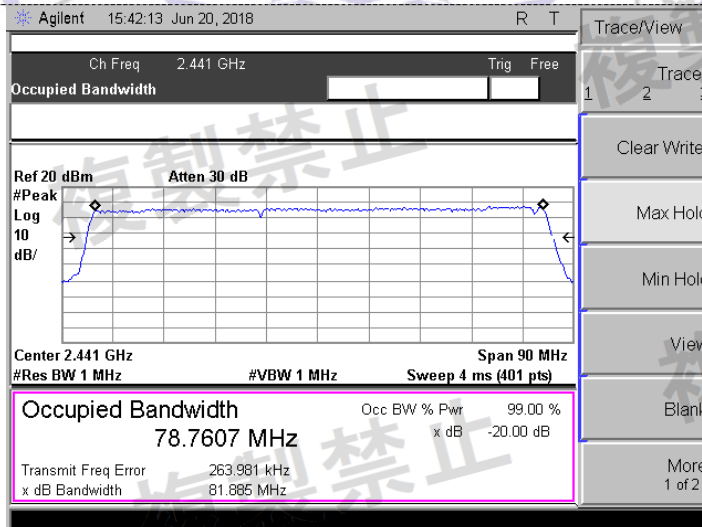
Bluetooth BR/EDR



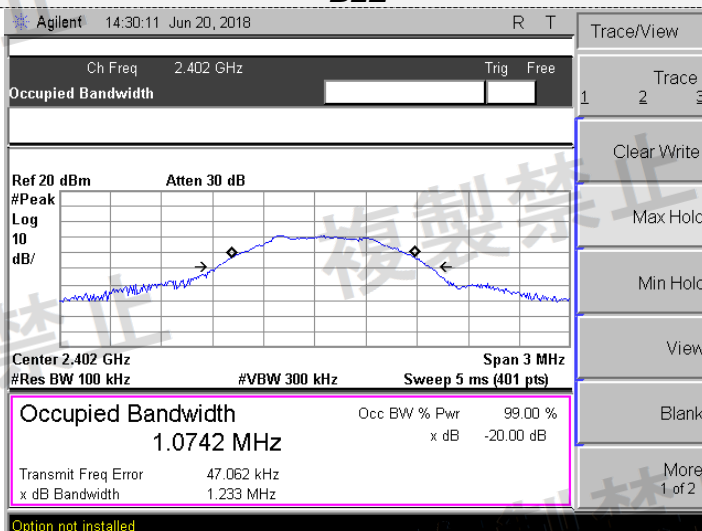
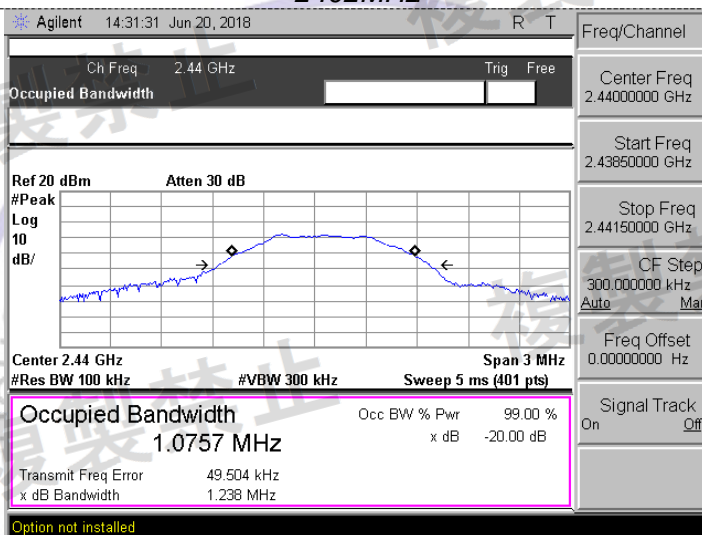
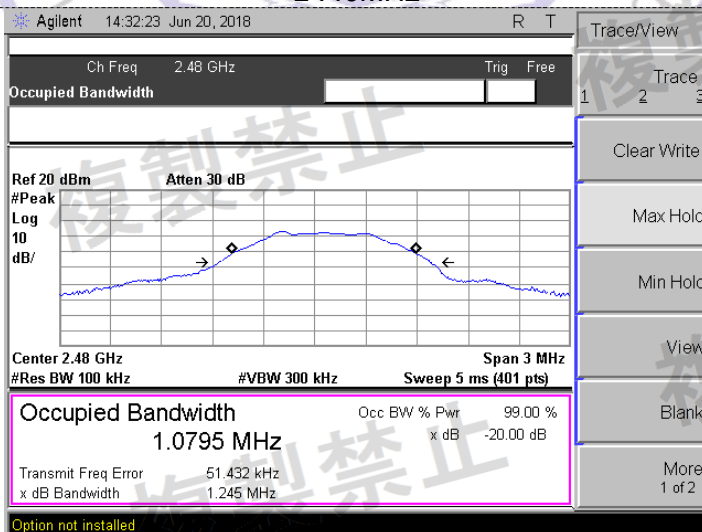
GFSK



Pi/4QPSK



8DPSK

BLE**2402MHz****2440MHz****2480MHz**

Bluetooth BR/EDR

Type	Channel (MHz)	Spread Bandwidth (MHz)	Spread Factor	Spread Bandwidth Limit (MHz)	Spread Factor Limit	Result
GFSK	2402-2480	71.1786	71.1786	≥ 0.5	>5	Pass
PI/4QPSK	2402-2480	71.0704	71.0704			
8DPSK	2402-2480	71.1459	71.1459			

Note: Spread Factor=Spread Bandwidth/modulation rate. The modulation rate: MR=1Mbps (declare by client)

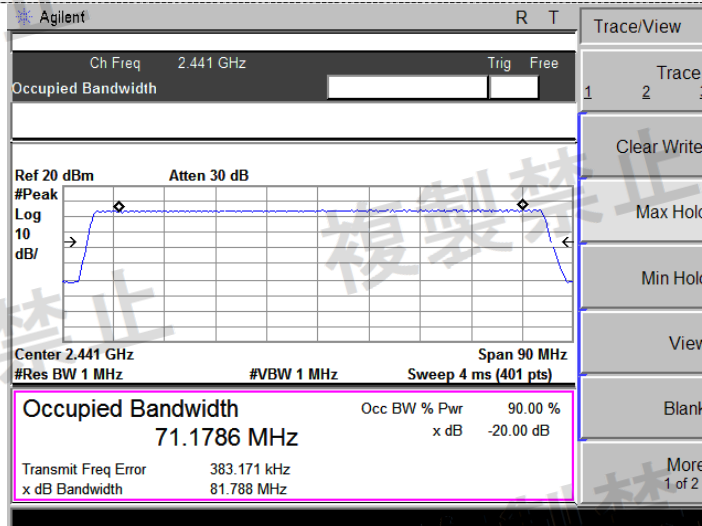
BLE

Type	Channel (MHz)	Spread Bandwidth (MHz)	Spread Factor	Spread Bandwidth Limit (MHz)	Spread Factor Limit	Result
BLE	2402	0.7009279	N/A	≥ 0.5	N/A	Pass
	2440	0.7001857				
	2480	0.7002001				

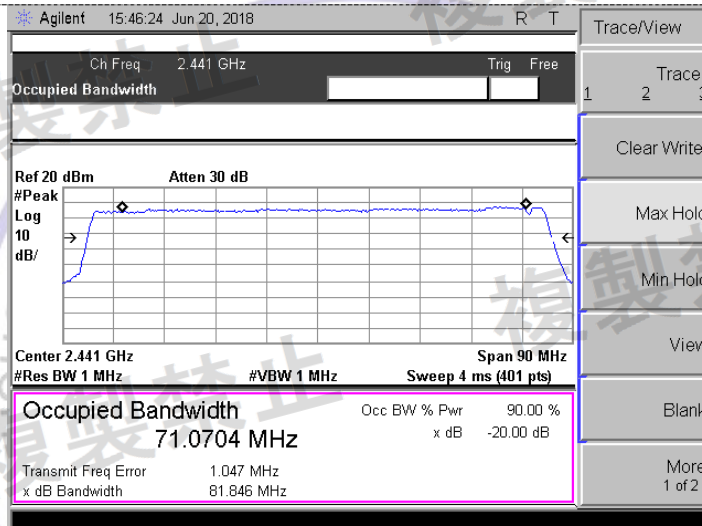
Note: N/A means not applicable to this modulation type.



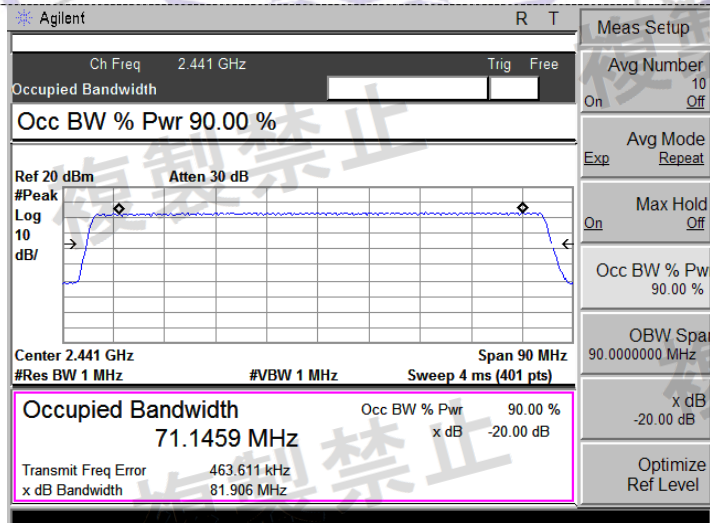
Bluetooth BR/EDR



GFSK

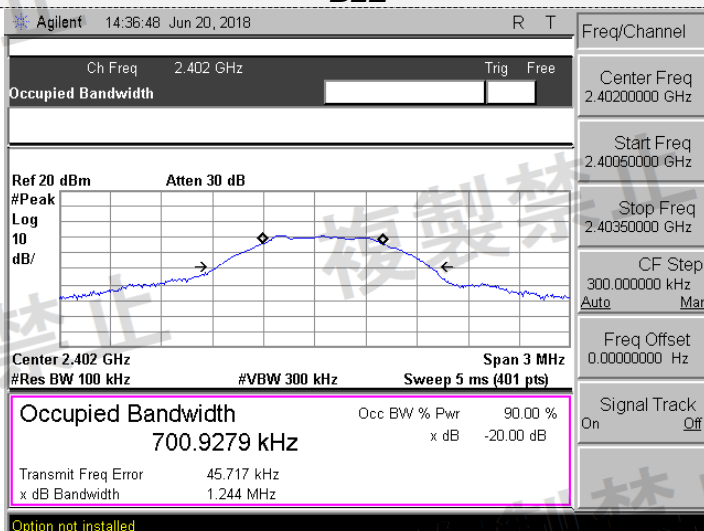


Pi/4QPSK

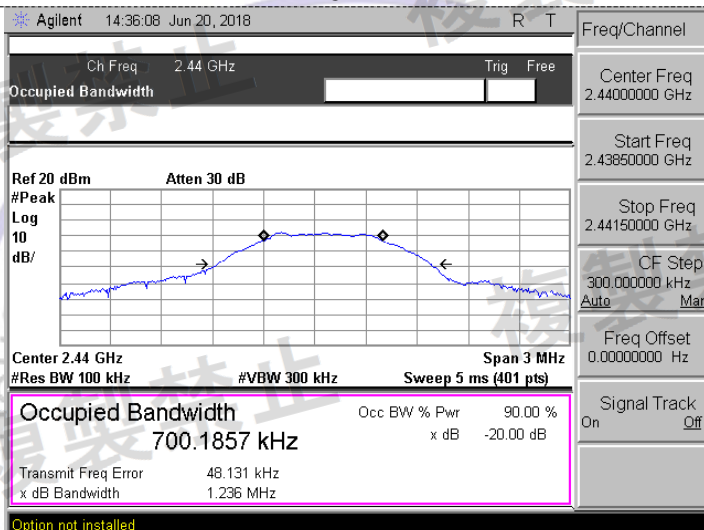


8DPSK

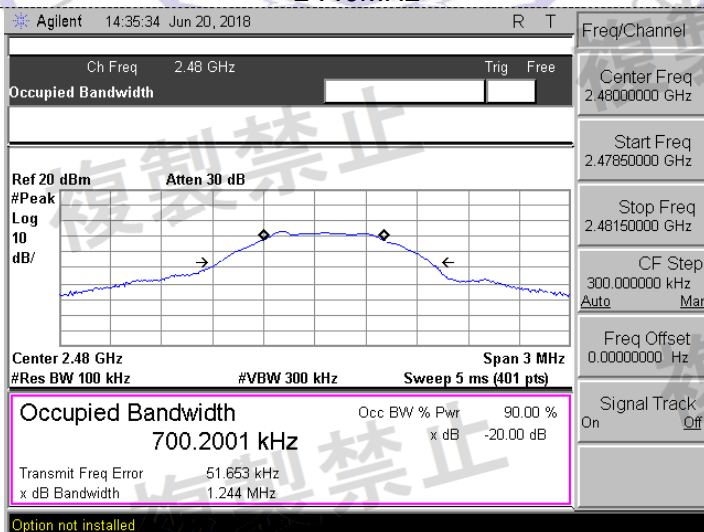
BLE



2402MHz



2440MHz



2480MHz

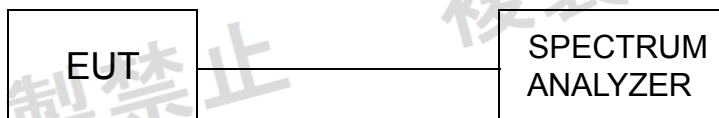
3.4. Dwell time

LIMIT

0.4 second or less

NOTE: Dwell time only applicable to HFSS system device.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

EUT Condition: modulation

Spectrum Condition:

- Frequency: test channel
- Span=0MHz
- RBW: 1MHz
- VBW: 1MHz
- Sweep time: Auto
- Detector mode: Positive peak

TEST RESULTS

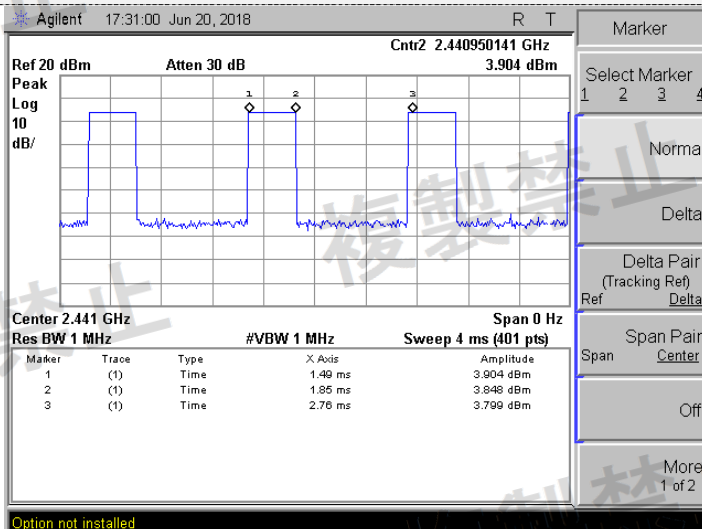
Type	spreading rate	transmission time of 1 burst (ms)	burst cycle (ms)	Channel numbers	Dwell time (second)	Limit (second)	Result
DH1/2-DH1/3-DH1	71.2086	0.36	1.27	79	0.1022	0.4	Pass
DH3/2-DH3/3-DH3	71.0704	1.594	2.513	79	0.2283		
DH5/2-DH5/3-DH5	71.6828	2.85	3.775	79	0.2740		

Remark: Dwell time=0.4 x (spreading rate)x(transmission time of 1 burst)/[(burst cycle)x(No. of hopping channels)]

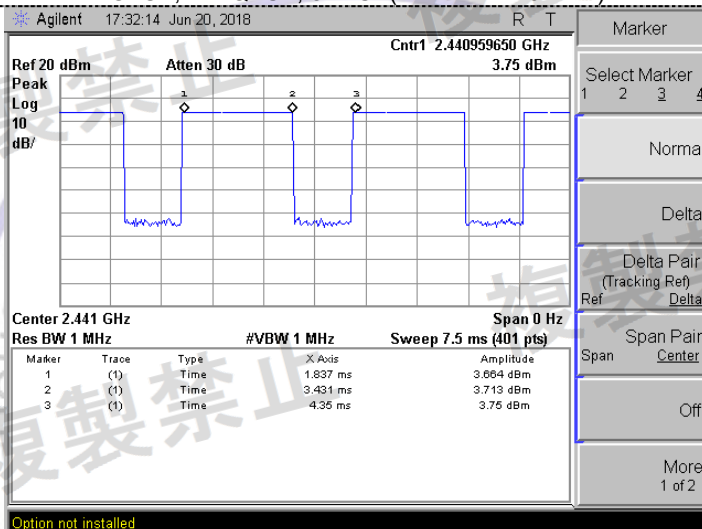
Spreading rate= [spread bandwidth (actual measurement value)]/ transmission rate

Transmission rate is 1Mbps (declare by client)

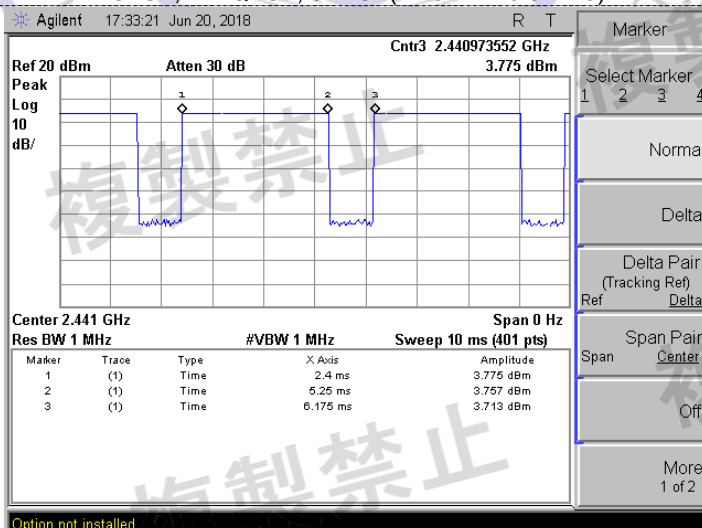
Dwell Time



GFSK, PI/4QPSK, 8DPSK(DH1/2-DH1/3-DH1)



GFSK, PI/4QPSK, 8DPSK(DH3/2-DH3/3-DH3)



GFSK, PI/4QPSK, 8DPSK (DH5/2-DH5/3-DH5)

3.5. Unwanted Emission Strength

LIMIT

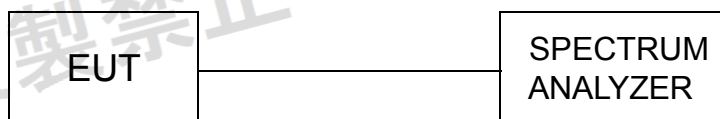
Below 2387 MHz: 2.5 μ W/MHz or less

2387 to 2400 MHz: 25 μ W/MHz or less

2483.5 Through 2496.5 MHz: 25 μ W/MHz or less

Over 2496.5 MHz: 2.5 μ W/MHz or less

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

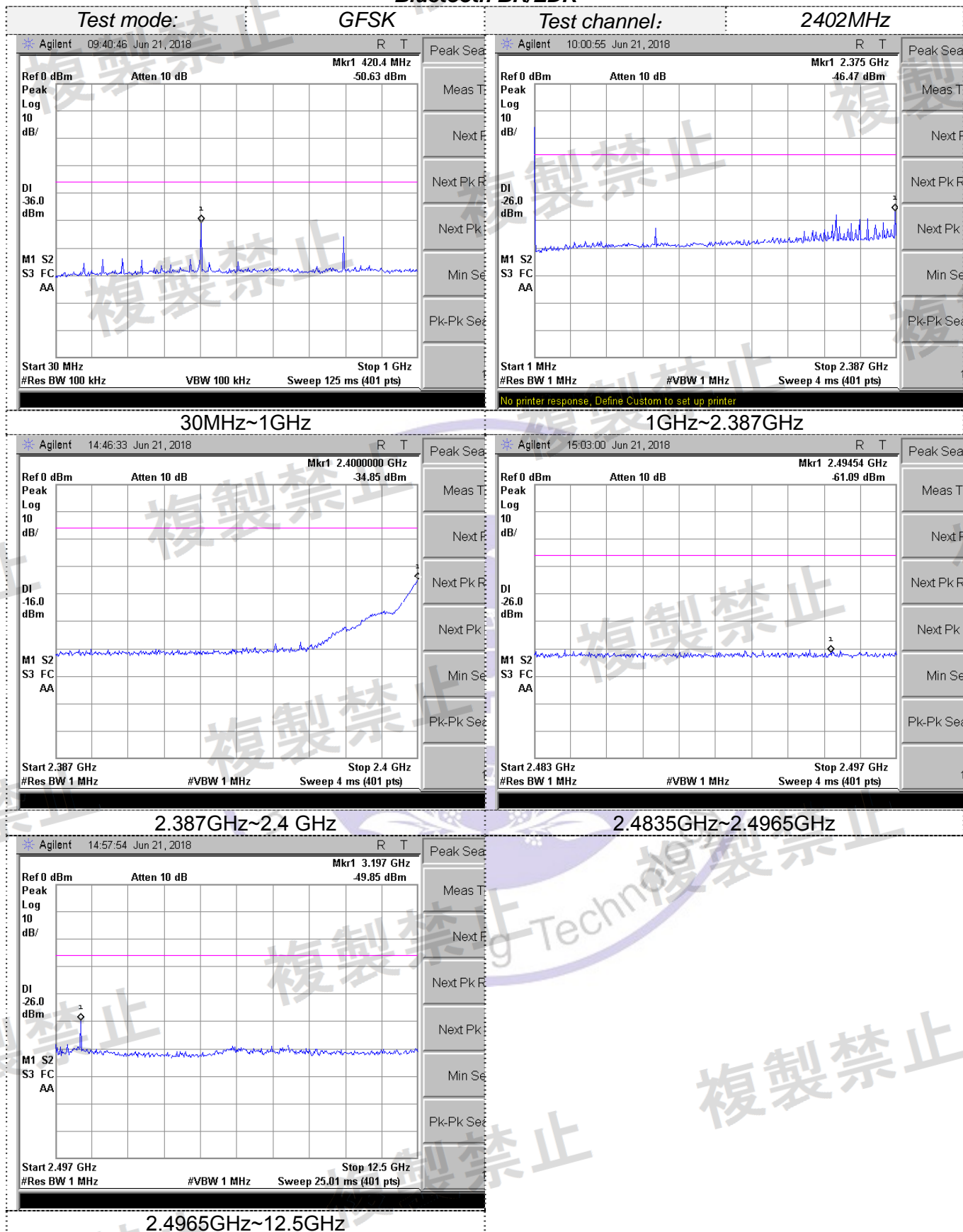
EUT Condition: modulation

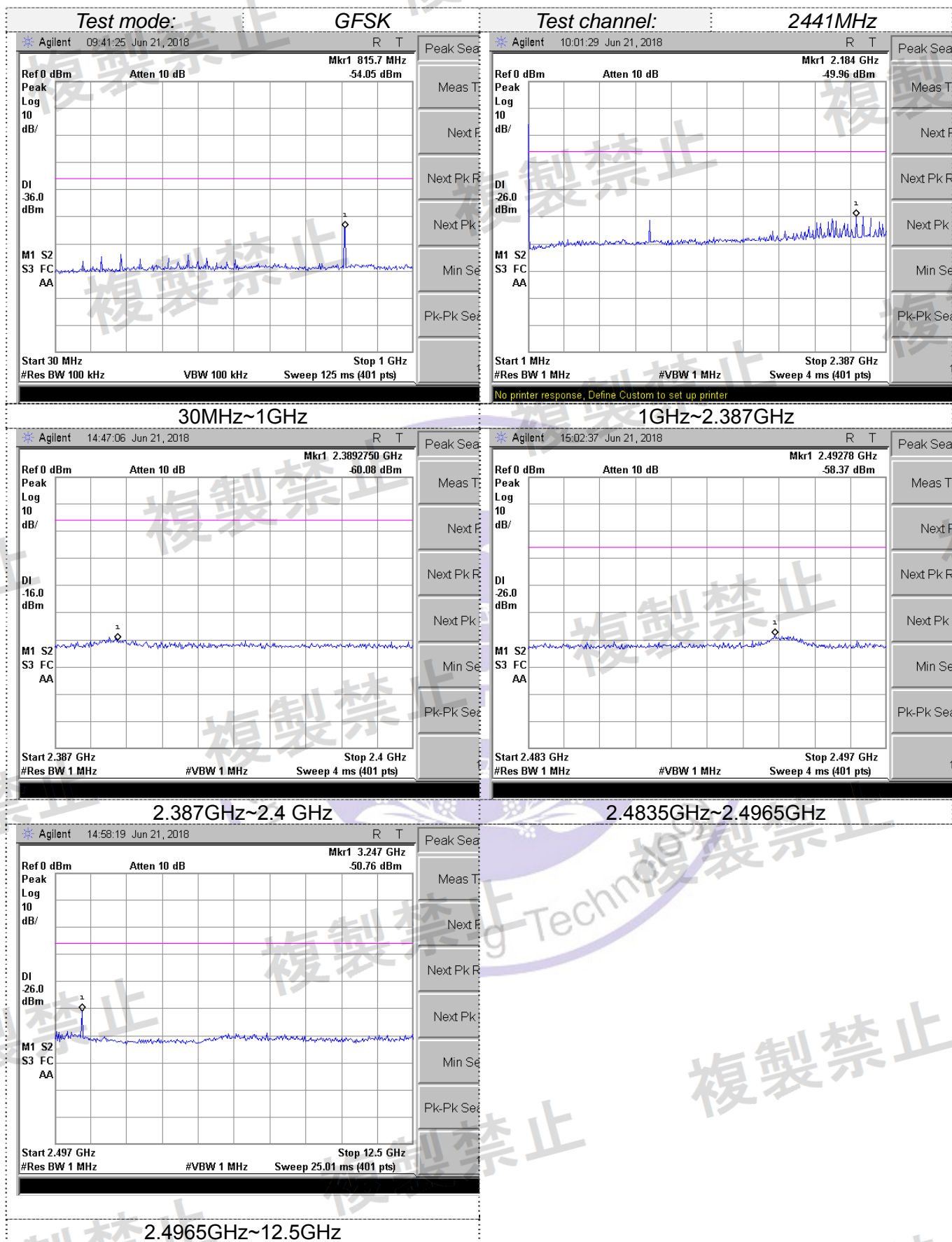
Spectrum Condition:

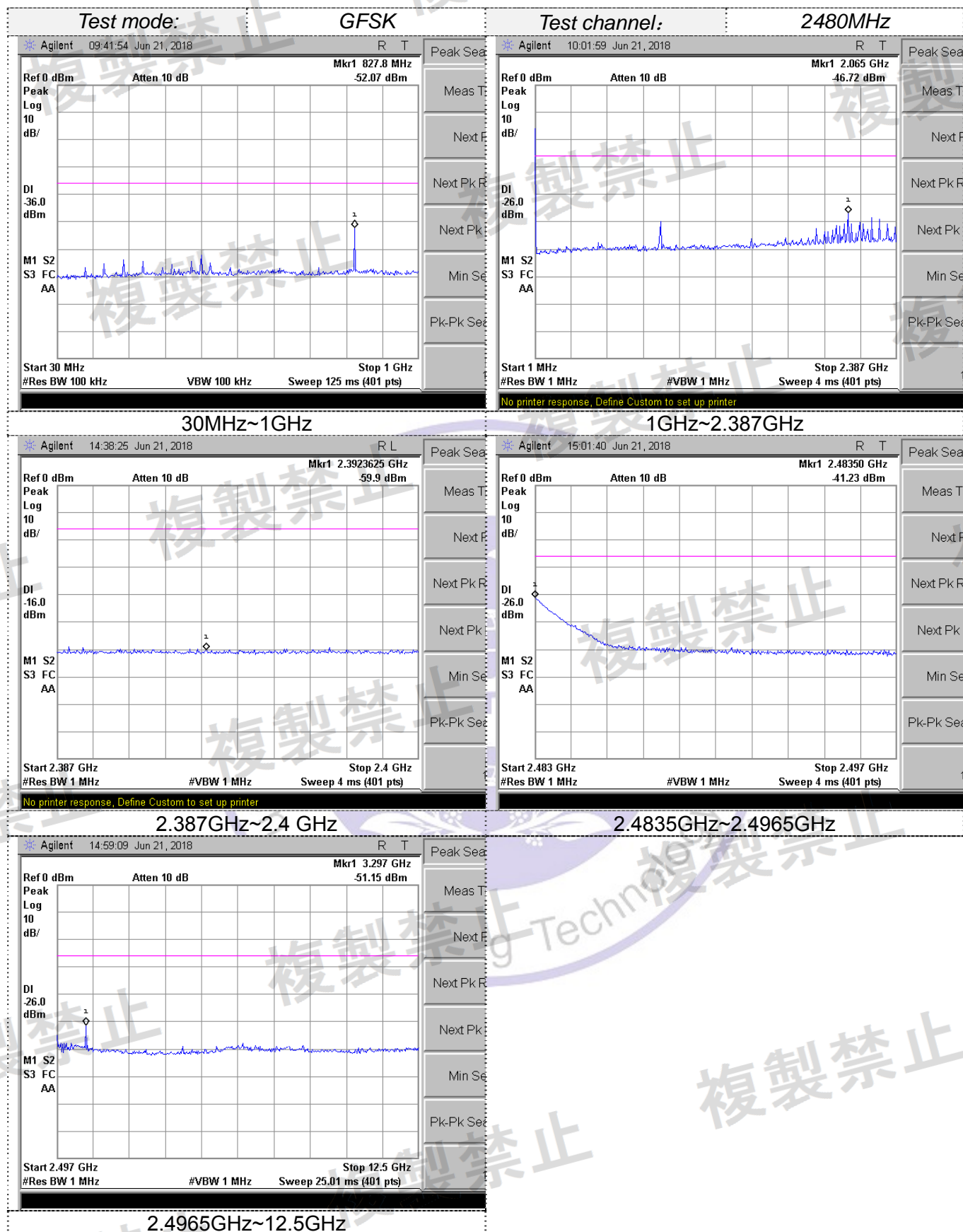
- Frequency: 30MHz-13GHz
- RBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- VBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

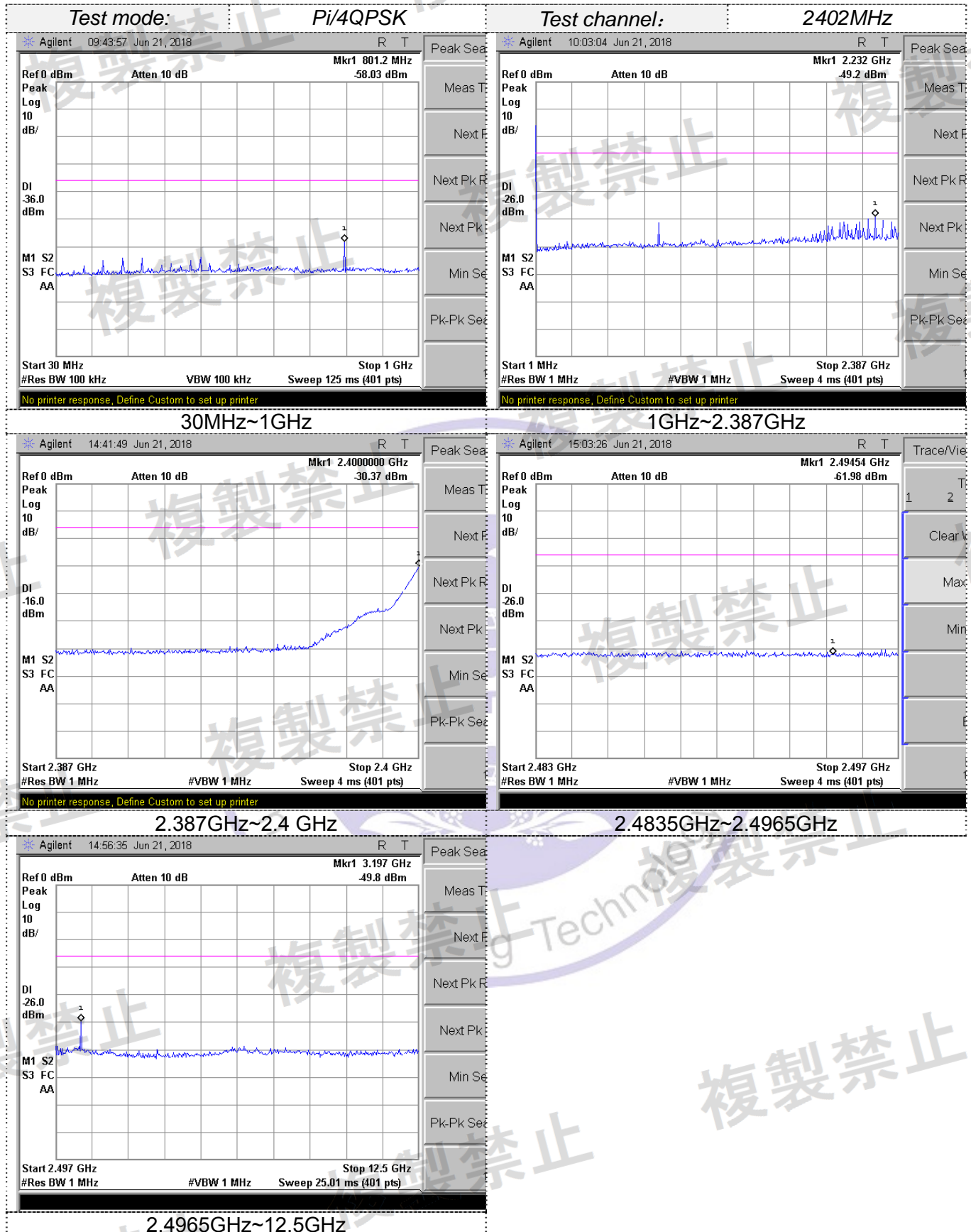
TEST RESULTS

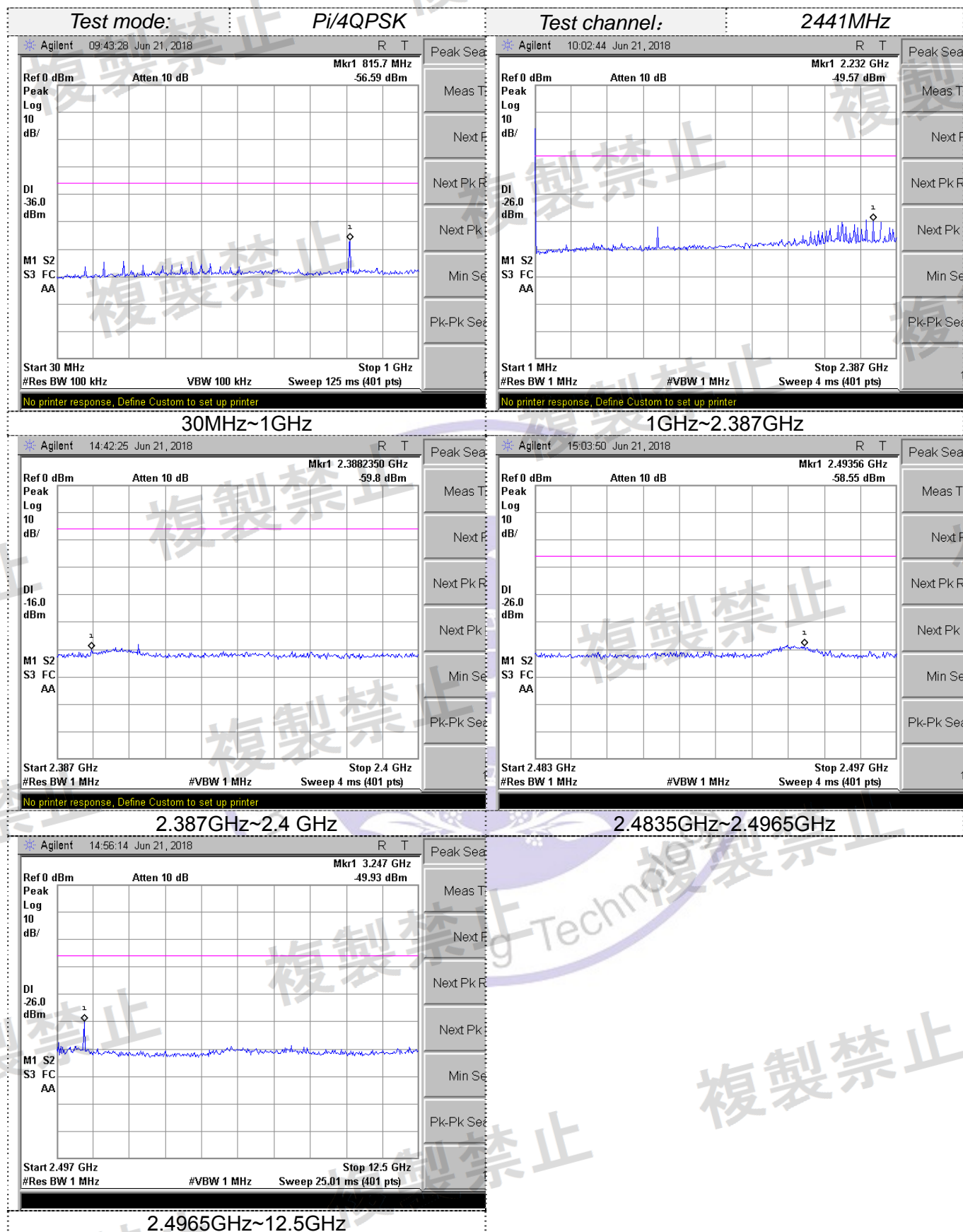
Bluetooth BR/EDR

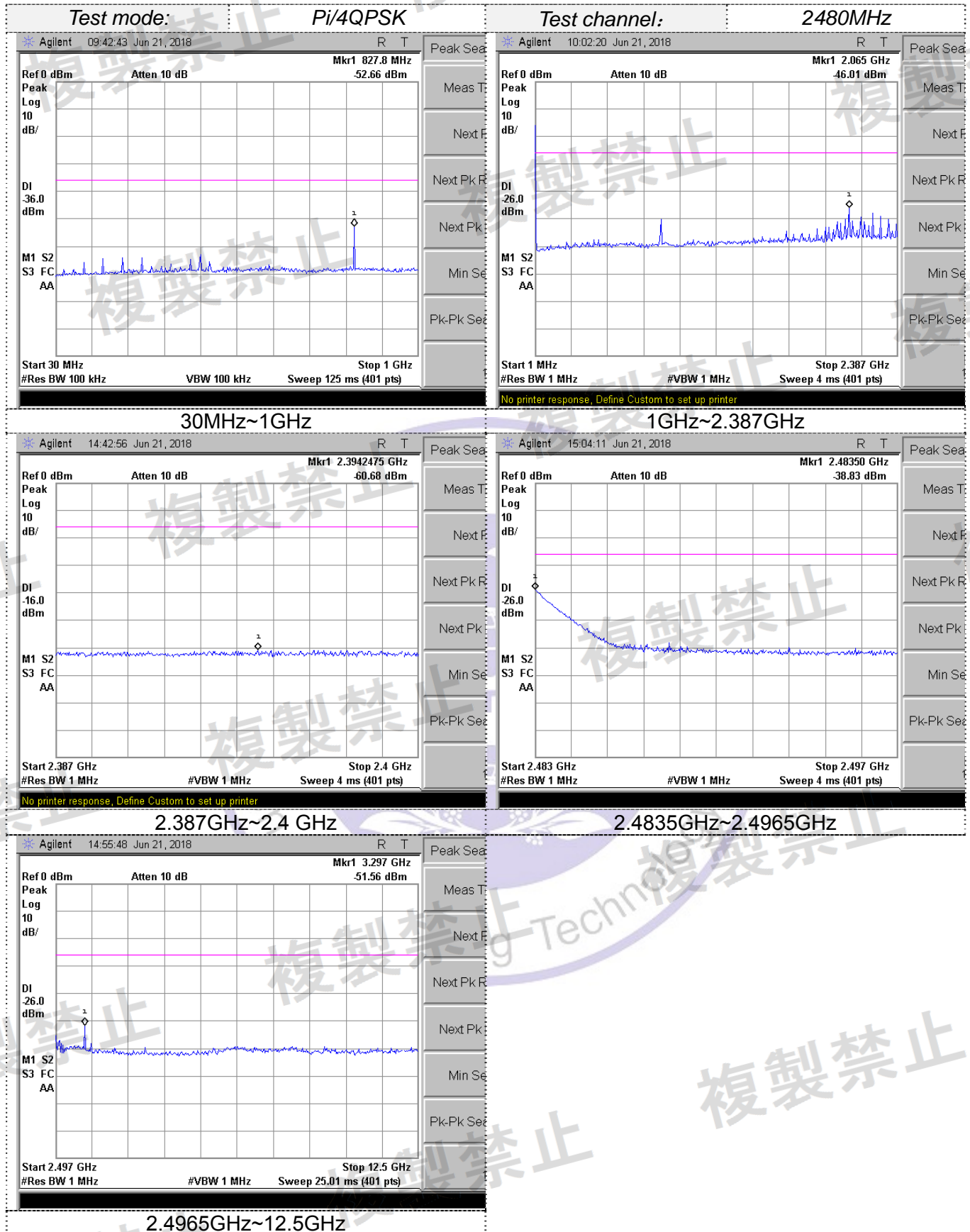


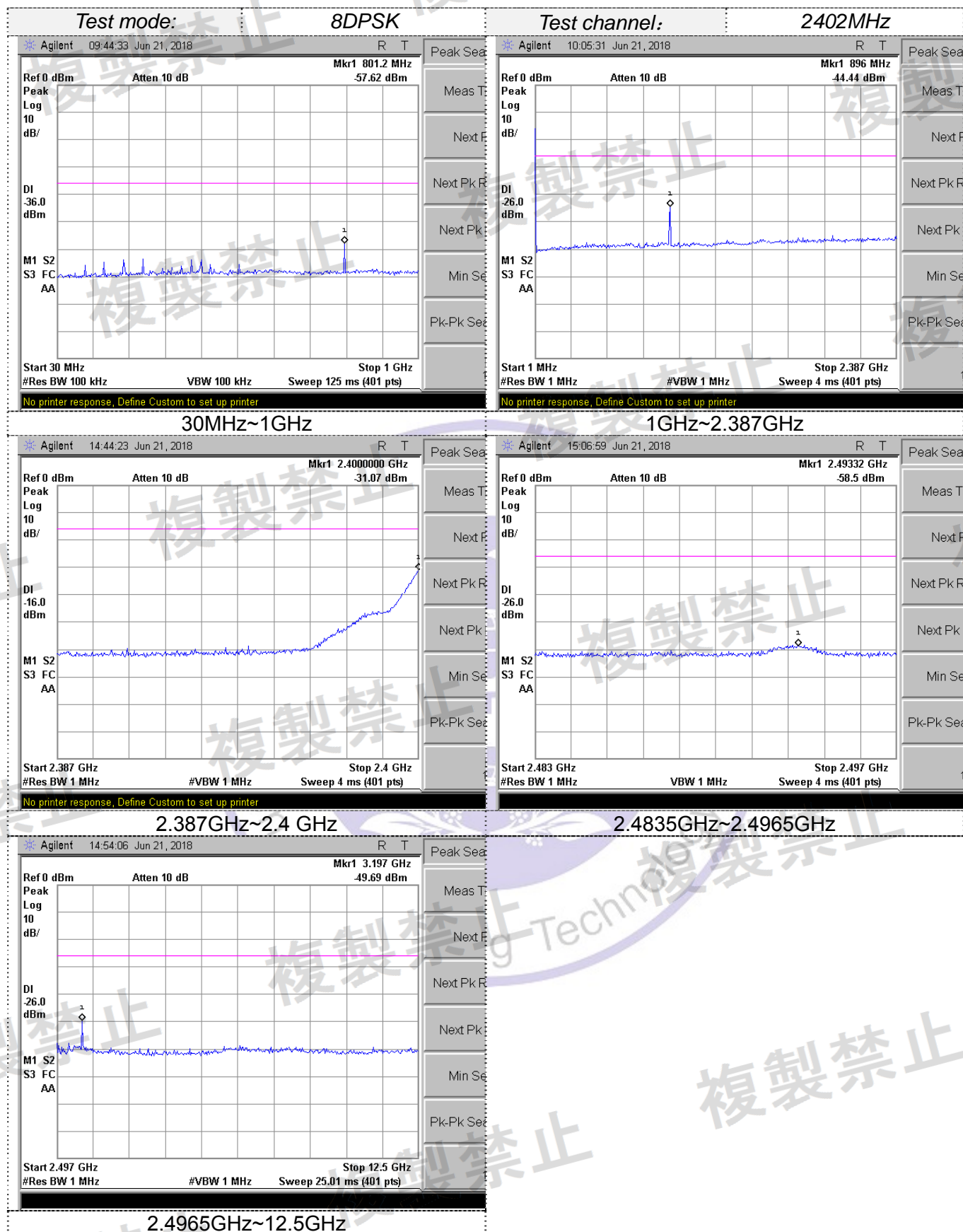


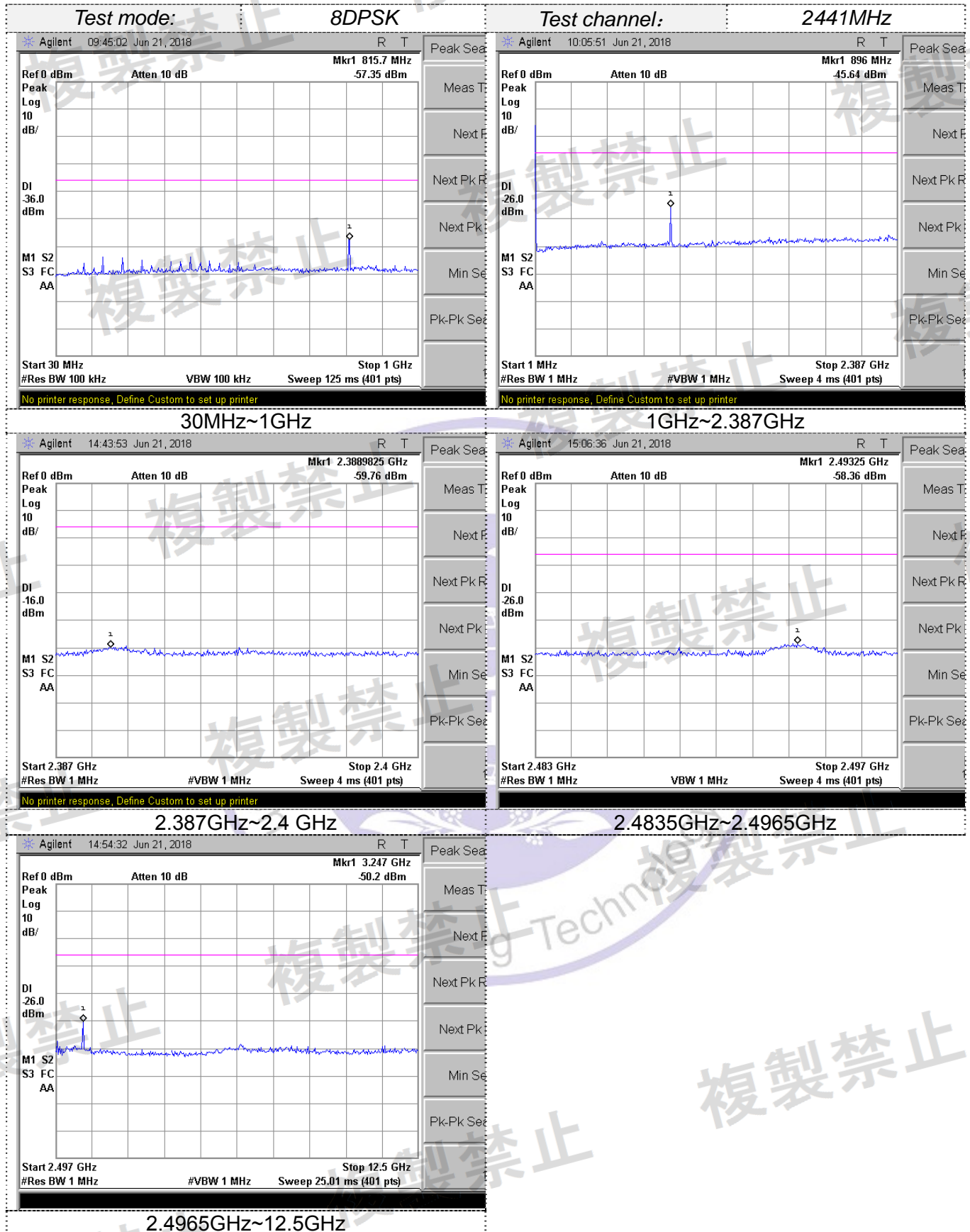


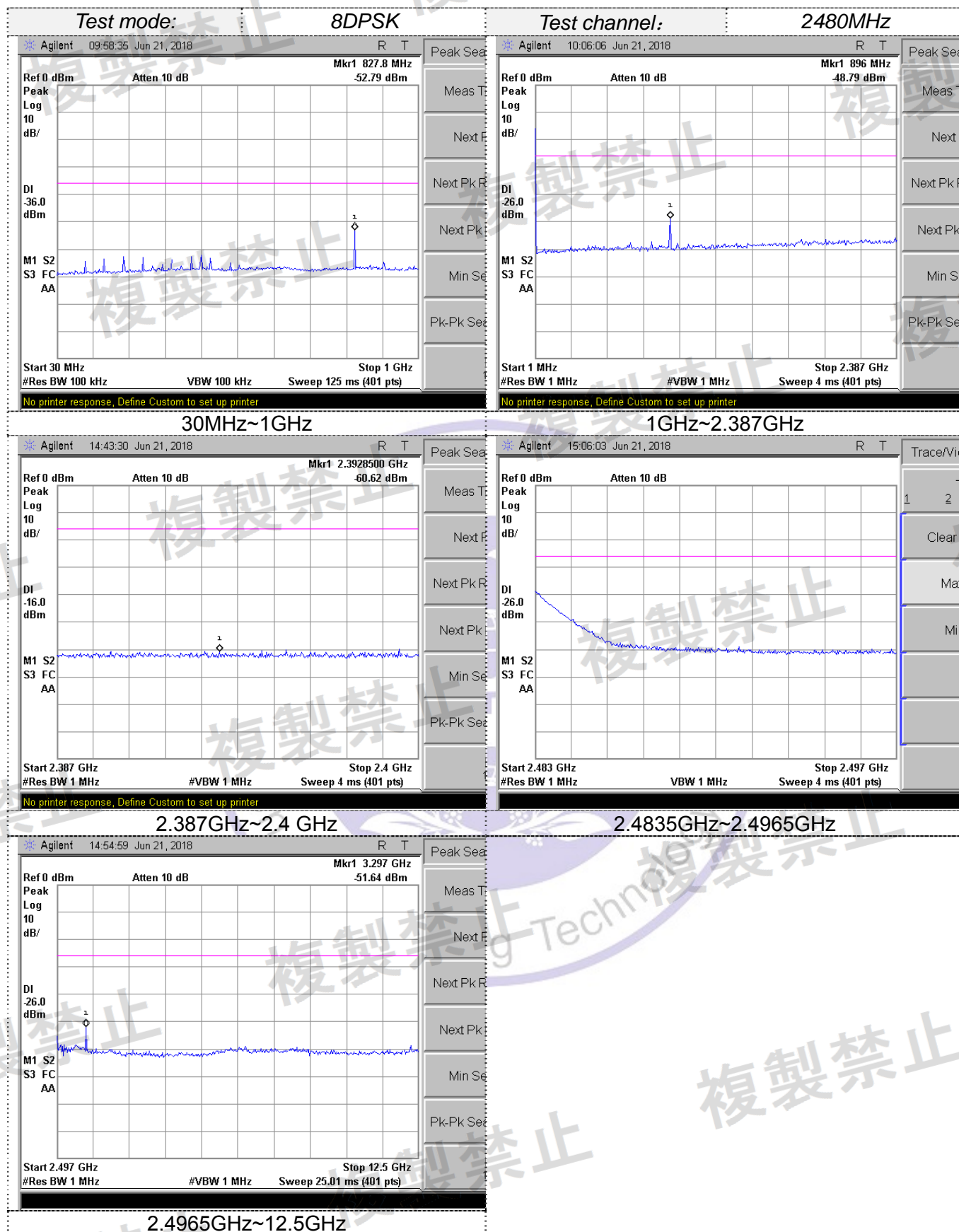




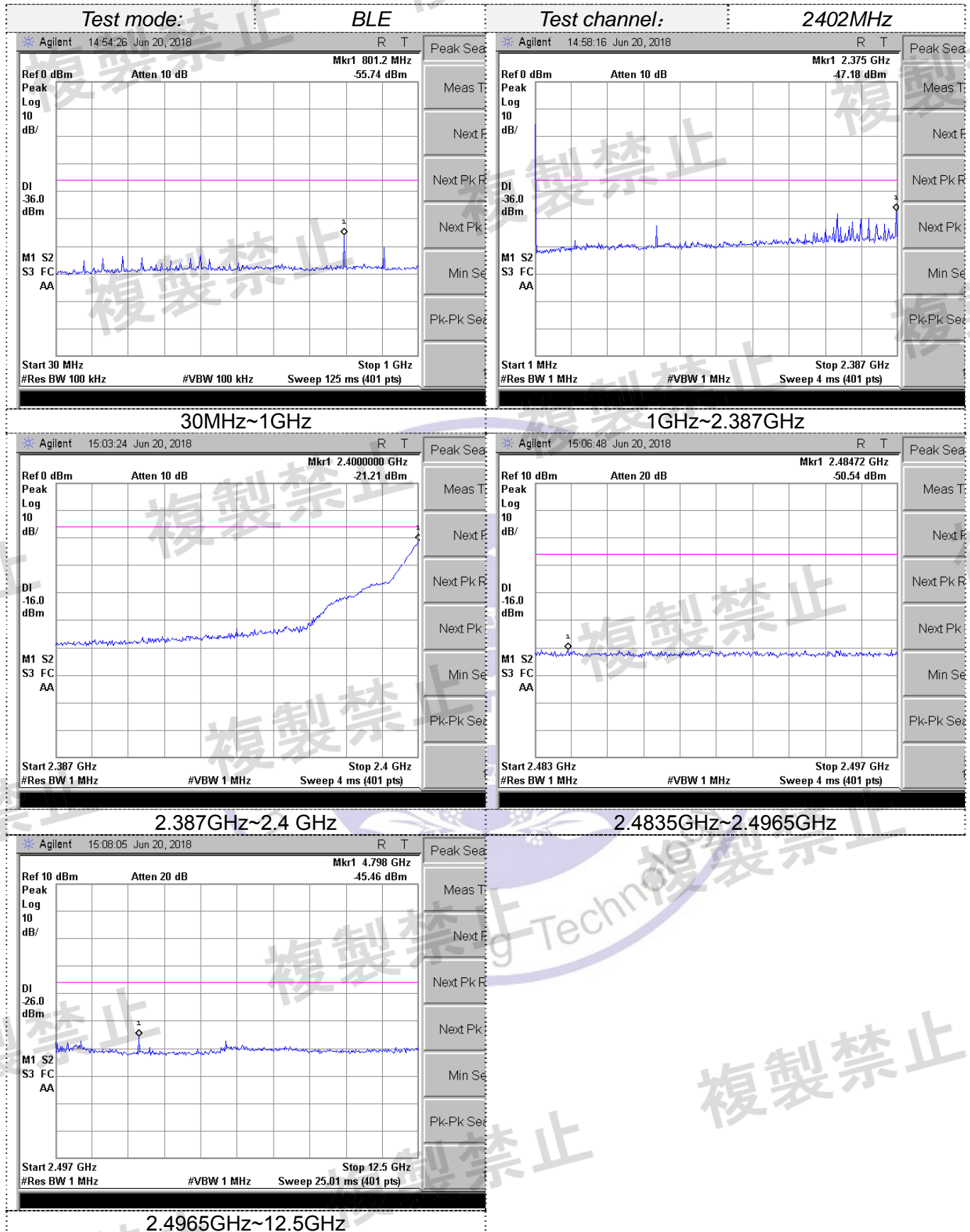


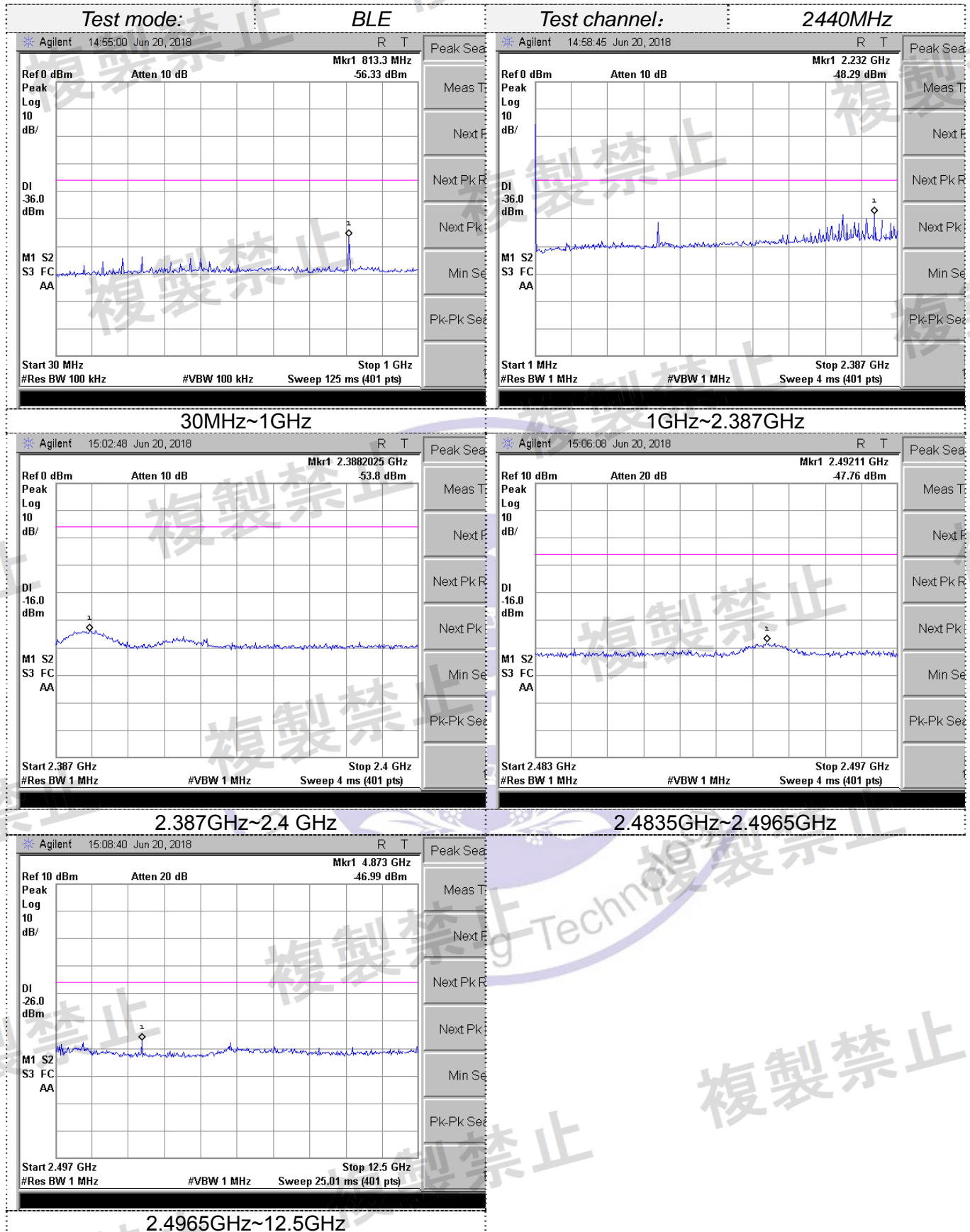


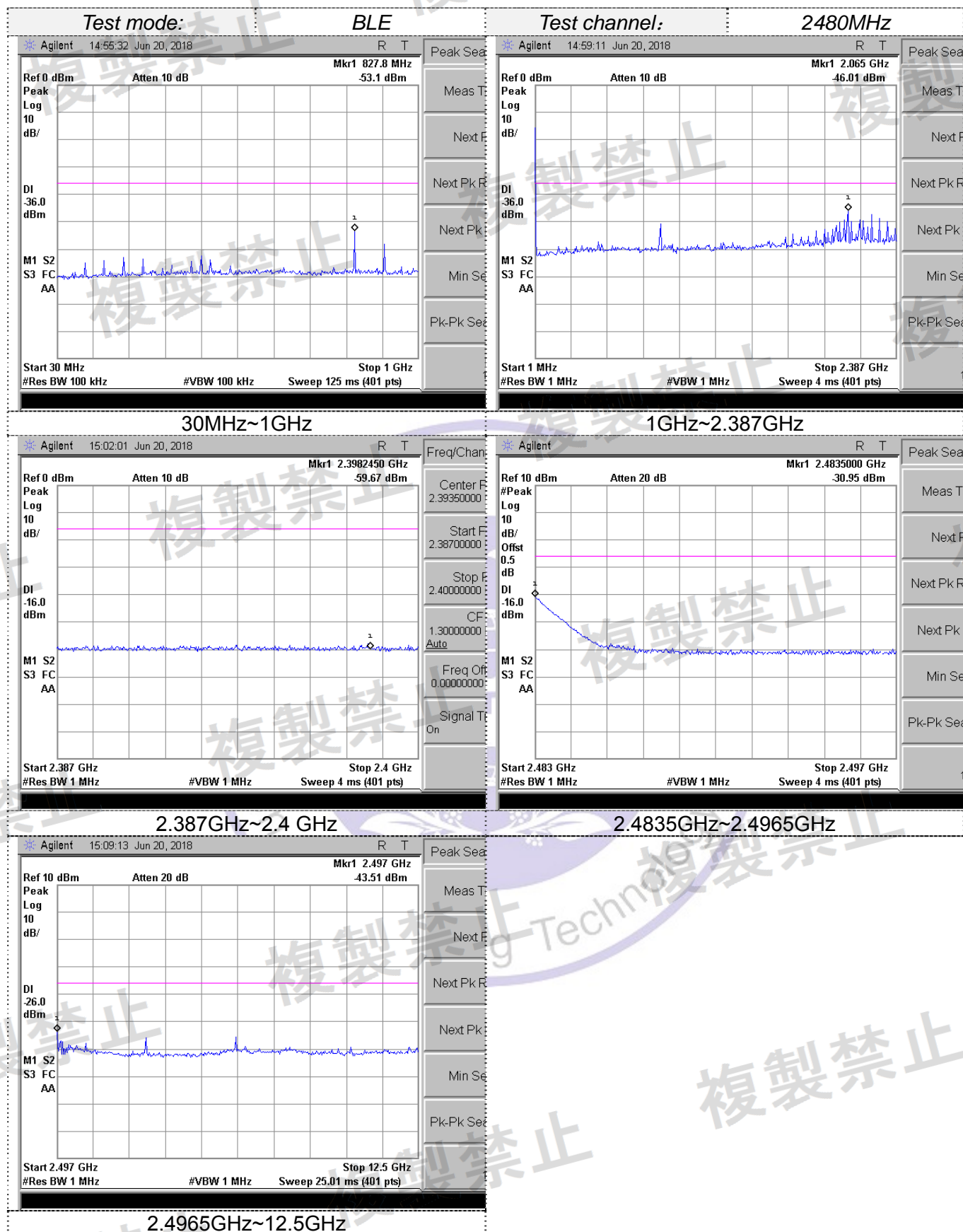




BLE







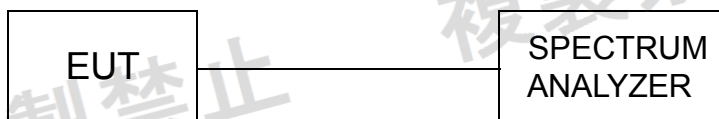
3.6. Secondary Radiated Emission Strength

LIMIT

Below 1GHz: 4.0nW or less

Above 1GHz: 20nW or less

TEST CONFIGURATION



TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram as TEST CONFIGURATION shows.

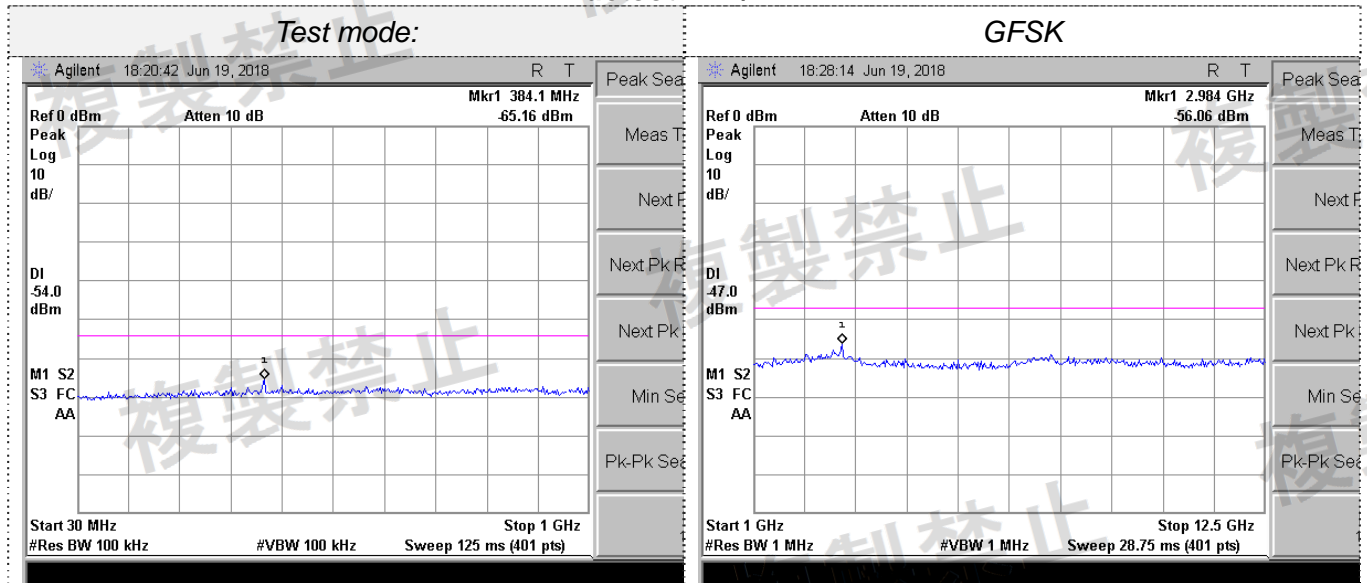
EUT Condition: modulation

Spectrum Condition:

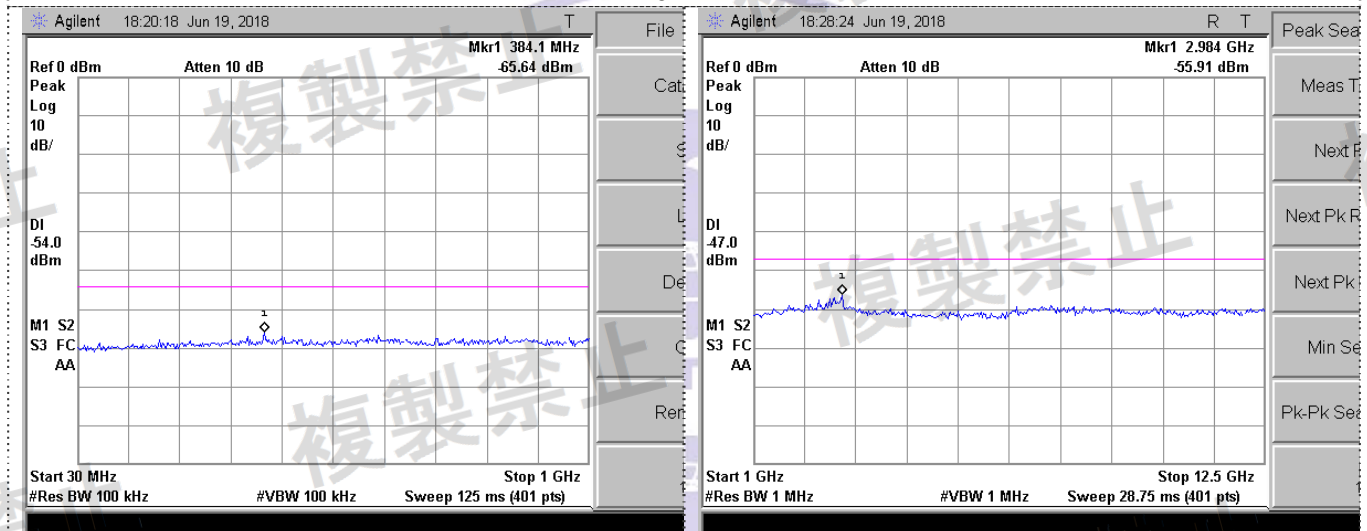
- Frequency: 30MHz-13GHz
- RBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- VBW: 100 KHz (30MHz-1GHz), 1MHz (1GHz-12.5GHz)
- Sweep time: Auto
- Detector mode: Positive peak
- Indication mode: max hold

TEST RESULTS

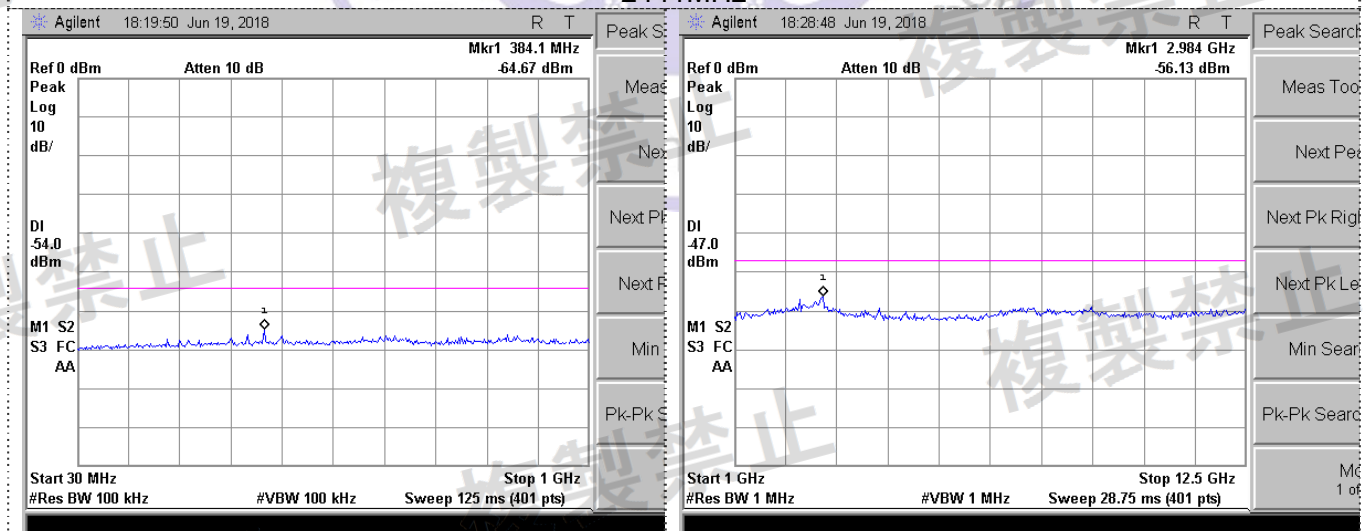
Bluetooth BR/EDR



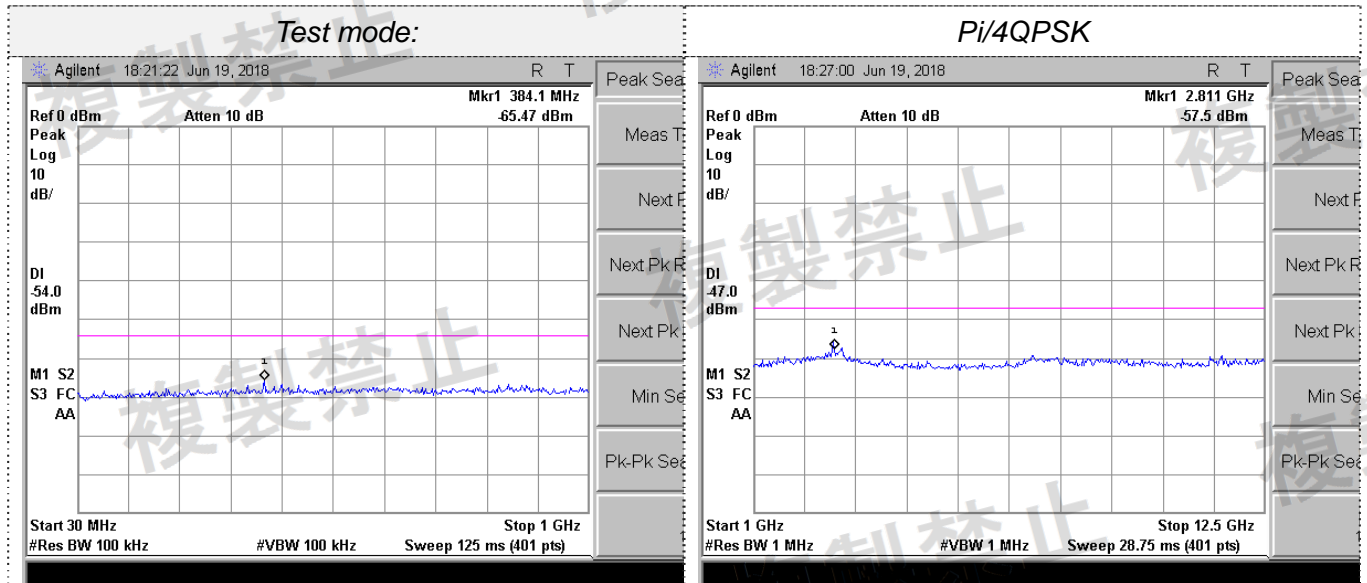
2402MHz



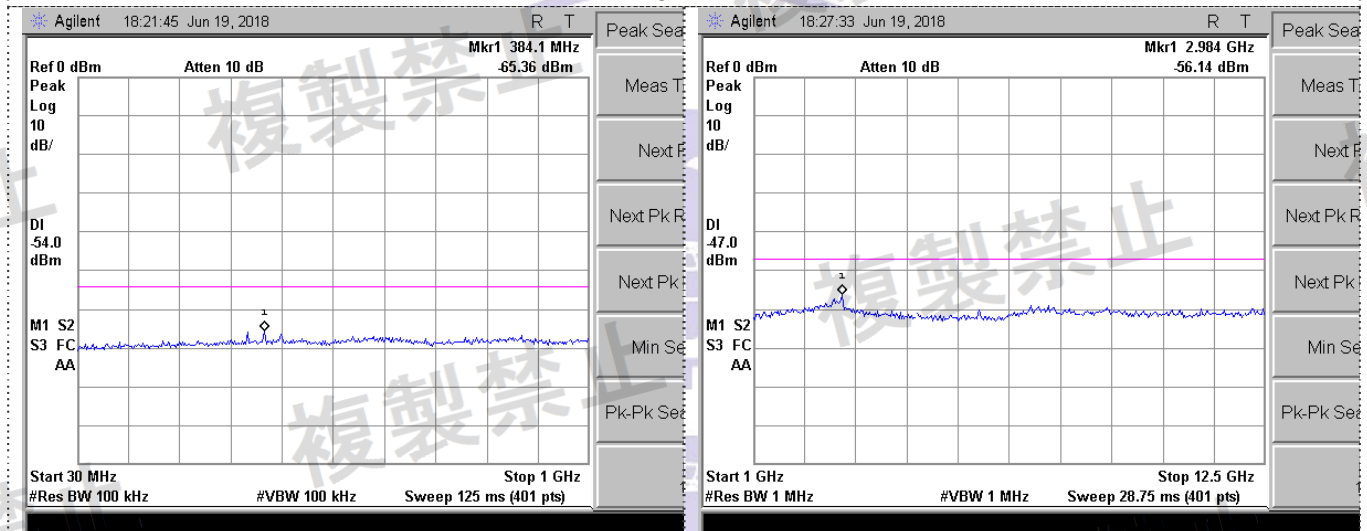
2441MHz



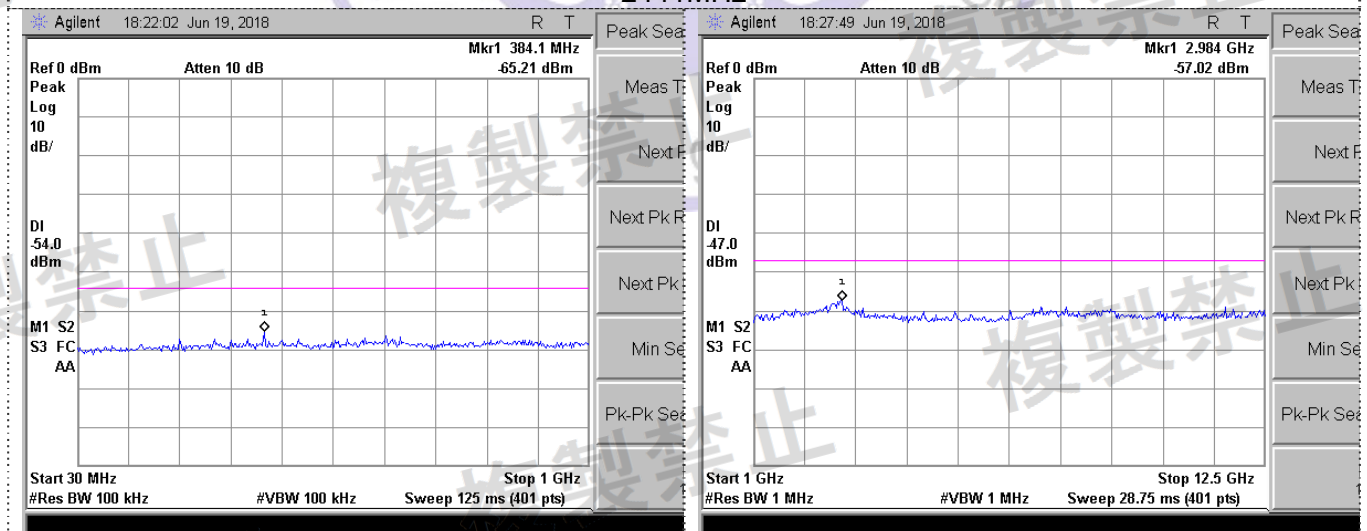
2480MHz



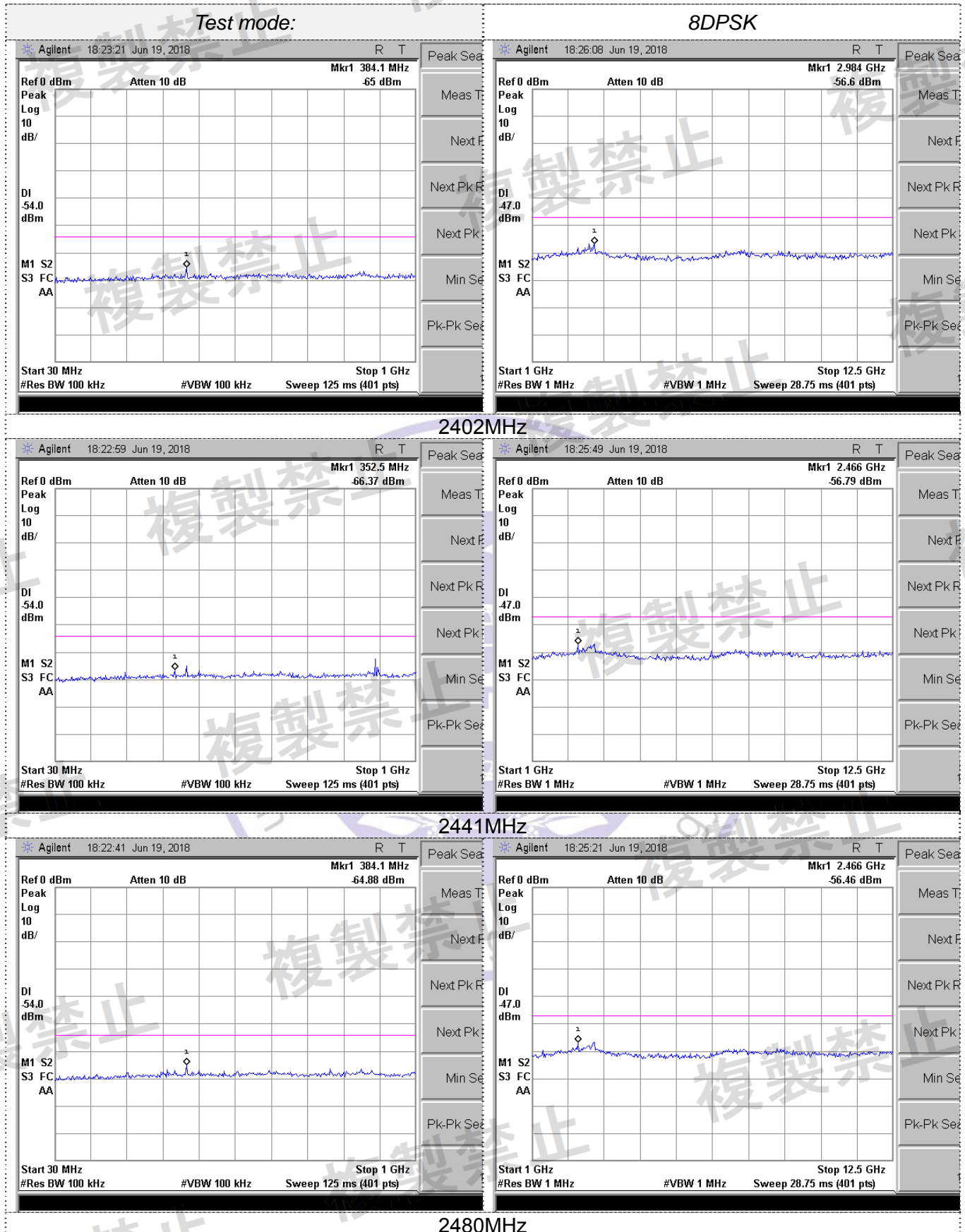
2402MHz



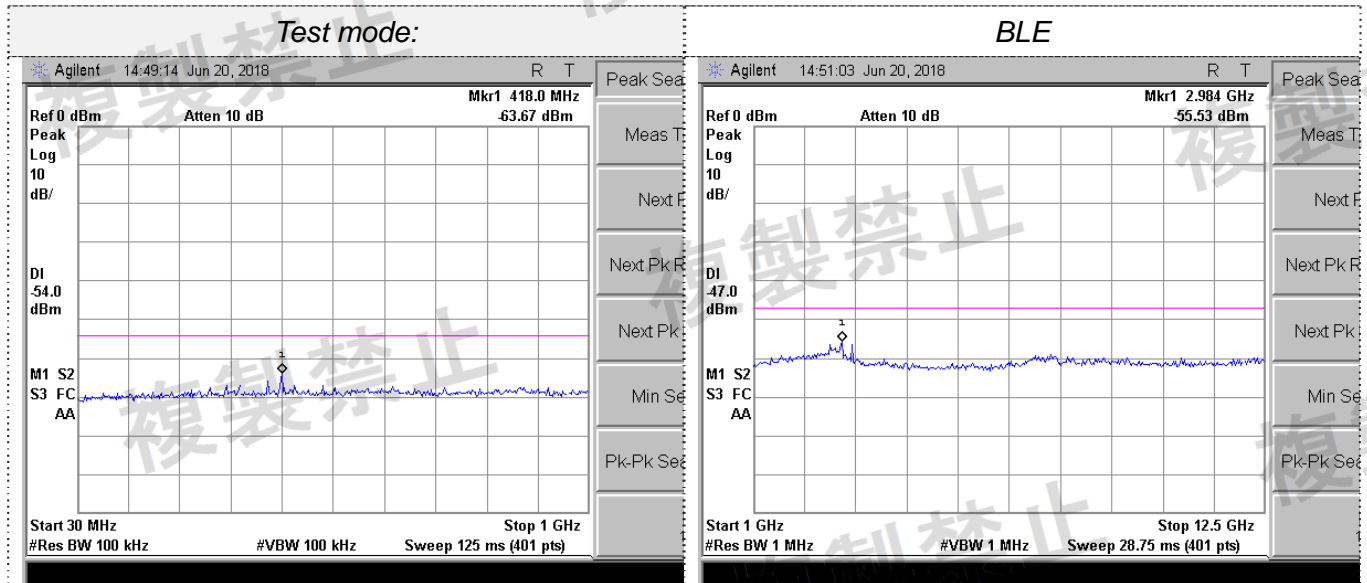
2441MHz



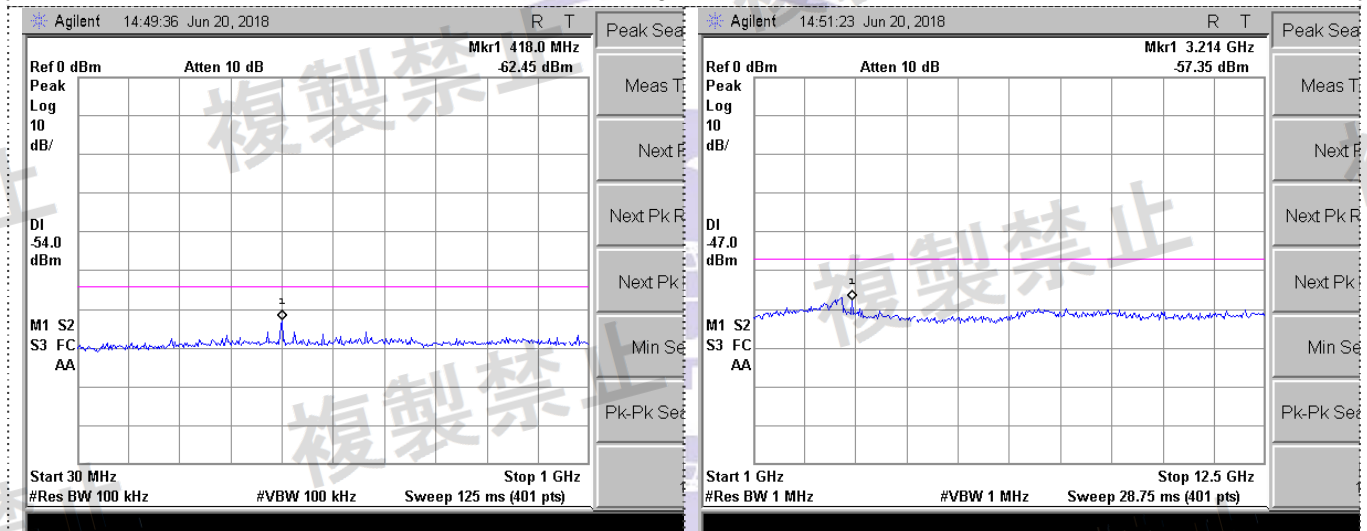
2480MHz



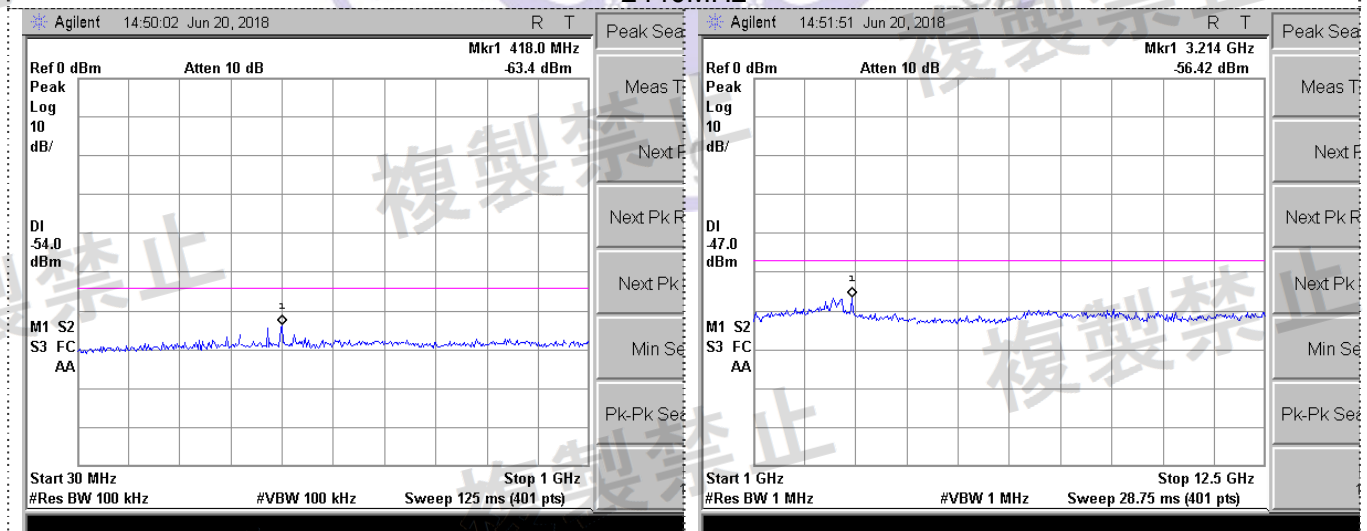
BLE



2402MHz



2440MHz



2480MHz

3.7. Construction protection method

Requirement

The high-frequency section and modulation section of the radio equipment except for the antenna system shall not be capable of being opened easily

Confirmation method

And all high-frequency section and modulation section was packaged in one IC.



3.8. Interference Prevention Function

Requirement

Clarify, the one automatically to transmit and to receive identification code with the wireless equipment of the wireless station used in the same premises.

Interference Prevention Function Confirm

A communication link was made where the ID code is correct (Identical).

TEST PROCEDURE

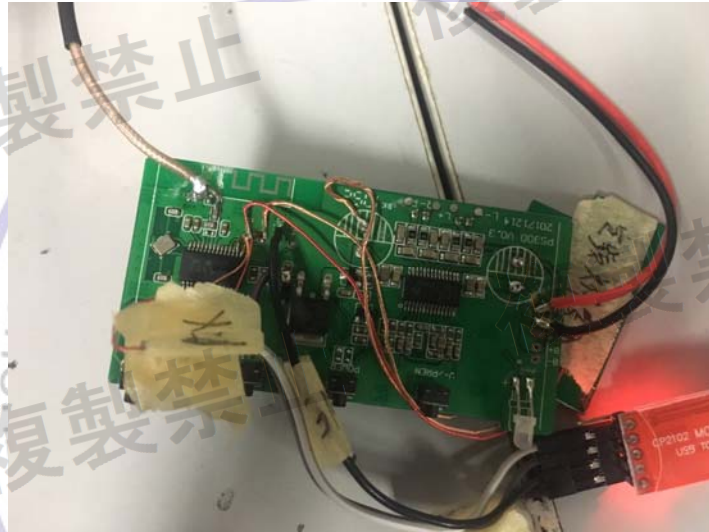
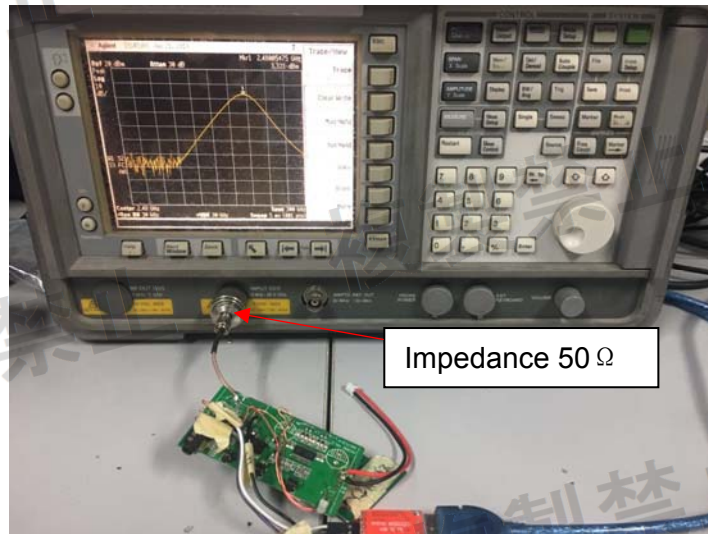
1. Connect the EUT in network
2. Open the software
3. We can get the information as follows:

TEST RESULTS

MAC: 06:21:c9:05:b7:0d



4. Test Setup Photos of the EUT



5. External and Internal Photos of the EUT

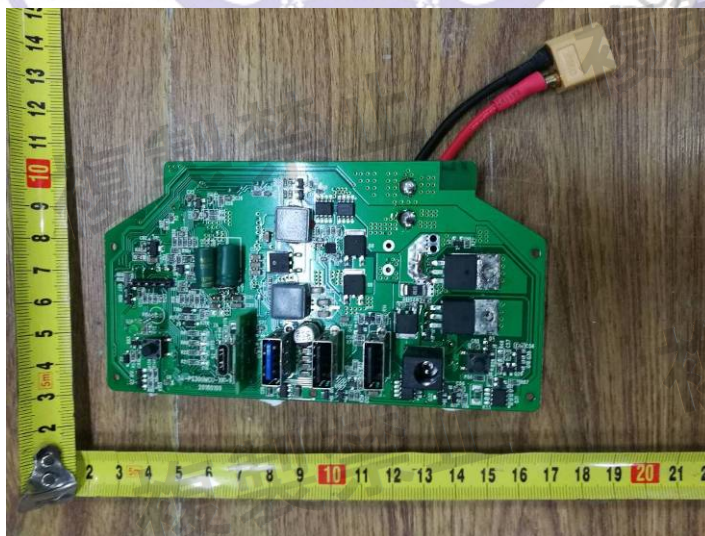
External Photos of EUT



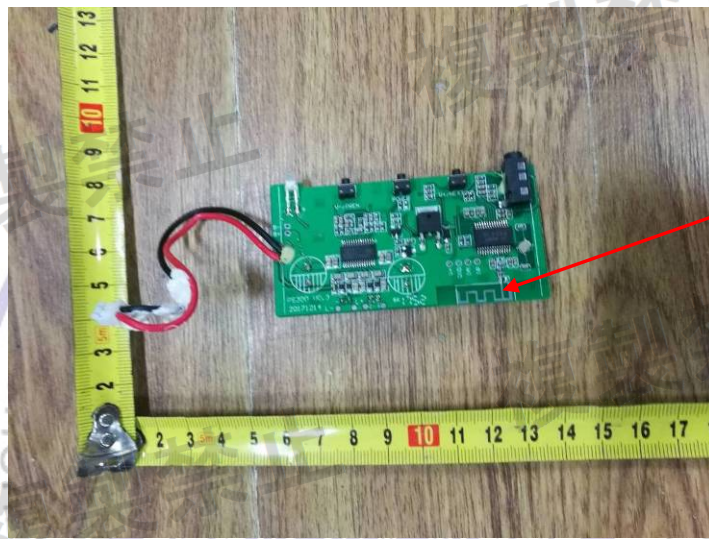




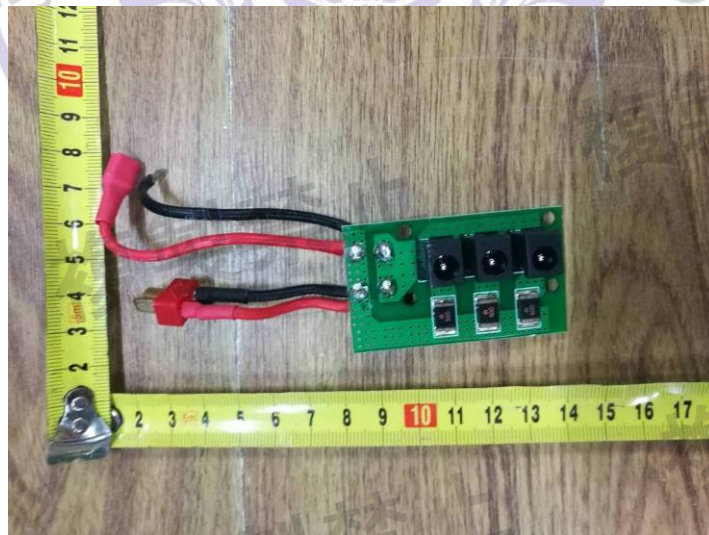
Internal Photos of EUT

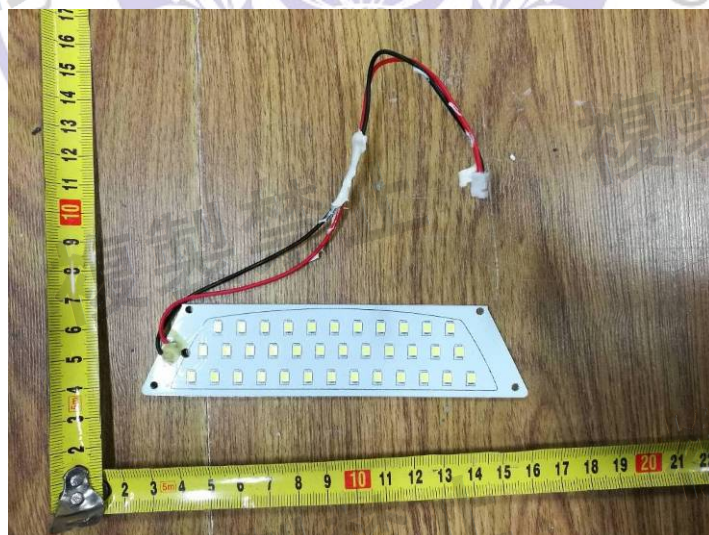
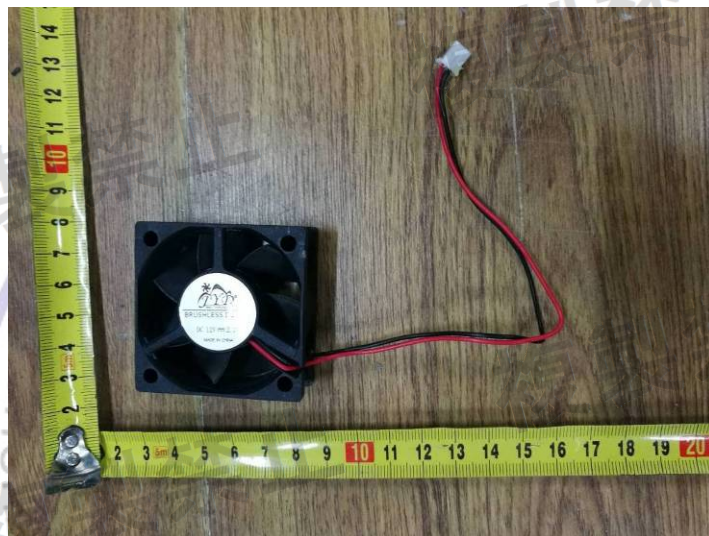






Antenna





*****THE END*****